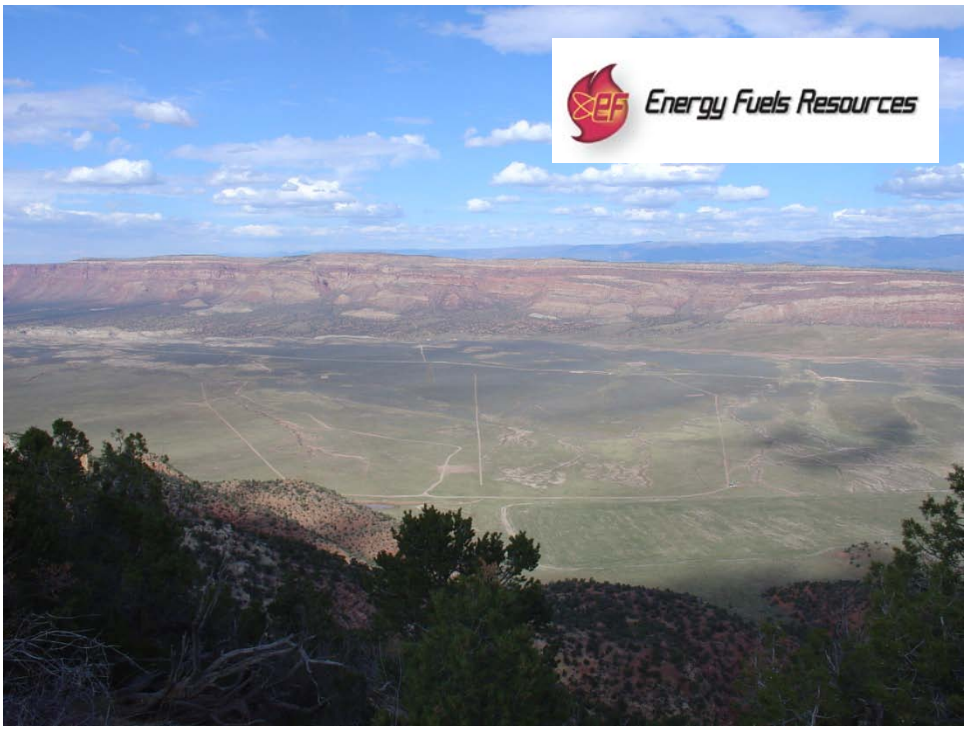
REPORT

CONSTRUCTION PLAN

Piñon Ridge Project, Montrose County, Colorado

Submitted To:
Energy Fuels Resources Corporation
44 Union Blvd., Suite 600
Lakewood, Colorado 80228

Submitted By:
Golder Associates Inc.
44 Union Blvd., Suite 300
Lakewood, Colorado 80228



October 2009 **Project No. 073-81694.0018**

A world of capabilities delivered locally

Golder Associates

Table of Contents

1.0 INTRODUCTION 1
1.1 Project Overview 1
1.2 Project Organization 1
1.3 Material and Labor Requirements 2
1.4 Project Execution Schedule 2
1.5 Project Security 3
1.6 Surveying 3
1.7 Detailed Engineering 3
1.8 Construction QA/QC 4
1.9 Health and Safety 4
2.0 SITE ACCESS AND SURFACE WATER DRAINAGE CONTROLS 5
2.1 Traffic Loads 5
2.2 Highway 90 Access Lane 5
2.3 All-Weather Access Road 6
2.4 Truck Wash, Scales, Guard House, and Helipad 6
2.5 Surface Drainage 6
3.0 GENERAL EARTHWORK 8
3.1 Clearing, Grubbing and Topsoil Stripping 8
3.2 Environmental Control Measures 8
3.3 Excavation and Structural Fill Stockpiles 8
3.4 Structural Fill 8
4.0 LINER SYSTEMS 10
4.1 Geosynthetic Clay Liner Placed on Prepared and Compacted Subgrade 10
4.2 Geomembrane 10
4.3 Leak Collection and Recovery Systems 10
5.0 MILL FACILITY 12
5.1 Objectives 12
5.2 Construction Management 12
5.3 Pre-License Owner Activities 12
5.4 Post-License Activities 13
5.4.1 Areas 100 and 200 13
5.4.2 Area 300 14
5.4.3 Area 400 and 600 14
5.4.4 Area 500 and 700 14
5.4.5 Area 800 14
5.4.6 Area 900 14
5.4.7 Transportation 15
5.4.8 Labor 16
5.4.9 Utilities 16

6.0 TAILINGS CELLS 17
6.1 Earthwork 17
6.2 Liner Installation 17
6.3 Leak Collection and Recovery System (LCRS) 17
6.4 Water Collection and Recycling 18
6.5 Tailings Cell A Construction Material and Labor Estimates 18
7.0 ORE STOCKPILE PAD AREA 19
7.1 One-Acre Concrete Ore Pad 19
7.2 Five-Acre Composite Ore Pad 19
7.3 Dumping Platform 19
7.4 East Stormwater Pond 19
7.5 Ore Pad Area Construction Material and Labor Estimates 20
8.0 EVAPORATION PONDS 21
8.1 Earthwork 21
8.2 Liner and LCRS Installation 21
8.3 Bird Netting 21
8.4 Evaporation Pond Construction Material and Labor Estimates 22
9.0 ADMINISTRATION BUILDING 23
9.1 Building Construction 23
9.2 Parking Lot Construction and Surface Drainage 23
10.0 REFERENCES 24
11.0 CLOSING 25

List of Tables

Table 2.1 Quarterly Traffic Loading
Table 5.1 Traffic Loading for Post-License Construction Period
Table 5.2 Estimated Labor Force for Mill Construction
Table 6.1 Tailings Cell Major Construction Activities and Estimated Costs
Table 6.2 Tailings Cell Construction Estimated Labor Requirements
Table 7.1 Ore Pad Area Construction Activities and Estimated Costs
Table 7.2 Ore Pad Area Construction Estimated Labor Requirements
Table 8.1 Evaporation Pond Construction Activities and Estimated Costs
Table 8.2 Evaporation Pond Construction Estimated Labor Requirements

List of Figures

Figure 1 General Site Layout
Figure 2 Construction Organizational Chart

List of Appendices

Appendix A Preliminary Project Execution Schedule

1.0 INTRODUCTION

Energy Fuels Resources Corporation (EFRC) proposes to license, construct, and operate a conventional acid leach uranium and vanadium mill at the Piñon Ridge Project site (Site) in western Montrose County, Colorado. The Site covers 880 acres on the south side of eastern Paradox Valley, approximately 12 miles west of Naturita near Highway 90. A general layout map of the site is shown as Figure 1.

The purpose of this report is to describe the plan for staged construction of the Piñon Ridge Mill. This report will be included as part of the Material License Application to be submitted to the Colorado Department of Public Health and Environment (CDPHE).

1.1 Project Overview

The Piñon Ridge Project is a proposed uranium and vanadium processing facility that includes the construction of the following major interrelated components:

- Mill facility;
- Administration building;
- Ore stockpile pads;
- Tailings cells;
- Evaporation ponds; and
- Surface water control features.

In addition to the major components listed above, general site grading, road construction, and construction of other, smaller structures contribute to the overall project. Permitting, detailed engineering and construction of the various components, as shown in Figure 1, will be scheduled in order to commission the facility during the first quarter of 2012 (see Appendix A).

1.2 Project Organization

An organization chart showing the hierarchy of individuals and groups involved with construction of the Piñon Ridge Project is shown in Figure 2. As indicated, the Construction Management Team consisting of mill and geotechnical management, field supervision, cost and scheduling staff, and other administrative personnel as required, reports to the Energy Fuels Resources Project Manager. The Mill Contractor will report to the Mill Construction Management Team, while the Earthworks, Liner, and Piping Contractors will report to the Geotechnical Construction Management Team. The Geotechnical Firm will provide Construction Quality Assurance (CQA) personnel to oversee earthwork, piping, geosynthetic, and concrete components of the site construction. Quality Assurance (QA) personnel from CDPHE will be on-site to observe construction on behalf of the State of Colorado.

The Construction Management Team will work closely with the engineering groups (i.e., Mill Team and Geotechnical Firm) to develop a detailed construction plan and schedule. Construction plans and specifications will be provided by the engineering contractors. The engineering contractors will provide technical field support during the construction and mill start-up period receiving direction from the Construction Management Team, and will prepare as-built construction drawings.

The Commissioning Team consists of the owner's mill operating, maintenance and radiation safety personnel and selected construction team personnel specializing in mechanical, electrical and instrumentation crafts.

1.3 Material and Labor Requirements

Material suppliers have been identified and contacted to confirm that they can provide the necessary supplies in sufficient quantity. Major material requirements include: mill components, concrete, piping, structures, procured soil materials (i.e., gravel and sand), and geosynthetic materials (i.e., geomembrane, geosynthetic clay liner, geonet, geocomposite drainage materials, and geotextile). Procurement of long lead items will commence as detailed engineering progresses, allowing timely deliveries to support the construction schedule.

Labor requirements have been addressed in the Basic Engineering Report (CH2M Hill 2009). Project construction will involve two major types of subcontractors: general (civil, structural, mechanical, and piping), and electrical/instrumentation. A number of minor specialty contractors will be employed as needed for pre-engineered buildings, tank erection, insulation, fire protection, liner installation, primary power supply, and minor on-going support activities.

Construction work will be bid on a 50-hour per week basis (10 hours per day), allowing a sixth day for make-up work or selected over-time for specific scheduling requirements. Contractors previously identified indicate that staff will be available to meet the anticipated peak work force of approximately 275 personnel (CH2M Hill 2009).

1.4 Project Execution Schedule

A preliminary project execution schedule is provided in Appendix A. The schedule was designed in order to commission the facility during the first quarter of 2012. Critical milestones include:

- Submittal of the Material License Application — Fourth Quarter 2009
- CDPHE Approval of the License — First Quarter 2011
- Detailed Engineering Complete — First Quarter 2011
- Montrose County Issues Building Permits — First Quarter 2011
- Begin Ancillary Construction — Fourth Quarter 2010
- Begin Mill Construction — First Quarter 2011
- Mechanical Completion — Fourth Quarter 2011
- Mill Commissioning — First Quarter 2012

The Site, located on the Western Slope of Colorado, is characterized by distinctive seasonal changes. During the winter season, temperatures are low and snowfall could be sufficient to cause delays in construction work, particularly earthwork, excavations for foundations, concrete placement, and structural steel erection (CH2M Hill 2009). Also, roadways could be icy and dangerous, while the ground may be frozen. Winter generally begins in November, and extends through February (CH2M Hill 2009). Favorable weather conditions generally prevail during the remainder of the year (March or April through October), allowing for good construction productivity. As a consequence, construction work will be scheduled to maximize work during warmer months, with a focus on completion of critical activities.

The proposed approach for project execution is based on early engineering and commencement of ancillary construction activities (e.g., highway access, site roads, drainage improvements) prior to receiving permit approval. This approach is required in order to meet the anticipated first quarter 2012 operational start-up.

1.5 Project Security

During construction, a guard will be posted at the main entrance. Early on in the construction process, a fence will be constructed around the property with a gated entrance off of the main access road near Highway 90. The guard will be stationed at the gated entrance during working hours. The gate will be locked and the site secured at all other times. Nearing construction completion, the project security will be enhanced against unauthorized entry by implementing more rigorous check-in and check-out procedures, and introducing badging requirements.

1.6 Surveying

Construction surveying will be performed according to the project-specific specifications. Specific surveying requirements vary among the different facilities and are therefore located throughout the specification packages. Refer to Golder (2008a) for earthwork-related project specifications. Emphasis will be placed on surveying accurate locations of buried utilities.

Baseline radiological surveys of the site were performed as part of the baseline studies for the project. Radiological surveys will be performed at the site with the introduction of uranium and vanadium ores to the five-acre ore pad, during commissioning and into full production and owner's acceptance. The owner will perform the radiological surveys, as outlined in the Health and Safety Plan procedures (EFRC 2009).

1.7 Detailed Engineering

Detailed engineering begins where basic engineering ends, including a review of the basic engineering to discuss planned additions, changed and exclusions. Detailed engineering will

commence third quarter 2010, during CDPHE's review of the License Application, to enable a construction schedule which includes mechanical completion during the fourth quarter of 2011. Engineering disciplines will mobilize to support procurement and construction activities.

1.8 Construction QA/QC

Construction quality assurance (QA) and quality control (QC) will be performed according to the project specifications. The construction quality assurance plan for earthworks is detailed in Section 01400.1 and for geosynthetics in Section 01400.2 in Golder's Technical Specifications for the Piñon Ridge Project (Golder 2008a). Construction QA/QC activities will be reported to CDPHE at the completion of each major phase of site construction.

1.9 Health and Safety

Health and safety plans for execution of the construction activities will be prepared by the Construction Management Team prior to commencement of construction activities. These plans will be submitted to Energy Fuels Resources for review and compliance with company protocols and procedures.

2.0 SITE ACCESS AND SURFACE WATER DRAINAGE CONTROLS

Access roads to and around the Site are required to be completed early to meet the construction time-table, and to allow for the heavy transport loads of equipment and materials to access the site. In general, construction of ancillary features, including access roads and site drainage controls, are scheduled to be nearing completion when the mill license and building permits are granted (refer to Appendix A).

2.1 Traffic Loads

Approximately 6,610 truck-loads are anticipated during both pre-license (third and fourth quarter of 2010) and post-license construction periods. The estimated quarterly truck load count is summarized in Table 2.1.

Table 2.1: Quarterly Traffic Loading.

Activity	2010 Qtr 3	2010 Qtr4	2011 Qtr 1	2011 Qtr 2	2011 Qtr 3	2011 Qtr 4	2012 Qtr 1	Total
Mobilize	15		25					40
Gravels		2,100	400	750	460	1,000		4,710
Concrete		100	300	400	170	30		1,000
Equipment		15	20	40	20	10		105
Steel		15	20	90	40	20		185
Pipe/Cable		5	5	25	30	10		75
Liner				250	200	5		455
Demobilize						30	10	40
Total	15	2,235	770	1,555	920	1,105	10	6,610

2.2 Highway 90 Access Lane

The Colorado Department of Transportation (CDOT 2008) has granted a State Highway Access Permit (Permit Number 508015) to Energy Fuels Resources to add an access road approximately 152 feet east of milepost 23 on the south side of State Highway (SH) 90. Under this permit, Energy Fuels Resources will add a westbound left turn deceleration lane and a 10-foot wide shoulder in the eastbound direction. Road improvements will conform to Section Four of the 1998 State Highway Access Code, Volume Two, Colorado Code of Regulations 601-1, as amended.

These highway improvements will be completed prior to initiating major construction within the site. Construction of the roadway improvements is scheduled to commence a few months prior to CDPHE granting a Source Material License to Energy Fuels Resources, enabling mill construction within the license boundary to begin immediately after the license is granted (refer to Appendix A). Energy Fuels Resources will notify the Colorado Department of Transportation in Durango prior to commencing construction within the State Highway right-of-way, in accordance with the permit.

2.3 All-Weather Access Road

The main access road to the site will be paved for the first 150 feet of length, nearest to SH 90. The remainder of the primary site roads will be surfaced with gravel, while secondary site roads will be two-track dirt roads (Kleinfelder 2008a). The primary roadways will be one lane in each direction, with a roadway width of 22 feet and 2-foot shoulders on each side (Kleinfelder 2008a; 2008b). The aggregate roadway design section varies across the site, depending on the estimated vehicular traffic loading, with an aggregate thickness as much as 17 inches for the main site access road (Kleinfelder 2008a; 2008b).

The roads and site drainage will comprise the first site construction activities to commence. After construction, periodic maintenance of the roadways will be performed, consisting of blading and placement of fresh aggregate, as needed (Kleinfelder 2008a).

2.4 Truck Wash, Scales, Guard House, and Helipad

The guard house and helipad will be built early on in the construction time-frame. The guard house will be used during construction as part of the site security system. The helipad will consist of a level area surfaced with gravel, and will be available during the majority of mill construction. Use of the helipad is expected to be limited to emergency situations should a rapid evacuation to a hospital be necessary. The truck wash and scales will not be needed until operations begin, so these structures will be constructed during later construction phases.

2.5 Surface Drainage

The surface grading of the site will be managed to control runoff, erosion, and sediment transport due to construction activities. The planned surface grading and drainage plans are included in Kleinfelder (2008b; 2008c). Grading necessary to manage site drainage during construction will be one of the first construction activities to commence within the site in order to manage drainage during subsequent construction activities.

Un-impacted surface water will be routed via diversion berms constructed south (i.e., uphill) of the mill into natural drainage channels on the east and west sides of the site. A drainage channel will also be

constructed along the main site access road, with culverts as designed (Kleinfelder 2008b; 2008c). These drainage channels may be constructed prior to issuance of the mill license.

The West Stormwater Pond will be constructed during the early stages of site construction to contain water from the production wells for use in dust suppression. A separate water tank will be constructed for general containment of water from the production wells. The East Stormwater Pond will be constructed in conjunction with the Ore Pad, and is discussed in Section 7.4.

A diversion channel will be constructed on the south side of the Evaporation Ponds to divert surface water around the Evaporation Pond complex (Kleinfelder 2008c). The channel will be constructed (at least partially) prior to Evaporation Pond construction.

A storm sewer network connects the East Stormwater Pond to the West Stormwater Pond, and then subsequently to the Evaporation Pond complex (Kleinfelder 2008c). The storm sewer network, designed to convey pond overflows resulting from the 1000-year storm (Kleinfelder 2008c), will be constructed after most of the tailings cell earthwork activities are completed to limit damage during other site construction.

3.0 GENERAL EARTHWORK

The following sections provide a general overview of the earthwork-related components of mill construction. An earthworks contractor will mobilize and commence construction with the plant site clearing and grubbing, mass earthworks and rough grading, including development of contractor laydown areas and temporary construction facilities. This will ready the Site for commencement of foundation construction, and tailings cell and evaporation pond earthworks upon receipt of the mill license.

3.1 Clearing, Grubbing and Topsoil Stripping

Areas requiring clearing, grubbing, and topsoil stripping will be cleared at the outset of construction. The topsoil materials resulting from this work will be stockpiled at the location identified on Figure 1, on the western portion of the property. Clearing, grubbing, and topsoil stripping will be performed according to the specifications (Golder 2008a; refer to Section 2200.0, Part 3). Topsoil stripping depths of 6 to 12 inches are anticipated, as the local vegetation generally consists of sparse grasses. Stockpiled topsoil will be used during site reclamation and closure activities.

3.2 Environmental Control Measures

During construction, a variety of sediment control measures will be utilized, including hay bales, silt fences, and temporary detention basins. The purpose of these controls will be to minimize the amount of sediment runoff from the property to levels that approximate conditions prior to initiating construction. Selection of the appropriate control measure will generally be the contractor's responsibility. Erosion control will be performed according to the specifications (Golder 2008a; refer to Section 2200.0, Part 3.03).

3.3 Excavation and Structural Fill Stockpiles

Excavations will be performed according to the specifications (Golder 2008a; refer to Section 2200.0, Part 3.05). The contractor will be responsible for the temporary stability of all cut slopes during construction. Excavated soil not used immediately as fill will be hauled to the structural fill stockpile location(s) shown on Figure 1, and stored for use during future construction phases.

3.4 Structural Fill

Structural fill materials will be selected and placed for site construction, including general site grading, mill bench construction, ore pad construction, tailings cell construction, and evaporation pond construction, according to the specifications (Golder 2008a; refer to Section 2200.0, Parts 2 and 3.07). Fill materials will consist primarily of on-site excavated soils with imported materials

utilized for various filters, drainage, and roadway applications, as needed to meet the specifications. Structural fill required for site construction is anticipated to be obtained from the excavation for construction of Tailings Cell A. If additional fill materials are required for site construction, material shall be obtained from the excavation areas for future Tailings Cells B and C.

4.0 LINER SYSTEMS

The following sections provide a general overview of the geosynthetic components of the liner systems designed for construction of the mill. Geosynthetic materials will be procured during the end of the detailed design phase to enable construction of liner systems to commence during the second quarter of 2011. Geosynthetic materials will be procured from reputable manufacturers with an established performance history of their geosynthetic products. Relatively warm and dry weather conditions are beneficial for liner installation.

Liner systems will be constructed in a manner that prevents equipment traffic from traveling directly on the geosynthetic materials. During the construction process for each layer of geosynthetic, and upon completion of construction of the liner systems, geosynthetic materials will be stabilized against wind uplift to prevent damage (refer to Golder 2008c; Golder 2008d).

4.1 Geosynthetic Clay Liner Placed on Prepared and Compacted Subgrade

Geosynthetic clay liners (GCL) consisting of bentonite clay sandwiched between two geotextiles will be used in construction of the ore pad, tailings cells, and evaporation ponds. The GCL has been designed as a low permeability barrier, underlying the double geomembrane liners within the evaporation ponds and tailings cells. GCL has also been designed as the filtration barrier underlying the five-acre Ore Pad. GCL will be procured and installed according to the specifications (Golder 2008a; Section 02776.1).

4.2 Geomembrane

Geomembrane materials will be used to line the tailings cells and evaporation ponds. Double composite geomembrane liner systems, using two layers of 60 mil high density polyethylene (HDPE) geomembrane, have been designed for these facilities. Procurement and installation of the geomembrane materials will be performed according to the specifications (Golder 2008a; refer to Section 02776.0). After installation, the primary geomembrane liners (i.e., upper liners) of the tailings cell and evaporation pond liner systems will be tested for leaks using conductive spark testing. The spark testing will be performed in addition to the standard quality assurance measures considered as the current industry practice for geomembrane installation (refer to Golder 2008a; Section 01400.2).

4.3 Leak Collection and Recovery Systems

The tailings cells and evaporation ponds are designed with a leak collection and recovery system (LCRS) to capture and recover seepage that passes through the primary geomembrane, and minimize solution heads on the lower secondary geomembrane liner. Drainage geonets and geocomposites will be used as the drainage LCRS layers installed between the lower secondary and

upper primary geomembrane liners within the tailings cells and evaporation ponds. Procurement and installation of the geosynthetic drainage layers will be performed according to the specifications (Golder 2008a; Section 02621.0).

The LCRS layers will be sloped toward LCRS sumps within the tailings cells and evaporation ponds to enable recovery of any seepage. The LCRS sumps will be filled with free-draining gravels, with geotextile materials placed in critical locations (Golder 2008c; Golder 2008d) serving as a cushion between the geomembrane and the gravel. Geotextile materials will be procured and placed according to the specifications (Golder 2008a; Section 02770.0).

5.0 MILL FACILITY

Early earthworks, including site clearing and grubbing, access road construction, and drainage construction, will be scheduled to enable mill construction to begin immediately upon receipt of the License. Mill construction will commence with site grading activities, followed by construction of mill foundations, major equipment placement, tankage assembly, building erection, piping, electrical instrumentation, HVAC, mechanical completion, and commissioning activities.

5.1 Objectives

The construction plan will be executed in accordance with the project plan to achieve the following objectives:

- Conformance to the budget;
- On-schedule completion;
- Seamless transition from commissioning to Energy Fuels Resources acceptance;
- Compliance with site permits and applicable local, state and federal regulations;
- Compliance with Energy Fuels Resources standards of quality and safety; and
- Maximize local participation consistent with the above objectives.

5.2 Construction Management

Energy Fuels Resources will retain engineering, procurement and construction management (EPCM) firms experienced in process plant engineering for the mill facilities and for the tailings and evaporation pond facilities. These contractors will design the facilities, procure equipment and materials, contract with general contractors and manage the site activities.

5.3 Pre-License Owner Activities

Activities identified that lead up to a decision to proceed with the project construction include the establishment of ore supplies, permitting, financing and selection of engineering, procurement and construction management (EPCM) firms. The Owner may authorize construction activities outside the license boundary prior to the issuance of the Material License by the Colorado Department of Health and Environment in order to lengthen the construction period and therefore, minimize the impact on local community services. This also allows for the performance of outdoor construction activities during the summer months and the indoor mechanical completion and commissioning activities during the fall months.

Early Piñon Ridge activities include: establishing the survey grid and control for construction and as-built reporting requirements; mobilizing a quality control and assurance laboratory; Highway 90 access improvements; plant site fencing; clearing and grubbing; access road construction; well field development; drainage controls; and Guard House and Administration Building construction.

These early construction activities enable the mill and impoundments construction to begin immediately upon receipt of the Material License.

Approximately 2,250 truckloads of materials and equipment will be delivered during the 3rd and 4th quarter of 2010 (see Table 2.1). This load count consists of 2,200 truckloads of gravels and concrete from the local community. An additional 50 truckloads of fencing, building steel and siding, culverts, piping, electrical and grounding materials are required.

5.4 Post-License Activities

Energy Fuels Resources will start mobilizing additional construction resources to the Piñon Ridge site immediately upon award of the Material License. The earthworks contractor will mobilize additional equipment and begin clearing, grubbing and stockpiling of topsoil within the license boundary and implement surface water and dust control measures. Energy Fuels Resources will establish additional health, safety and security measures.

The mill pad area grading will be moderate, consisting of cut along the southern portion, and fill at the north end of the mill Site. Near-surface soils will be removed, moisture-conditioned, and re-compacted to limit collapse potential. Earthworks will be performed in accordance with the project specifications (refer to Golder 2008a; Section 02200.0).

Kleinfelder (2008d) provided recommendations for the mill foundations. Conventional spread footing foundations will be placed on compacted engineered fill supports for mill structures, equipment and slabs (Kleinfelder 2008d).

Construction sequencing proceeds from the ground up. The sequence starts with concrete construction followed by equipment setting, tank erection, construction of steel platforms and stair stringers, building erection, piping, electrical, and instrumentation. The deepest concrete foundations are excavated, poured and backfilled first, working toward the surface. The shallowest foundations, such as slabs on grade or door aprons, will be poured last.

5.4.1 Areas 100 and 200

The dump hopper and SAG mill foundations are likely to be the deepest and largest foundations in terms of single pours on the project. The pulp storage tank and leach tank foundations will follow. Pulp storage tank and leach tank erection and lining will start after the concrete is cured and backfilled. Millwrights and iron workers will set the SAG mill and feeder, vibrating screens and supporting steel in place before the Grinding and Leach Building (approximately 225'L x 75'W x 95'H) steel is erected and sheeted. Electricians and pipe fitters will install conduits, cables, instruments, pipe, valves and fittings from electrical motors to the motor control centers and between pumps and tanks.

5.4.2 Area 300

Concrete crews will pour individual thickener foundations prior to field erection and lining these 40' diameter tanks. Pumps, floor sumps and slab on grade concrete foundations will follow. Thickener mechanisms and bridges will be set prior to curing the linings. The CCD Thickener Building (approximately 200'L x 25'W x 20'H) is constructed after setting the mechanical equipment. Electricians and pipe fitters will perform similar construction activities as in Area 100 and 200.

5.4.3 Area 400 and 600

The Solvent Extraction Building (approximately 370'L x 140'W x 30'H) is the largest building in square footage on the project. Millwrights and mechanics will set the mixer settlers, filters, tanks, pumps, and agitators in place after the concrete cures. Ironworkers will erect the building steel and sheeting, followed by electrical and piping crews.

5.4.4 Area 500 and 700

The Uranium and Vanadium Packaging Building, (approximately 250'L x 150'W x 80'H) contains the most process equipment, floors and stairways. Ironworkers and millwrights will install building steel, floor steel and stair stringers, along with the mechanical equipment from the ground floor to the top floor in a controlled and planned manner after the concrete is poured and cured. Electricians and pipe fitters will interconnect conduit, cables, pipe, valves and fittings between the process equipment, motor control center and control rooms.

5.4.5 Area 800

Numerous process reagents in liquid, granular or powder form are utilized and located as near as possible to the point of injection into the process streams. Reagent systems consist of concrete foundations, storage silos, storage and mixing tanks, agitators, pumps, electrical cables, instruments, pipe, valves and fittings. All trades and craftsman will participate in constructing the reagent systems.

5.4.6 Area 900

An electrical distribution line east of the mill access road will provide power from the Highway 90 transmission line to the Piñon Ridge substation located south of the mill parking lot. Electricians will install power cables in an underground duct bank from the substation to the Grinding and Leach Building Electrical Room located adjacent to the Grinding and Leach Building. Medium voltage will be distributed to the SX Building Electrical Room, Packaging Building Electrical Room and Reagents/Lab Electrical Room.

The electrical rooms, which are constructed of concrete masonry units, sit atop a concrete footing with an internal floor slab and block outs for pulling power cables to switchgear, motor control centers

and field devices. Electricians will install cable tray, rigid and plastic conduit, power cable and instrumentation wire from the motor control center to the motors, field devices and control room.

The approximate electrical room buildings sizes are:

- Grinding and Leach Building Electrical Room 60'L x 40'W x 14'H
- SX Building Electrical Room 36'L x 16'W x 14'H
- Packaging Building Electrical Room 30'L x 20'W x 14'H
- Reagents/Lab Electrical Room 25'L x 10'W x 14'H

A single propane storage tank supported on tank saddles and vaporizer are located on the southwest corner of the mill site. Pipe fitters will install pipe, valves, fittings, and in line instruments from the vaporizer to the steam boilers, dryers, fusion furnace, hot water heaters and building unit heaters.

Millwrights and pipe fitters will offload and install the pre-packaged diesel and gasoline storage tanks with dispensing pumps located in the northwest corner of the property. Electricians will provide power to the pre-wired units.

5.4.7 Transportation

Approximately 4,360 truck-loads of equipment and materials delivery will occur during the post-license construction period. Gravels, fencing supplies and concrete will be sourced locally along with petroleum products. Equipment deliveries will originate from all areas of the continental United States. Structural steel, plate work and building materials may originate in Texas, Utah or Montana. Manufactured liner materials and HDPE piping materials will be shipped from Texas. The estimated post-license construction truck load count per quarter is listed in Table 5.1.

Table 5.1: Traffic Loading for Post-License Construction Period.

Activity	2011 Quarter 1	2011 Quarter 2	2011 Quarter 3	2011 Quarter 4	2012 Quarter 1	Total
Mobilize	25					25
Gravels	400	750	460	1,000		2,610
Concrete	300	400	170	30		900
Equipment	20	40	20	10		90
Steel	20	90	40	20		170
Pipe/Cable	5	25	30	10		70
Liner		250	200	5		455
Demobilize				30	10	40
Total	770	1,555	920	1,105	10	4,360

5.4.8 Labor

General and specialized contractors will be contracted for the construction of the Piñon Ridge project. General Contractors qualified and experienced in constructing mineral processing plants in the Western United States will be responsible for executing the mill construction plan, and suitably qualified and experienced Earthworks and Liner Installation Contractors will be contracted to perform the tailings cell and evaporation pond construction. These General Contractors will mobilize supervisory personnel along with a select number of "crew leaders" from within the company. Typically, skilled craftsman and equipment operators follow the General Contractors from project to project.

A number of specialized contractors will be utilized on the project. Field tank erection crews are specialists in the erecting, testing, lining and coating of large tanks, which are too large to be fabricated in a shop and safely transported to a project site. Pre-engineered building and siding suppliers will mobilize company ironworkers and sheet metal installation crews along with mobile cranes, man-lifts, forklifts, welding machines and other specialized construction machinery.

The General Contractors will be asked to review, qualify and employ as many skilled and unskilled workers from the immediate area as possible. Energy Fuels Resources will encourage the mill General Contractor to employ millwrights, welders, pipe fitters and electricians from the local communities. Energy Fuels Resources anticipates that these locally-hired skilled tradesmen will later form the nucleus of the Piñon Ridge operating and maintenance crews. Table 5.2 provides an estimate of the labor force on a quarterly basis.

Table 5.2: Estimated Labor Force for Mill Construction.

	2010 Quarter 3	2010 Quarter 4	2011 Quarter 1	2011 Quarter 2	2011 Quarter 3	2011 Quarter 4	2012 Quarter 1
Labor (Avg):	25	45	125	200	200	150	10

5.4.9 Utilities

Site utilities will consist of water and power. Production wells installed on and adjacent to the Site will supply non-potable groundwater for use in the mill. Prior to mill operations, temporary water storage may be provided in the West Stormwater Pond for dust suppression during construction. Immediately prior to commencement of milling, temporary water storage may also be provided in one of the tailings cell sub-cells. The power transmission line and the propane tank and distribution system will need to be installed and tested in advance of the scheduled date for energizing the mill.

6.0 TAILINGS CELLS

Construction of Tailings Cell A will commence upon issuance of the mill license. Due to the size of the facility, the volume of earthworks, and the requirements of the double composite liner system, Tailings Cell A construction will be on a critical path for completion during the available construction time-frame. Excavation, subgrade preparation, and liner installation will need to take place concurrently from one end of Tailings Cell A to the other in order to meet the schedule for mill commissioning.

6.1 Earthwork

Tailings Cell A will be constructed prior to commissioning the facility. Tailings Cells B and C will be constructed as needed in the future. Tailings Cell A was designed mostly in cut to provide structural fill for other structures on the Site, so a large quantity of excess material will be generated during construction. The generated excess material will either be used for construction of the tailings cell perimeter berms, transported directly to other facilities needing fill (such as the mill pad), or transported to the structural fill stockpile (refer to Figure 1). The base and side slopes of the tailings cell will be moisture conditioned and compacted in preparation for liner installation. Earthworks will be performed in accordance with the specifications (Golder, 2008a; Section 02200.0).

6.2 Liner Installation

A multi-layer liner system has been designed for the tailings cells, consisting of two layers of 60 mil HDPE geomembrane separated by an intervening leak collection and recovery system (refer to Section 6.3), and underlain by GCL. Liner installation and testing will be performed as stated in the specifications (Golder 2008a; Sections 01400.2, 02776.0, 02776.1).

6.3 Leak Collection and Recovery System (LCRS)

The tailings cells have been designed with a leak collection and recovery system (LCRS), as discussed in Section 4.3. Drainage geonets will be installed at the base of the tailings cells, with drainage geocomposites installed on the side-slopes. The LCRS layer will be sloped toward an LCRS sump located in the northeast and northwest corners of Tailings Cell A. Seepage collected in the LCRS sump will be pumped to the surface via HDPE riser pipes extending from the base of the sump to the surface. Piping will be procured and installed per the project specifications (Golder 2008a; Section 02710.0). Collected seepage will either be returned to the mill for processing, or to the tailings cell.

6.4 Water Collection and Recycling

An underdrain system has been designed at the base of the tailings, above the Tailings Cell A liner system. The base of the tailings cell is designed to slope toward underdrain sumps constructed above the liner system. Tailings effluent collected in the underdrain sumps will be pumped to the surface via HDPE underdrain riser pipes, and returned to the tailings cell. Piping will be procured and installed per the project specifications (Golder 2008a; Section 02710.0).

After mill commissioning, and after sufficient tailings have been placed in Tailings Cell A, a floating decant barge system will be installed to collect tailings effluent from the surface of the tailings. The collected effluent will be returned to the mill circuit for re-use. The decant system will be designed during the detailed design phase of the project.

6.5 Tailings Cell A Construction Material and Labor Estimates

Material and labor estimates associated with the activities outlined in the construction schedule (see Appendix A) are summarized in Table 6.1 and Table 6.2, respectively.

Table 6.1: Tailings Cell Major Construction Activities and Estimated Quantities.

Activity	Est. Quantity	Unit
Tailings Cell A Earthwork (cut, fill, clearing, grubbing, stockpiling)*	2,355,000	C.Y.
Tailings Cell A GCL Installation*	1,510,000	S.F.
Tailings Cell A Secondary Liner Installation (HDPE geomembrane)*	1,510,000	S.F.
Tailings Cell A Drainage Layer Installation (HDPE geocomposite)*	1,262,000	S.F.
Tailings Cell A Drainage Layer Installation (HDPE geonet)*	260,000	S.F.
Tailings Cell A Primary Liner Installation (HDPE geomembrane)*	1,510,000	S.F.

*Note: Excludes associated minor construction activities (e.g. mobilization/demobilization, surface preparation, piping, etc.).

Table 6.2: Tailings Cell Construction Estimated Labor Requirements.

Activity	2011 Qtr 1	2011 Qtr 2	2011 Qtr 3	2011 Qtr 4
Earthworks activities	12	12	12	0
Liner System Installation	0	15	15	15
Total	12	27	27	15

*Note: The total number of construction employees itemized in Table 6.2, and summarized in Table 5.2, is likely a conservative estimate since some of the site activities will be performed concurrently utilizing the same construction personnel.

7.0 ORE STOCKPILE PAD AREA

Construction of the ore stockpile pad area is planned for completion a minimum of three months prior to mill commissioning, enabling development of a stockpile of ore prior to commissioning the mill (refer to Appendix A). EFRC may establish the license boundary initially around the ore stockpile pad area, and then later expand the license boundary to encompass the remainder of the mill facility prior to the start of processing operations.

7.1 One-Acre Concrete Ore Pad

The one-acre reinforced concrete ore pad is designed to minimize infiltration and maximize runoff to the adjacent five-acre ore pad (Golder 2008b). The concrete pad includes water stops to minimize infiltration at construction joints. The concrete slab generally consists of 12 inches of reinforced concrete having a minimum compressive strength of 5,000 pounds per square inch (psi). The concrete slab will be constructed over a graded and prepared foundation. The one-acre ore pad will be constructed after the five-acre ore pad is constructed to allow for the proper drainage from the one-acre ore pad to the five-acre ore pad.

7.2 Five-Acre Composite Ore Pad

The five-acre ore pad consists of a geosynthetic clay liner (GCL) placed on a graded and prepared foundation, covered with 2.5 feet of cushion material and a one-foot wearing surface (Golder 2008b). The ore pad will be constructed in a manner that prevents equipment traffic directly on the GCL. The pad will be sloped toward the northeast in order to drain into the East Stormwater Pond.

7.3 Dumping Platform

A dumping platform will be constructed adjacent to the east side of the five-acre ore pad, and will serve as a means for haul trucks to dump loads onto the pad without having to drive within the license boundary and onto the ore pad. The side of the platform next to the ore pad will be raised approximately 10 feet above the ore pad surface with a Hilfiker retaining wall. The 20 feet of the dumping platform closest to the wall will be surfaced with reinforced concrete, while the remaining 100 feet of platform width will be surfaced with aggregate base course materials. The dumping platform will be constructed in conjunction with the five-acre ore pad in order to enable the two systems to be joined.

7.4 East Stormwater Pond

The East Stormwater Pond will be constructed in conjunction with the ore pad facilities and will collect runoff from the southeast section of the mill site as well as the ore pad and truck wash. The liner system for the East Stormwater Pond consists of a GCL overlain by a 60-mil HDPE geomembrane. The pond will be constructed in a manner that prevents construction equipment from

driving over the GCL or the geomembrane. An overflow pipe will be constructed to connect the East Stormwater Pond to the West Stormwater Pond (refer to Section 2.5).

7.5 Ore Pad Area Construction Material and Labor Estimates

Material and labor estimates associated with the ore pad construction activities are outlined in Table 7.1 and Table 7.2, respectively.

Table 7.1: Ore Pad Area Construction Activities and Estimated Quantities.

Activity	Est. Quantity	Unit
Ore Pad Area Earthwork (cut, fill, clearing, grubbing, stockpiling)*	66,000	C.Y.
Ore Pad Area GCL Installation (five-acre ore pad and east stormwater pond)	260,000	S.F.
Ore Pad Cushion Mat. Installation (haul, placement and compaction)*	19,000	C.Y.
Ore Pad Roadbase Mat. Installation (haul, placement and compaction)*	8,500	C.Y.
Retaining Wall (Hilfiker Wall construction)	1	L.S.
Ore Pad Area Concrete Placement (includes reinforcement)*	1,900	C.Y.
East Stormwater Pond Primary Liner Installation (HDPE geomembrane)*	29,000	S.F.

*Note: Excludes associated minor construction activities (e.g. mobilization/demobilization, surface preparation, piping, etc.).

Table 7.2: Ore Pad Area Construction Estimated Labor Requirements.

Activity	2011 Qtr 1	2011 Qtr 2	2011 Qtr 3	2011 Qtr 4
Earthworks activities	0	0	6	0
Liner System Installation	0	0	8	0
Retaining Wall Installation	0	0	5	0
Concrete Placement	0	0	5	0
Total	0	0	24	0

*Note: The total number of construction employees itemized in Table 7.2, and summarized in Table 5.2, is likely a conservative estimate since some of the site activities will be performed concurrently utilizing the same construction personnel.

8.0 EVAPORATION PONDS

The initial series of evaporation ponds required for mill production at the 500 ton per day (tpd) capacity will be constructed once the mill license is issued (refer to Appendix A). Subsequent evaporation pond cells will be constructed as needed during milling.

8.1 Earthwork

The ten (10) southernmost evaporation pond cells are planned for construction prior to commissioning of the facility. Earthwork for evaporation pond construction will generally be shallow, and will cover approximately 40 acres. Some excess cut is anticipated, which will either be transported to the designated structural fill stockpile, or stockpiled locally for use during future evaporation pond cell construction and/or closure.

8.2 Liner and LCRS Installation

Similar to the tailings cells, a multi-layer liner system has been designed for the evaporation ponds, consisting of two layers of 60 mil HDPE geomembrane separated by an intervening leak collection and recovery system (LCRS) (refer to Section 6.3), and underlain by GCL. Liner installation and testing will be performed as per the specifications (Golder 2008a; Sections 01400.2, 02776.0, 02776.1).

The evaporation ponds have been designed with a LCRS, as discussed in Section 4.3. Drainage geonets will be installed at the base of the evaporation pond cells. The LCRS layer will be sloped toward a LCRS sump located at the corner of each evaporation pond cell. Seepage collected in the LCRS sump will be pumped to the surface via HDPE riser pipes extending from the base of the sump to the surface. Piping will be procured and installed per the project specifications (Golder 2008a; Section 02710.0). Collected seepage will be returned to the surface of the evaporation ponds for disposal via evaporation.

8.3 Bird Netting

During evaporation pond construction, the supports for bird netting will be installed. Once the evaporation pond construction is complete, the bird netting will be installed. The netting system will be erected with the intent of preventing bird contact with the mill byproduct solution (i.e., raffinate). The bird netting will be fully constructed over the evaporation ponds prior to mill commissioning.

8.4 Evaporation Pond Construction Material and Labor Estimates

Material and labor estimates associated with the evaporation pond construction activities are summarized in Table 8.1 and Table 8.2, respectively.

Table 8.1: Evaporation Pond Construction Activities and Estimated Quantities.

Activity	Est. Quantity	Unit
Evaporation Pond Earthwork*	960,000	C.Y.
Evaporation Pond GCL installation*	2,051,000	S.F.
Evaporation Pond Secondary Liner Installation (60 mil HDPE)*	2,051,000	S.F.
Evaporation Pond Drainage Layer Installation (HDPE Geonet)*	2,051,000	S.F.
Evaporation Pond Primary Liner Installation (60 mil HDPE)*	2,051,000	S.F.
Bird-Netting (support poles, cables, netting)*	1	L.S.

*Note: Excludes associated minor construction activities (e.g. mobilization/demobilization, surface preparation, piping, etc.).

Table 8.2: Evaporation Pond Construction Estimated Labor Requirements.

Activity	2011 Qtr 1	2011 Qtr 2	2011 Qtr 3	2011 Qtr 4
Earthworks activities	6	6	6	0
Liner System Installation	0	10	10	10
Bird-Netting Installation	0	0	0	8
Total	6	16	16	18

*Note: The total number of construction employees itemized in Table 8.2, and summarized in Table 5.2, is likely a conservative estimate since some of the site activities will be performed concurrently utilizing the same construction personnel.

9.0 ADMINISTRATION BUILDING

The administration building (refer to Figure 1) is considered an ancillary facility, and its construction may proceed prior to receiving the mill license (see Appendix A). If built prior to mill construction, the administration building may be used by the Construction Management Team and engineering disciplines during construction activities.

9.1 Building Construction

The administration building will be constructed on a concrete slab foundation after completing clearing and grubbing and earthwork grading activities. Earthworks will be performed in accordance with the project specifications (refer to Golder 2008a; Section 02200.0). Surface drainage, as required, will be constructed according to the design drawings.

The building consists of two attached modules with the approximate dimension of (170'L x 30'W) and (80'L x 50'W). The buildings will likely consist of modular units, transported to the Site.

Site utilities will consist of water and power with non-potable water for use in sanitary facilities supplied from the nearest installed production wells. Potable water will be transported to the Site. Towards the end of construction activities, electricians and pipe fitters will install required conduits, cables, pipe, valves and fittings.

The administration building is outside of the license area, and may be accessed without going through security. Energy Fuels Resources will establish health, safety and security measures relevant to administration building construction.

9.2 Parking Lot Construction and Surface Drainage

A parking lot will be constructed around the administration building. The parking lot will be surfaced with gravel, and sloped to drain away from the building. Other surface drainage, as required, will be constructed according to the design drawings.

10.0 REFERENCES

CH2M Hill, 2009. Basic Engineering Report, Piñon Ridge Project, Colorado. Report prepared for Energy Fuels Resources. 4 February 2009.

Colorado Department of Transportation (CDOT). 2008. State Highway Access Permit. CDOT Permit No. 508015. Permittee: Stephen Antony, Energy Fuels Resources Corporation. 21 May 2008.

Energy Fuels Resources Corporation (EFRC). 2009. Piñon Ridge Mill Health and Safety Plan. Lakewood, Colorado.

Golder Associates Inc. (Golder). 2008a. Technical Specifications, Piñon Ridge Project, Montrose County, Colorado. Revision A – Issued for Permitting. Prepared for Energy Fuels Resources Corporation. September. Project No. 073-81694.0009.

Golder Associates Inc. (Golder). 2008b. Ore Pad Design Report, Piñon Ridge Project, Montrose County, Colorado. Prepared for Energy Fuels Resources Corporation. October. Project No. 073-81694.0005.

Golder Associates Inc. (Golder). 2008c. Tailings Cell Design Report, Piñon Ridge Project, Montrose County, Colorado. Prepared for Energy Fuels Resources Corporation. October. Project No. 073-81694.0003.

Golder Associates Inc. (Golder). 2008d. Evaporation Pond Design Report, Piñon Ridge Project, Montrose County, Colorado. Prepared for Energy Fuels Resources Corporation. October. Project No. 073-81694.0004.

Golder Associates Inc. (Golder). 2009. Specifications for Reclamation of Mill Facilities, Piñon Ridge Project, Montrose County, Colorado. Prepared for Energy Fuels Resources. Project No. 073-81694.0017.

Kleinfelder. 2008a. Roadway Pavement Design Recommendations, Piñon Ridge Project, Montrose County, Colorado. Letter to Golder Associates Inc. 30 October 2008.

Kleinfelder. 2008b. Piñon Ridge Project, Site Grading, Drainage and Access Road Design, Montrose County, Colorado. 1 December 2008.

Kleinfelder. 2008c. Site Drainage Analysis and Design Report, Piñon Ridge Project, Montrose County, Colorado. 15 December 2008.

Kleinfelder, 2008d. Geotechnical Design Recommendations, Mill and Infrastructure, Piñon Ridge Project, Montrose County, Colorado. 31 October 2008.

Visus Consulting Group, Inc. (2009). Facility Operating Plan - Piñon Ridge Mill Facility, Montrose County, Colorado. Prepared for Energy Fuels Resources Corporation and submitted to Colorado Department of Public Health and Environment Radiation Management Program, July 17, 2009.

11.0 CLOSING

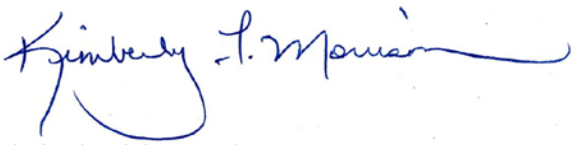
Golder appreciates the opportunity to provide continued engineering support to Energy Fuels Resources for the Piñon Ridge project. Please contact the undersigned with any questions or comments on the information contained within this report.

Respectfully submitted,

GOLDER ASSOCIATES INC.



Gordan Gjerapic, Ph.D., P.E.
Senior Project Engineer

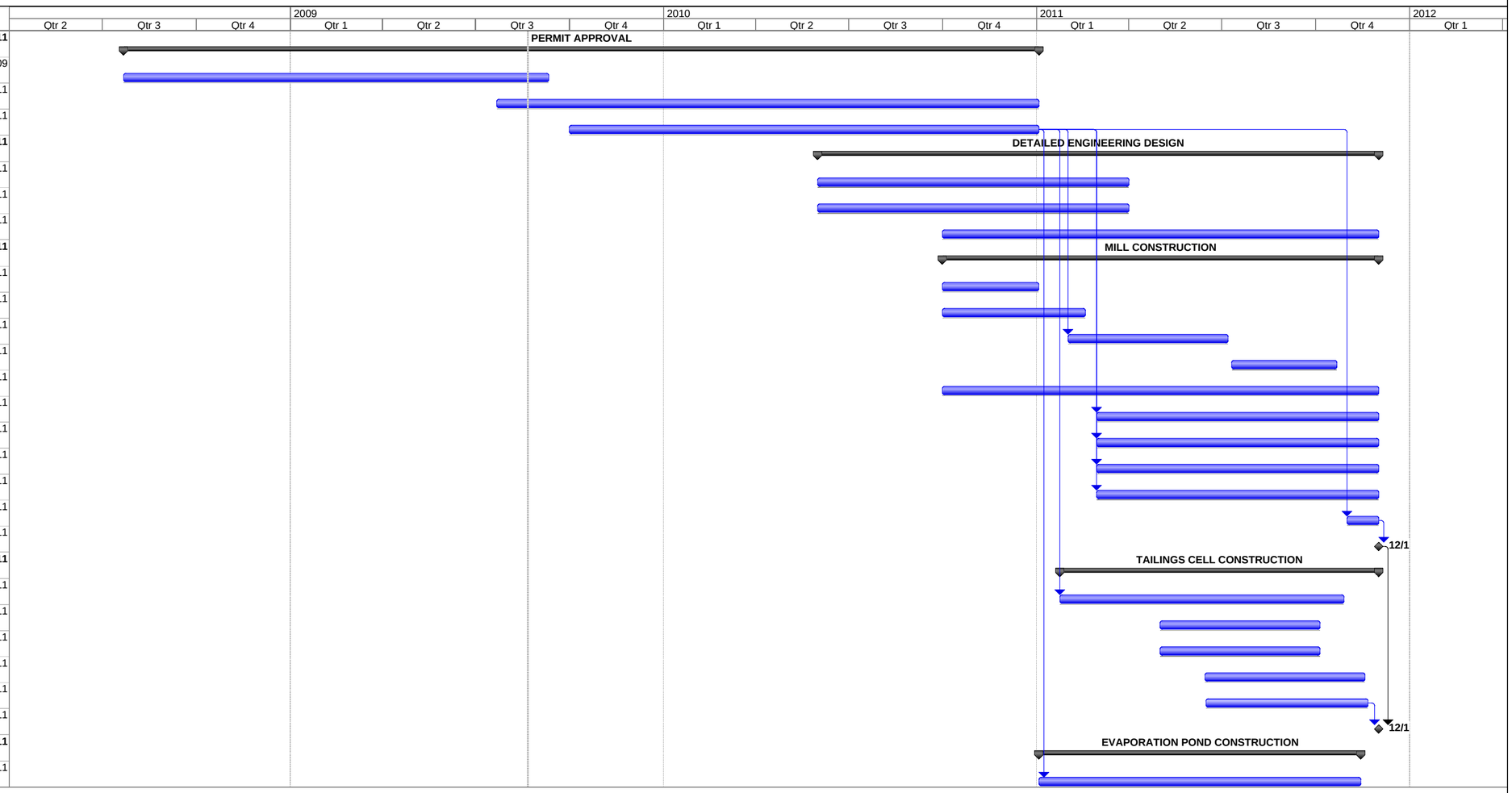


Kimberly Finke Morrison, P.E., R.G.
Associate, Senior Project Manager

APPENDIX A
PRELIMINARY PROJECT EXECUTION SCHEDULE

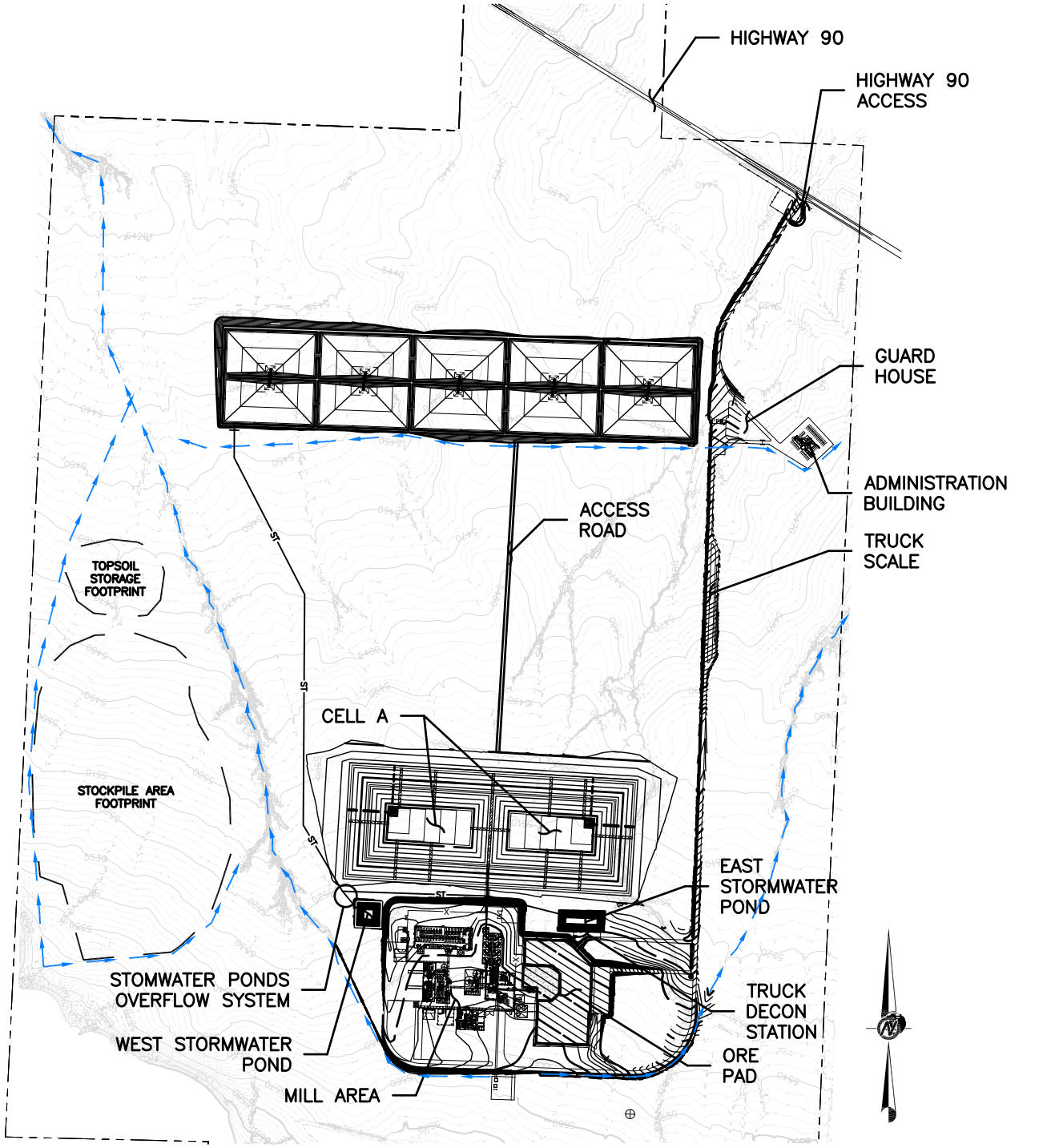
PIÑON RIDGE PROJECT
PRELIMINARY PROJECT EXECUTION SCHEDULE

ID	Task Name	Duration	Start	Finish
1	**PERMIT APPROVAL**	**511.8 days**	**Tue 7/22/08**	**Mon 1/3/11**
2	Special Use Permit (Montrose County)	238.4 days	Tue 7/22/08	Thu 9/10/09
3	Air Permit	303 days	Wed 7/22/09	Mon 1/3/11
4	Source Material License (CDPHE)	262 days	Thu 10/1/09	Mon 1/3/11
5	**DETAILED ENGINEERING DESIGN**	**314.4 days**	**Tue 6/1/10**	**Thu 12/1/11**
6	Mill Design	175 days	Tue 6/1/10	Fri 4/1/11
7	Geotechnical Design	175 days	Tue 6/1/10	Fri 4/1/11
8	Mill & Geotechnical Construction Support	244 days	Fri 10/1/10	Thu 12/1/11
9	**MILL CONSTRUCTION**	**244 days**	**Fri 10/1/10**	**Thu 12/1/11**
10	US Hwy. 90 Access Construction	53 days	Fri 10/1/10	Mon 1/3/11
11	Site Drainage Controls	80 days	Fri 10/1/10	Thu 2/17/11
12	Mill Grading	90 days	Tue 2/1/11	Thu 7/7/11
13	Construct Ore Pad	60 days	Mon 7/11/11	Fri 10/21/11
14	Ancillary Facilities	244 days	Fri 10/1/10	Thu 12/1/11
15	SAG/Leach Areas	158.4 days	Tue 3/1/11	Thu 12/1/11
16	CCD/Tailings Areas	158.4 days	Tue 3/1/11	Thu 12/1/11
17	SX Area	158.4 days	Tue 3/1/11	Thu 12/1/11
18	Packaging/Reagent Areas	158.4 days	Tue 3/1/11	Thu 12/1/11
19	Mechanical Completion	18.4 days	Tue 11/1/11	Thu 12/1/11
20	Mill Commissioning	0 days	Thu 12/1/11	Thu 12/1/11
21	**TAILINGS CELL CONSTRUCTION**	**179.2 days**	**Mon 1/24/11**	**Thu 12/1/11**
22	Excavation for Tailings Cell A	160 days	Mon 1/24/11	Fri 10/28/11
23	Talings Cell A GCL Installation	90 days	Mon 5/2/11	Wed 10/5/11
24	Tailings Cell A Secondary Liner Installation	90 days	Mon 5/2/11	Wed 10/5/11
25	Tailings Cell A Drainage Layer Installation	90 days	Wed 6/15/11	Fri 11/18/11
26	Tailings Cell A Primary Liner Installation	90 days	Thu 6/16/11	Mon 11/21/11
27	Begin Deposition in Tailings Cell A	0 days	Thu 12/1/11	Thu 12/1/11
28	**EVAPORATION POND CONSTRUCTION**	**180 days**	**Mon 1/3/11**	**Mon 11/14/11**
29	Construct Evaporation Ponds (40 Acres)	180 days	Mon 1/3/11	Mon 11/14/11



Project: ConstructionSchedule-rev2
Date: Fri 8/21/09

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone



LEGEND

- EXISTING GROUND TOPOGRAPHY
- PROPOSED GRADES (175 / 150)
- PROJECT BOUNDARY
- STORMWATER PONDS OVERFLOW SYSTEM (ST)
- STOCKPILE AREA FOOTPRINTS
- SITE DRAINAGE

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
B	08/20/09	KM	CONSTRUCTION PLAN REPORT	DBS	GG	KFM
A	07/23/09	KM	ISSUED FOR CLIENT REVIEW	DBS	GG	KFM

PROJECT

ENERGY FUELS RESOURCES CORPORATION
PIÑON RIDGE PROJECT - TAILINGS CELL DESIGN
MONTROSE COUNTY, COLORADO

TITLE

GENERAL SITE LAYOUT

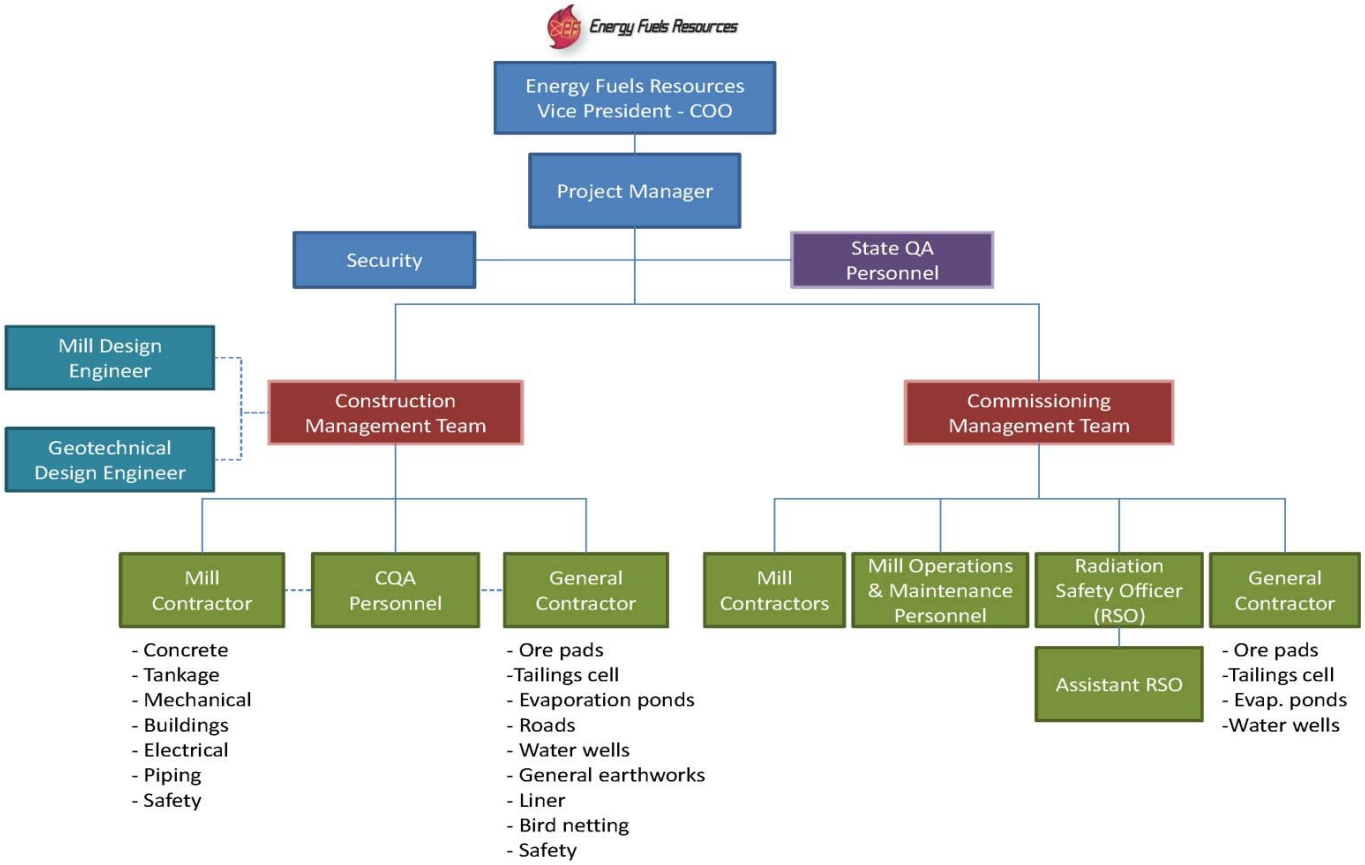
Golder Associates
DENVER, COLORADO

PROJECT No.	073-81694		FILE No.	07381694B001	
DESIGN	KFM	07/23/09	SCALE	AS SHOWN	REV. B
CADD	DBS	07/23/09			
CHECK	GG	07/23/09			
REVIEW	KFM	07/23/09			

1

Dwg Name: N:\07\073-81694_B FIGURES\07381694B001.dwg
Layout Name: 8.5X11 Portrait Machine: DEN1-L-DSAUNDER
Last Update: Aug 20, 2009 15:26 By: dsaunders
Last Plot: Aug 20, 2009 15:32 By: dsaunders

Plot Time: 08/20/09 15:32



Golder Associates Denver, Colorado

TITLE

Construction Organizational Chart

CLIENT/PROJECT

ENERGY FUELS RESOURCES CORP.
PIÑON RIDGE PROJECT

DRAWN	KFM/GG	DATE	Aug-09	JOB NO.	073-81694.0018
CHECKED	KFM	SCALE	NTS	DWG. NO.	NA
REVIEWED	JMJ	FILE NO.	Figure2-OrgChart.xls	FIGURE NO.	2

FACILITY OPERATING PLAN

PIÑON RIDGE MILL FACILITY
MONTROSE COUNTY, COLORADO

Submitted to

Colorado Department of Public Health and Environment
Radiation Management Program
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

Prepared for

ENERGY FUELS RESOURCES CORPORATION

44 Union Boulevard, Suite 600
Lakewood, Colorado 80228

Prepared by Energy Fuels Resources Corporation and

Visus Consulting Group, Inc.
7278 South Sundown Circle
Littleton, Colorado 80120

November 3, 2009

Table of Contents

0.0 Introduction 0-1
0.1 Document Organization and Format 0-1
0.2 Project Overview 0-2
0.2.1 Ore Delivery and Storage 0-3
0.2.2 Mill Facility 0-4
0.2.3 Waste Management Facilities 0-6
0.2.4 Ancillary Facilities and Infrastructure 0-7
0.3 Mill Control Room 0-9
0.3.1 Control System 0-9
0.3.2 Control Philosophy 0-9
0.4 Mill Equipment 0-10
0.4.1 Tanks 0-10
0.4.2 Pumps 0-11
0.4.3 Piping 0-11
0.4.4 Thickeners and Clarifiers 0-11
0.4.5 Mixer-Settlers 0-12
0.5 Mill Monitoring and System Controls 0-12
0.5.1 Mill Instrumentation 0-13
0.5.2 Secondary Containment 0-14
0.5.3 Air Emission Controls 0-15
0.5.4 Radiation Monitoring and Controls 0-16

1.0 Area 100 – Ore Handling and Grinding 1-1
1.1 Ore Storage Pad 1-2
1.1.1 Operating Procedures 1-2
1.1.2 System Controls 1-4
1.1.3 Maintenance 1-6
1.2 Feed Hopper and Conveyor System 1-7
1.2.1 Operating Procedures 1-7
1.2.2 System Controls 1-7
1.2.3 Maintenance 1-9
1.3 SAG Mill and Pulp Storage 1-9
1.3.1 Operating Procedures 1-9
1.3.2 System Controls 1-10
1.3.3 Maintenance 1-12

2.0 Area 200 – Leaching 2-1
2.1 Pre-Leach 2-1
2.1.1 Operating Procedures 2-1
2.1.2 System Controls 2-3
2.1.3 Maintenance 2-4
2.2 Leach 2-4
2.2.1 Operating Procedures 2-4
2.2.2 System Controls 2-5

2.2.3 Maintenance 2-6

3.0 Area 300 – CCD Thickeners and Waste Disposal 3-1
3.1 Counter Current Decantation (CCD) Thickeners 3-2
3.1.1 Operating Procedures 3-2
3.1.2 System Controls 3-3
3.1.3 Maintenance 3-3
3.2 Tailings Sump 3-4
3.2.1 Operating Procedures 3-4
3.2.2 System Controls 3-4
3.2.3 Maintenance 3-5
3.3 Tailings Cells 3-5
3.3.1 Operating Procedures 3-6
3.3.2 System Controls 3-8
3.3.3 Maintenance 3-10
3.4 Evaporation Ponds 3-10
3.4.1 Operating Procedures 3-10
3.4.2 System Controls 3-12
3.4.3 Maintenance 3-13

4.0 Area 400 – Uranium Solvent Extraction (SX) 4-1
4.1 Polishing Filters and Feed Tanks 4-1
4.1.1 Operating Procedures 4-1
4.1.2 System Controls 4-2
4.1.3 Maintenance 4-3
4.2 Uranium SX Circuit 4-3
4.2.1 Operating Procedures 4-3
4.2.2 System Controls 4-5
4.2.3 Maintenance 4-6
4.3 Uranium Scrub and Strip 4-6
4.3.1 Operating Procedures 4-6
4.3.2 System Controls 4-7
4.3.3 Maintenance 4-7

5.0 Area 500 – Uranium Precipitation 5-1
5.1 Uranium Precipitation Tanks 5-1
5.1.1 Operating Procedures 5-1
5.1.2 System Controls 5-2
5.1.3 Maintenance 5-3
5.2 Uranium Dewatering 5-3
5.2.1 Operating Procedures 5-3
5.2.2 System Controls 5-5
5.2.3 Maintenance 5-6
5.3 Uranium Drying and Packaging 5-6
5.3.1 Operating Procedures 5-6
5.3.2 System Controls 5-7
5.3.3 Maintenance 5-8

6.0 Area 600 – Vanadium Oxidation and Solvent Extraction 6-1

6.1 Vanadium Oxidation and Polishing Filters....6-2
6.1.1 Operating Procedures....6-2
6.1.2 System Controls....6-3
6.1.3 Maintenance....6-3
6.2 Vanadium SX Circuit....6-3
6.2.1 Operating Procedures....6-3
6.2.2 System Controls....6-5
6.2.3 Maintenance....6-6
6.3 Vanadium Scrub and Strip....6-6
6.3.1 Operating Procedures....6-6
6.3.2 System Controls....6-7
6.3.3 Maintenance....6-7

7.0 Area 700 – Vanadium Precipitation....7-1
7.1 Vanadium Precipitation Tanks....7-1
7.1.1 Operating Procedures....7-1
7.1.2 System Controls....7-2
7.1.3 Maintenance....7-3
7.2 Vanadium Filtering and Drying....7-3
7.2.1 Operating Procedures....7-3
7.2.2 System Controls....7-4
7.2.3 Maintenance....7-4
7.3 Vanadium Fusion and Packaging....7-5
7.3.1 Operating Procedures....7-5
7.3.2 System Controls....7-6
7.3.3 Maintenance....7-6

8.0 Area 800 – Reagents....8-1
8.1 General Overview....8-1
8.1.1 System Controls....8-2
8.1.2 Maintenance....8-3
8.2 Reagent Unloading and Warehouse Area....8-3
8.2.1 Operating Procedures....8-3
8.2.2 System Controls and Maintenance....8-3
8.3 Tank Storage Areas....8-3
8.3.1 Operating Procedures....8-3
8.3.2 System Controls and Maintenance....8-5
8.4 Organics Storage Areas....8-6
8.4.1 Operating Procedures....8-6
8.4.2 System Controls and Maintenance....8-6
8.5 Other Reagent Storage Areas....8-7
8.5.1 Operating Procedures....8-7
8.5.2 System Controls and Maintenance....8-7

9.0 Area 900 – Utilities and Buildings....9-1
9.1 Electric Power Distribution....9-1
9.1.1 Operating Procedures....9-1
9.1.2 System Controls....9-2

9.1.3 Maintenance 9-2
9.2 Propane Heating System 9-2
9.2.1 Operating Procedures 9-2
9.2.2 System Controls 9-3
9.2.3 Maintenance 9-3
9.3 Diesel and Gasoline Storage 9-4
9.3.1 Operating Procedures 9-4
9.3.2 System Controls 9-4
9.3.3 Maintenance 9-5
9.4 Water Supply System 9-5
9.4.1 Operating Procedures 9-5
9.4.2 System Controls 9-7
9.4.3 Maintenance 9-7
9.5 Septic Systems 9-8
9.5.1 Operating Procedures 9-8
9.5.2 System Controls 9-8
9.5.3 Maintenance 9-8
9.6 Buildings and Parking Requirements 9-8
9.6.1 Buildings 9-8
9.6.2 Parking 9-11
9.6.3 System Controls 9-12
9.6.4 Maintenance 9-12

10.0 Area 1000 – General Plant 10-1
10.1 Facility Access, Screening, and Security 10-1
10.1.1 Operating Procedures and System Controls 10-1
10.1.2 Maintenance 10-2
10.2 Warehouse and Shops 10-2
10.2.1 Operating Procedures and System Controls 10-2
10.2.2 Waste Products 10-2
10.3 Laboratory 10-3
10.3.1 Operating Procedures and System Controls 10-3
10.4 Environmental Monitoring Systems 10-4
10.4.1 Operating Procedures and System Controls 10-4
10.5 Emergency Response Systems 10-5
10.5.1 Operating Procedures and System Controls 10-5

11.0 References 11-1

List of Tables

Table 8-1 Primary Reagents

List of Figures

Figure 0-1 Site Location Map
Figure 0-2 Property Map
Figure 0-3 Site Plan
Figure 0-4 Milling and Process Area Key Map
Figure 0-5 Process Flowsheet
Figure 1-1 Area 100 – Ore Handling and Grinding
Figure 2-1 Area 200 – Leaching
Figure 3-1 Area 300 – CCD Thickeners and Waste Disposal
Figure 4-1 Area 400 – Uranium Solvent Extraction (SX)
Figure 5-1 Area 500 – Uranium Precipitation
Figure 6-1 Area 600 – Vanadium Oxidation and Solvent Extraction (SX)
Figure 7-1 Area 700 – Vanadium Precipitation
Figure 8-1 Area 800 – Reagents
Figure 9-1 Area 900 – Utilities and Buildings
Figure 10-1 Area 1000 – General Plant

List of Appendices

Appendix A Process Control Philosophy
Appendix B Process Design Criteria
Appendix C Transport Vehicle Radiation Screening and Decontamination Plan
Appendix D Laboratory Facilities and Plans

Units of Measure and Abbreviations

°F	Degree Fahrenheit
<	Less than
>	Greater than
=	Equal to
Act	Colorado Radiation Control Act
ALARA	As low as reasonably achievable
APCD	Air Pollution Control Division of CDPHE
ASM	Abnormal Situation Management
ATS	Automatic transfer switch
BMPs	Best Management Practices
$C_{10}H_{22}O$	Exxal 13 (isodecanol)
$C_{14}H_{30}$	Amine
CCD	Counter Current Decantation
CCR	Code of Colorado Regulations
CCTV	Closed-Circuit Television
CDPHE	Colorado Department of Public Health and Environment
CH2M HILL	CH2M HILL Engineers, Inc.
CRS	Colorado Revised Statutes
DE	Diatomaceous earth
DOE	U.S. Department of Energy
EEMUA	Engineering Equipment and Materials Users' Association
Energy Fuels	Energy Fuels Resources Corporation
Facility	Piñon Ridge Mill Facility
FIBC	Flexible intermediate bulk container
FRP	Fiberglass reinforced plastic
ft	feet or foot
GCL	Geosynthetic clay liner
Golder	Golder Associates, Inc.

Units of Measure and Abbreviations (continued)

gpm	Gallons per minute
H_2O_2	Hydrogen peroxide
H_2SO_4	Sulfuric acid
Hp	Horsepower
HDPE	High density polyethylene
HVAC	Heating, ventilation, and air-conditioning
H:V	Horizontal to vertical
IBC	Intermediate bulk container
ISA	Instrument Society of America
kV	Kilovolt
LCRS	Leak collection and recovery system
MC/SPCC	Material Containment and Spill Prevention Control and Countermeasure
Mill License	Radioactive Source Material License
Mill Design Report	Piñon Ridge Project Basic Engineering Report (CH2M HILL, Feb. 2009)
mrem	Millirem
MSDS	Material safety data sheets
MVA	Megavolt ampere
$NaClO_3$	Sodium chlorate
Na_2CO_3	Sodium carbonate
NaOH	Sodium hydroxide
NH_3	Ammonia
$(NH_4)_2SO_4$	Ammonium sulfate
NRC	U.S. Nuclear Regulatory Commission
PCB	Polychlorinated Biphenyl
PCS	Process Control System
pH	Hydrogen (ion) concentration
PLC	Programmable logic controller
PPE	Personal protective equipment

Units of Measure and Abbreviations (continued)

Project	Piñon Ridge Mill Facility
Property	Piñon Ridge Property
psig	Pounds per square inch gauge
PVC	Polyvinyl chloride
R_3N	Alamine 336 (amine)
RH	Radiation Health
RSO	Radiation Safety Officer
SAG	Semi-autogenous grinding
sf	Square foot or Square feet
SMPA	San Miguel Power Association, Inc.
SOP	Standard Operating Procedure
SPCC	Spill Prevention Control and Countermeasure
SX	Solvent extraction
tpd	Tons per day
tph	Tons per hour
U_3O_8	Uranium oxide
USDOT	U.S. Department of Transportation
V	Volt
V_2O_5	Vanadium oxide
VFD	Variable frequency drive

0.0 Introduction

Energy Fuels Resources Corporation ("Energy Fuels" or "the Company") proposes to license, construct, and operate a conventional acid leach uranium and vanadium mill at the Piñon Ridge Property (the "Property") in western Montrose County, Colorado. The Property covers approximately 880 acres in the southeastern portion of Paradox Valley. The proposed Piñon Ridge Mill Facility (the "Project" or the "Facility") is located at 16910 Highway 90, approximately 7 miles east of Bedrock, Colorado and 12 miles west of Naturita, Colorado. Refer to Figure 0-1, Site Location Map, for the general location of the Property, and Figure 0-2, Property Map, for the Property boundary.

The Piñon Ridge Mill Facility includes an administration building, a 17-acre mill, tailing ponds totaling approximately 90 acres, a 40-acre evaporation pond (expansion capacity to 80 acres), an approximately 6-acre ore storage pad, and access roads. Figure 0-3, Site Plan, shows the locations of the Project facilities. The mill is designed to process ore produced from mines on the Colorado Plateau located within a reasonable truck-haul distance. The mill will initially process 500 tons of ore per day and is designed for future expansion capable of accommodating a production capacity of 1,000 tons per day ("tpd"). The projected operating life of the Facility is 40 years, operating 24 hours per day, 350 days per year at 500 tpd. The Facility is expected to employ 85 people directly.

Energy Fuels has prepared this Facility Operating Plan for submittal to the Radiation Management Program of the Colorado Department of Public Health and Environment ("CDPHE") as one component of its Mill License Application. The Colorado Radiation Control Act (the "Act") provides for the regulation of radioactive materials by the CDPHE in Colorado Revised Statutes ("CRS") 25-11-101, et seq. Through the Act and an agreement between the Governor and the U.S. Nuclear Regulatory Commission ("NRC"), the CDPHE is empowered to be the sole regulator of radioactive material in the state. The Rules and Regulations Pertaining to Radiation Control [6 Code of Colorado Regulations ("CCR") 1007-1] provides the details of how radioactive materials are regulated. The process for licensing uranium-recovery facilities is specifically addressed in the Act (CRS 25-11-203). The regulatory process requires that a Mill License Application be submitted to CDPHE, which includes amongst other items, an Environmental Report, design plans, and operating and decommissioning procedures.

0.1 Document Organization and Format

Energy Fuels has developed this Facility Operating Plan to function as a dynamic (working) document, incorporating and reflecting changes to the Facility as they occur. Therefore, to facilitate future revisions and improve the readability of this initial version, which has been created prior to construction and operation of the Facility, the narrative describing the Facility operation is written in the present tense (i.e., as if the Facility is currently in operation). Energy Fuels plans to develop Standard Operating Procedures ("SOPs") for each area of the mill once the facility is constructed. These SOPs will be developed in consultation with the mill operators, foremen, and technicians and will require approval by the Plant Manager and Radiation Safety Officer ("RSO") prior to implementation.

This Facility Operating Plan provides a comprehensive narrative of the Facility design and operation, and references design reports prepared by CH2M HILL Engineers, Inc. ("CH2M HILL") and Golder Associates Inc. ("Golder"). Specifically, the Facility Operating Plan references the following sections of the Piñon Ridge Project Basic Engineering Report ("Mill Design Report") prepared by CH2M HILL and dated February 2009: (1) design drawings (i.e., plans, sections and elevations); (2) process flow diagrams; (3) mechanical equipment lists; and (4) the process control philosophy and process design criteria for the mill and process facilities. For ease of reference, the two Item 4 design documents have been included herein as Appendix A, Process Control Philosophy, and Appendix B, Process Design Criteria, respectively. The design reports prepared by Golder and referenced herein include design plans for the ore storage pad, tailings cells and evaporation ponds. The CH2M HILL and Golder design documents provide additional detail regarding the Facility design.

Consistent with the Mill Design Report, this Facility Operating Plan categorizes the milling and process components into the following 10 areas:

- Area 100 – Ore Handling and Grinding
- Area 200 – Leaching
- Area 300 – CCD Thickeners and Tailings Disposal
- Area 400 – Uranium Solvent Extraction (SX)
- Area 500 – Uranium Precipitation
- Area 600 – Vanadium Oxidation and Solvent Extraction (SX)
- Area 700 – Vanadium Precipitation
- Area 800 – Reagents
- Area 900 – Utilities and Buildings
- Area 1000 – General Plant

This Facility Operating Plan discusses the operating procedures, system controls and maintenance procedures specific to each process area. Figure 0-3, Site Plan, shows the locations of the Project facilities including the ore pad, mill, tailings cells, evaporation ponds and ancillary facilities. Figure 0-4, Milling and Process Area Key Map, provides the locations of each process area. A listing of the relevant design documents, providing additional detail for each process area, is provided in the narrative section pertaining to that area. A general arrangement drawing of each process area is provided in the figures section of this plan. The figures (drawings) prepared for this plan are located together, near the end of the document. The appendices to this document contain supporting design documentation and operating plans. Appendix A, Process Control Philosophy, and Appendix B, Process Design Criteria, provide the basis for the Facility design and operation. Appendices C and D provide the Truck and Equipment Decontamination Plan and the Laboratory Operating and Safety Plan, respectively.

0.2 Project Overview

The Facility is designed to process run-of-mine ("uncrushed") uranium and vanadium ore at the nameplate capacity of 1,000 tpd, but will initially be constructed and operated to process 500

tpd. Accordingly, certain circuits of the process plant are designed with two equal and parallel trains, which can be operated independently or at the same time to efficiently handle varying throughput. A summary of the Project is provided below, including an overview of ore delivery and storage, the mill facility, waste management facilities, and ancillary facilities and infrastructure.

0.2.1 Ore Delivery and Storage

Ore Pad Facility

An engineered ore pad constructed in the area immediately east of the mill serves to receive and store the ore that is delivered to the Facility for processing. Having the capability to stockpile ore at the mill enables Energy Fuels to maintain a readily available source of mill feed, balance mining and milling operations, and maximize the mill efficiency by blending and feeding stockpiled ore to the mill at varying rates and grades as necessary. Furthermore, ore deliveries to the Facility from area mines are not jeopardized during scheduled and unscheduled mill shutdowns.

Approximately one acre of the ore pad is lined with concrete and the remaining five acres are lined with a geosynthetic clay liner ("GCL") covered with a protective layer of compacted native soils and roadbase materials. The concrete pad is located next to the feed hopper and conveyor, where equipment loading and unloading activity is greatest. The five-acre lined pad has a horseshoe-shaped configuration encircling the feed hopper and concrete pad. A front-end loader feeds the dumped ore into the ore hopper. The hopper is enclosed within a three-sided structure to minimize fugitive dust emissions.

Ore Delivery

Ore is delivered to the Project site in 24-ton capacity highway trucks via State Highway 90 at the estimated rate of 500 tpd, or 21 loads per day, predominately during daylight hours. Eastbound and westbound ore deliveries are expected to remain approximately equal throughout the life of the Facility. The delivered ore is stockpiled on the ore pad and ultimately processed in the mill. Haul trucks entering the site are weighed at an onsite truck scale before moving to the ore pad facility. After being weighed, trucks move onto an elevated earthen platform (located on the east end of the ore pad) and dump their loads over a retaining wall onto the 5-acre ore pad without entering the ore pad area. Trucks dumping onto the pad from the dumping platform do not require washing prior to leaving the site provided they pass the required radiation screening. Under certain situations and after being weighed, trucks delivering ore may enter directly onto the concrete ore pad or 5-acre ore pad to dump their loads. Upon leaving the pad, these trucks are washed at the onsite truck wash facility and screened for radiation prior to leaving the site.

Ore Source

The two, primary sources of ore delivered to the ore pad are the Energy Fuels Whirlwind Mine (formerly called the Packrat Mine and Urantah Decline) and Energy Queen Mine (formerly called the Hecla Shaft Mine). These mines are located on the Colorado Plateau within the Uravan Mineral Belt District in Western Colorado and Eastern Utah, and are within reasonable truck hauling distance to the Project site. More specifically, the Whirlwind Mine is located in Mesa County, Colorado and Grand County, Utah, approximately five miles southwest of

Gateway, Colorado. The Energy Queen Mine is located in San Juan County, Utah between La Sal and La Sal Junction. Both of these mines are capable of producing 200 tpd of uranium ore.

The balance of the ore feed is expected to come from other mines operated by Energy Fuels and mines controlled and operated by other mining companies in the area. These mines are all located on the Colorado Plateau in western Colorado and eastern Utah and produce ore primarily from the mineralized sandstones of the Salt Wash Member of the Morrison Formation. Some ore may also be mined from the Chinle and Cutler sandstone formations in eastern Utah. These formations are similar to the Salt Wash ores in terms of mineral content, but typically have much lower vanadium concentrations and a higher lime content that consumes more acid during the milling process.

In addition to raw ore, water treatment residuals from mine water treatment plants in the area are also processed. This uranium source material is minimal and probably represents less than 0.1 percent of the mill feed. Chemical characterization of representative ore and water treatment plant residuals are provided in the Material Containment Plan (Energy Fuels 2009).

0.2.2 Mill Facility

The milling operation involves grinding the ore into a fine slurry and then leaching it with sulfuric acid to separate the uranium and vanadium from the remaining rock. Uranium and vanadium are then recovered from solution and precipitated as uranium oxide ("U_3O_8") concentrate (called yellowcake) and vanadium oxide ("V_2O_5") concentrate, respectively. These dry concentrates are sealed in 55-gallon, steel drums and transported off site for further processing by others. The primary milling and process stages include:

- Grinding;
- Pre-leaching and Thickening;
- Leaching;
- Separation and Purification;
- Uranium Recovery; and
- Vanadium Recovery.

Following is a brief description of each primary component of the milling process. Figure 0-5, Process Flowsheet, illustrates the milling and process stages. Subsequent sections of this Facility Operating Plan describe each component in further detail.

Grinding

Run-of-mine ore is fed into the mill from onsite stockpiles using a front-end loader and/or trucks. The ore is dumped into a feed hopper and delivered by belt conveyor to a semi-autogenous grinding ("SAG") mill located in the main mill building (Grinding and Leaching Building). In the SAG Mill, the ore is combined with water and tumbled with steel balls. The tumbling action causes the larger ore pieces and steel balls to grind the ore into fine powder, exposing the uranium and vanadium mineral surfaces from the host rock.

Pre-leaching and Thickening

The resulting slurry from the SAG Mill, consisting of 0.03-inch sized particles and water, is distributed to one of two large, steel pulp storage tanks located outside in the area west of the Grinding and Leaching Building. The slurry is pumped from the storage tanks to two rubber-lined, steel pre-leach tanks where the pulp reacts with sulfuric acid reducing the pulp density to approximately 25 percent solids. The pulp then reports to a rubber-lined, steel thickener tank. The overflow from the thickener is clarified, filtered and sent to a feed tank for use in the uranium recovery circuit. The partially dewatered underflow from the thickener is pumped to the leaching circuit.

Leaching

The leach circuit, located in the Grinding and Leaching Building, consists of eight rubber-lined steel tanks with agitators. The tanks are arranged in a cascading and staggered configuration so that individual tanks can be bypassed if necessary. In the leaching circuit, the pulp pumped from the pre-leach thickener tank is heated with steam and then leached with sulfuric acid to dissolve the uranium and vanadium minerals. Sodium chlorate is also added as an oxidant, as necessary.

Liquid/Solid Separation and Purification

The leached pulp is pumped to a series of 40-foot diameter counter current decantation ("CCD") thickeners, where liquids and solids are separated. The CCD thickener tanks are located outside, on the north side of the Grinding and Leaching Building, and the CCD Thickener Building runs between the two rows of tanks. The uranium- and vanadium-bearing (or pregnant) solution is separated from the remaining solids, called tailings, which consist of a variety of other minerals that were present in the ore. The pregnant solution is pumped to the pre-leach tanks and subsequently to the uranium recovery feed tank while the tailings are pumped to the tailings cell.

Uranium Recovery

A solvent extraction ("SX") process is used to concentrate and recover the uranium from the pregnant solution. In the SX process, the pregnant solution is filtered and the uranium separated and purified using a kerosene-based solvent. The result is a pure, but weak, uranium solution, which is washed with sulfuric acid and water to remove impurities. Following washing, the uranium is stripped from the solvent using a sodium carbonate solution. The uranium SX circuit is located in the Solvent Extraction Building.

Within the Precipitation and Packaging Building, the uranium is continuously precipitated from the stripping fluid by adding hydrogen peroxide to the solution, which precipitates a bright yellow powder referred to as yellowcake. The powder is then partially dewatered, washed, filtered and dried in a vacuum dryer. Finally, the dried yellowcake is packed, weighed, and sealed in 55-gallon, steel drums for shipment. Each packed drum weighs approximately 900 pounds.

At an ore processing rate of 500 tpd, an average ore grade of 0.23 percent U_3O_8, and a 96 percent recovery rate, approximately 2,200 pounds of yellowcake (or 2½ drums) are produced per day. The drums of yellowcake are shipped to a conversion plant where the uranium is converted to uranium hexafluoride, which can be enriched for use in nuclear power plants. Conversion

plants currently in operation include the ConverDyn facility in Metropolis, Illinois, the Cameco facility in Port Hope, Ontario, and several more facilities in both France and Great Britain. Shipments to the North American facilities are via trucks licensed to transport low-level radioactive material. Shipments overseas require truck transport to a port, followed by ship transport. Typically, a transport truck can carry 25 to 27 tons of cargo, or up to approximately 55 to 60 drums of yellowcake. Approximately 15 truckloads of yellowcake are shipped from the Facility per year.

Vanadium Recovery

When uranium-vanadium ores are treated, the portion of the solution that remains after the uranium minerals have been recovered (i.e., the raffinate solution) is prepared for vanadium recovery by oxidizing the vanadium ion species in solution with the addition of sodium chlorate, and reducing the acid concentration slightly by the addition of ammonia. In a similar fashion to the uranium recovery process discussed above, the vanadium circuit uses an SX process to recover vanadium. The barren raffinate from the vanadium circuit is pumped to the CCD circuit for use in transporting the tailings to the tailings cell or to the evaporation pond for disposal. The vanadium SX circuit is located in the Solvent Extraction Building.

The vanadium is precipitated by adding ammonium sulfate to the stripping fluid within the Precipitation and Packaging Building. The precipitate is then dewatered, dried and removed of ammonium in a kiln. The V_2O_5 discharging from the kiln is melted in a furnace and solidified into a black-flake product, which is packed, weighed and sealed in 55-gallon, steel drums for shipment. Each packed drum weighs approximately 570 pounds.

At an ore processing rate of 500 tpd, an average ore grade of 0.92 percent V_2O_5, and an 80 percent recovery rate, approximately 7,300 pounds of V_2O_5 (or 13 drums) are produced per day. The drums of V_2O_5 are shipped via truck to a plant that produces ferro-vanadium products. Two of the larger, such plants include the Stratcor plant in Hot Springs, Arkansas and the Bear Metallurgical plant in Butler, Pennsylvania. Approximately 50 truckloads of V_2O_5 (which is not radioactive) are shipped from the Facility annually.

0.2.3 Waste Management Facilities

Following the extraction and recovery of the uranium and vanadium from the ore, the remaining byproducts from the milling operation are disposed onsite, in engineered facilities designed to protect the environment. These facilities are designed to contain 40 years of waste material at a milling rate of 500 tpd.

Tailings Cells

After extraction of the uranium, the finely ground byproduct (called tailings) is mixed with barren raffinate from the vanadium SX circuit and pumped as a slurry through a pipeline to a tailings cell for dewatering and permanent disposal. The tailings consist of all materials remaining in the ore following the extraction of uranium and vanadium. The main radioactive materials remaining in the tailings are Thorium-230 and Radium-226.

The tailings cells are synthetically-lined impoundments constructed predominately below ground level, covering approximately 30 acres each. A total of three tailings cells (Cells A, B, and C), each with a capacity of 2.3 million tons, are required to store the tailings over a 40-year operating life. The design capacity of each cell incorporates adequate vertical distance

(freeboard) between the top elevation of the tailings material and the top elevation of the cell embankment. As shown on Figure 0-3, Site Plan, Cell A has been divided into two subcells (Cells A1 and A2) to provide operational flexibility in discharging tailings to the facility. Similar subcells may be constructed in Cell B and Cell C.

After the tailings slurry is discharged to a cell, the sands settle and the majority of the water is recovered by a floating pump barge. The recovered water is returned to the mill for reuse. Additionally, each cell or subcell has an underdrain system, designed to recover any water seeping through the sands and not recovered by the pump system. Once a tailings cell reaches full capacity, the entire cell is covered with an engineered cap consisting of soils derived from onsite excavation and imported rock aggregate products.

Evaporation Ponds

The portion of the solution that remains after the vanadium minerals have been recovered (i.e., the raffinate solution) is pumped to the CCD circuit to decrease the density of the tailings, which enables pumping of the tailings to the tailings cells. Excess raffinate solution is pumped to a series of connected, shallow pond cells for evaporation. The raffinate solution contains high levels of salts and cannot be easily recycled. The initial, total lined evaporation pond area is 40 acres. Evaporation of the raffinate solution is enhanced by mechanical means (i.e., the use of bubblers, fountains, or misters) within the central area of the ponds. As evaporation ponds fill with salts, new ponds will be constructed thus increasing the evaporation pond area to 80 acres over the life of the facility.

0.2.4 Ancillary Facilities and Infrastructure

Access

The access point to the Project site is located near milepost 23 on State Highway 90. The highway access consists of a de-acceleration lane for westbound vehicles entering the Facility and an extra wide shoulder for eastbound vehicles leaving the Facility. An improved gravel road provides access to the Facility from Highway 90. Secondary gravel roads branching off the main access road provide access to the ore pad, mill, and other process and non-process facilities.

Buildings and Parking

In addition to the primary process buildings, several secondary buildings support the Facility operation. All secondary buildings are located outside of the Mill License Boundary area. These include an administration building, change house and laboratory building, warehouse, truck shop, and guardhouse. The administration building, located east of the main access road at the north end of the Project site, houses office facilities for both milling and mining personnel and includes a garage for the onsite ambulance. The change house and laboratory building, warehouse, and truck shop are located next to the primary process facilities at the mill. Gravel parking areas are located at the administration building and secondary mill buildings.

Power and Heating Systems

An overhead electric transmission line is the primary power source for the Facility. A diesel-powered generator, located at the mill, provides backup power to operate the critical mill

facilities during line outages. A propane system heats the administration and mill buildings, and the steam boilers, kilns and furnaces used in the processing circuit.

Water Supply System

The average water requirement for the Facility is 144 gallons per minute ("gpm") or 232 acre-feet per year to support the milling process, dust suppression and fire suppression requirements, truck wash, and potable uses (i.e., washrooms and drinking). The majority of water is required for processing purposes; therefore, process water is recycled wherever feasible to minimize consumption.

The primary source for non-potable water is groundwater, pumped from a series of onsite and adjacent offsite deep production wells. Water from the well field is pumped to a raw water storage tank located at the mill. This tank supplies water to process components, dust suppression systems at the ore pad facility, the truck wash, fire hydrants and water trucks. Energy Fuels has also secured a contingency water supply from the Town of Naturita in the event that the well field cannot sustain the requirement for non-potable uses (141 gpm).

The potable water source (3 gpm) is treated water purchased from the Town of Naturita. This water is trucked to the site and stored in tanks located at the administration building and mill.

Septic Systems

Two separate absorption field septic systems receive effluent from the onsite restroom facilities. These systems are located near the administration and mill buildings.

Stormwater Systems

The mill process areas, ore pad, tailings cells, and evaporation ponds are designed as "zero discharge" facilities. Precipitation and stormwater runoff that contacts these areas is contained on site in lined ponds and cells and recycled for use in the mill. Precipitation and runoff from the surrounding undisturbed/unimproved areas is diverted around the Facility into the existing drainage network. Stormwater runoff from the Administration Facility and other site structures not within the footprint of the mill, ore pad, tailings cells and the evaporation ponds (e.g., monitoring stations, water supply well field, secondary roads) is controlled using best management practices ("BMPs") for stormwater and erosion control.

The stormwater ponds, drainage diversions, ditches and culverts are designed for the 100-year, 24-hour storm volume and peak discharge. The ponds are designed to retain (with no discharge) the 100-year, 24-hour storm volume and include emergency overflow outlets, consisting of a pipe network, sized to convey the peak discharge from a 1,000-year storm event to the evaporation ponds for containment. The evaporation ponds and tailings cells are designed and operated with adequate capacity to contain runoff from the 1,000-year storm event.

Security Systems

A guardhouse near the entrance of the site allows for the inspection and control of traffic entering the Facility. The Property boundary is fenced with barbed wire and the Mill License Boundary is surrounded by six-ft high, chain-link fence topped with three strands of barbed wire. Both fences are posted with warning signs indicating that unauthorized access is not

allowed and points of access are strictly controlled. A secondary road around the perimeter of the Mill License Boundary fence allows for daily security inspections.

0.3 Mill Control Room

0.3.1 Control System

The mill and process facilities are monitored and controlled from the Mill Control Room using a Process Control System ("PCS"). The control room is located on the third level of the Control Room Building, which is adjacent to the west side of the Grinding and Leach Building. A cantilever area extending into the Grinding and Leach Building provides full viewing of the SAG Mill and leach circuit. The room is equipped with three operator workstations, which give the operators access to real-time and historical data from the process. The functions available at each workstation are controlled by password access to four levels of security. The PCS is a complete plant control system and provides automatic control of the circuit, regulatory and supervisory control of the process, configuration of batch processing operations, an operator interface and historical data storage.

The historical data is used by the operators for normal operation of the plant and by the engineering staff for analysis and optimization of plant performance. The data is essential for recording and analyzing toll milling of different ores, necessary for accounting of toll milling batches and optimization of process conditions for different ores.

A closed-circuit television ("CCTV") system displays images of the process areas on dedicated monitors in the control room and the control room operator controls the pan-tilt-zoom functions of the cameras. A separate security CCTV system is controlled in the guardhouse. Images can be exchanged between the process and security systems.

0.3.2 Control Philosophy

The PCS is used for monitoring and control of the process and for safe operation of the plant as well as the protection of personnel, equipment and the environment. The overall operating philosophy of the plant is that the process is sufficiently instrumented to allow automatic operation under normal, stable conditions. Nonetheless, switching process streams and similar changes require manual intervention and verification. Therefore, some interlocking of pumps and flows rely on operator actions in the field without feedback to the control system. Additionally, local control is provided in the uranium and vanadium packaging areas as well as at the central Mill Control Room. This allows packaging personnel to make minor adjustments when filling the drums to avoid potential spills or dust emissions. A summary of the various controls is provided below. A more detailed description is provided in Appendix A, Process Control Philosophy.

Motor Control

Motors and drives are normally controlled from the control system over a device link to the control system. If the link is not functioning, the drive can only be operated by a manual override from the motor control relay. This ensures that all safety and process interlocking is always in place during normal operation, providing safe operation and equipment protection.

Valve Control

Valves are controlled by the PCS. All valves are installed and configured with a fail-safe position in the event of PCS, power, or air failure that drives the process to a safe state. Valve controls use feedback of actual valve position where possible, and the operator interface displays the state of any valve interlocks.

Alarms

The alarm philosophy follows the latest Instrument Society of America ("ISA") and Engineering Equipment and Materials Users' Association ("EEMUA") guidelines on process control system alarms and include the principles of Abnormal Situation Management ("ASM"). Alarms require operator action and are prioritized using the following structure:

- PRIORITY 1 – Immediate operator action required to prevent injury or loss;
- PRIORITY 2 – Operator action required to correct an abnormal situation;
- PRIORITY 3 – Operator action required to avoid an abnormal situation;
- PRIORITY 4 – Abnormal situation recorded but not annunciated; and
- PRIORITY 5 – System fault alarms.

Functional Description of Controls

The PCS monitors various controls in each area of the process. Refer to Section 5.0 of Appendix A, Process Control Philosophy, for a description of the operation and process controls applied in each area of the plant.

0.4 Mill Equipment

Each section of this Facility Operating Plan provides details of the processing equipment used in that area of the mill. Some of the more common processing components of the mill are described in general terms below. This equipment includes tanks, pumps, piping, thickeners, and mixer-settlers.

0.4.1 Tanks

Numerous process and storage tanks are located throughout the mill. Process tanks are designed to allow for a specified retention period while storage tanks are designed to store sufficient feed material or reagent to allow for uninterrupted processing over a specified period. Storage tanks also provide a buffer between processing systems so that an upstream process does not necessarily need to shut down if a downstream processing system is shut down. The mill is designed so that wherever practicable, solutions flow by gravity from one tank to the next. This reduces power consumption and is typically accomplished by placing the first tank in a series at the highest elevation and subsequent tanks at increasingly lower elevations.

Tanks are constructed of various materials including steel, fiberglass reinforced plastic ("FRP"), stainless steel, epoxy-coated steel, and chlorobutyl-lined steel. The steel and fiberglass tanks are generally used in areas where the tank contents are near neutral pH, while the lined steel systems are used to contain acidic or caustic solutions and slurries. Sacrificial materials such as bricks may also be used to line the lower portions of some tanks to protect tank interior surfaces from the more acidic materials. Tank construction materials are typically described for each area of the mill; however, there may be more than one alternative available for some tanks and

these referenced construction materials could change during final design based on capital and maintenance cost considerations.

Tanks may be either open or closed on top. Open-topped tanks are utilized to hold materials that are in equilibrium with the atmosphere while closed-top tanks are used to hold process streams that are being treated with reagents and/or heated (e.g., leach tanks) and reagents that could react with the atmosphere or be damaged by precipitation. Most closed-top tanks are also vented to an emission control device (e.g., scrubber) and equipped with an emergency overflow. Tanks used for mixing purposes or that store material that must be kept in suspension are equipped with agitators that are turned by electric motors mounted above the tanks. The agitators are typically constructed of materials similar to those used for the tank.

0.4.2 Pumps

Most of the pumps in the mill are either centrifugal or hose pumps. The centrifugal pumps, which have rotating impellers, are useful for pumping solutions with low viscosity at relatively high rates. Most of the centrifugal pumps in the mill are of stainless steel construction or lined with rubber to protect their casing and impellers from corrosion. Most of these pumps are also equipped with packing glands and are lubricated with gland water. Hose pumps do not provide as high a pumping rate, but are better suited for viscous slurries and pulps. They also are useful as metering pumps for the various reagents. Hose pumps have an internal rubber hose that contains the slurry, and the slurry is pushed through the hose by rotating cams. The hose and cams can be observed for leaks through a Plexiglas observation window on the pump casing, and require replacement when showing signs of wear or leaking. Hose pumps do not require the use of packing glands or gland water.

Primary pump systems within the plant are generally equipped with two pumps (a primary and a backup) so that if one pump goes down, the other pump can be brought on-line by turning several valves. Redundant systems are usually unnecessary for less critical pumps and smaller metering pumps (which can be quickly replaced).

0.4.3 Piping

High density polyethylene ("HDPE") and polyvinyl chloride ("PVC") pipe, which are resistant to abrasion, are used for process and waste discharge lines. HDPE elbows and/or reinforced rubber hose is typically used at bends and connections. Steel pipe is used for water, specific reagents, and compressed air lines. The type of pipe used for reagent lines is dependent on the characteristics of the reagent. Within the mill area, the various pipes are typically mounted on aboveground pipe racks; however, underground burial may be used over short distances where there are no other practical alternatives. The tailings and raffinate discharge lines are installed within a lined trench that has vehicle crossings where the trench intersects secondary roads. As discussed in Section 0.5.2 below, pipelines used to convey process streams, reagents, and waste streams are equipped with secondary containment and leak detection.

0.4.4 Thickeners and Clarifiers

A thickener is a circular tank with a sloped bottom that is used to partially dewater a slurry or pulp by creating a very gradual upward current of solution that is too slow to carry the solid material up with it. A typical thickener includes the following components:

- a feed box where the pulp is mixed with flocculents and other reagents prior to entering the thickener;
- a vertical stilling well in the center where the pulp enters the thickener;
- a sloped bottom equipped with a series of rotating metal rakes that push the accumulated solids toward the solids discharge point in the center; and
- a liquid overflow located around the top perimeter of the thickener.

Adding flocculants to the process feed causes the solids in solution to agglomerate into flocs, which settle much more rapidly than individual dispersed particles.

A clarifier has a similar configuration to a thickener and operates in much the same manner; however, it is designed to remove solid particles from a solution. The bottom of a clarifier generally has a steeper slope than the bottom of a thickener and the upward current is slower, so that finer particles settle more readily. As the solids settle out in the bottom of the clarifier, they can be recirculated back on themselves to build up larger flocs if necessary.

0.4.5 Mixer-Settlers

Mixer-settlers are utilized in the uranium and vanadium SX systems to concentrate these metals so that they can be subsequently precipitated out of solution as a relatively pure product. Concentration of both uranium and vanadium is accomplished by first transferring the metal from the loaded (pregnant) acid solution to an organic solution consisting of kerosene with an amine extractant. The uranium or vanadium is then stripped from the organic solution using a caustic solution of sodium carbonate. This process results in concentrating the metals by approximately 100 fold.

Mixer-settler tanks are constructed of materials resistant to acid and organics (e.g., FRP, stainless steel) and are mounted on a series of settler platforms with the pumps located underneath. The mixer-settler system typically consists of several mixer-settlers in series that operate via gravity flow between tanks with the lighter organic phase flowing through a weir located at the top end of each tank while the denser aqueous phase flows out the bottom end of each tank.

The mixer-settlers designed for the Piñon Ridge Mill contain two mixing compartments where the aqueous and organic solutions are mixed and then a settler compartment where the phases are allowed to separate. In the first mixing compartment, the organic solution is fed into the bottom of the tank while the denser acid solution is fed in above. An agitator mixes the two solutions and then the mixture passes through a baffle located near the top of the tank into a second mixing compartment where the process is repeated. The mixture then flows through a second baffle into the settling area where the organic floats to the top while the aqueous solution settles to the bottom. The settlers selected for this Project are approximately 20-ft long by 10-ft wide by three- to four-ft deep. They contain internal "picket fences" that slow the flows and allow greater time for separation of the aqueous and organic phases.

0.5 Mill Monitoring and System Controls

This section provides a brief overview of the mill instrumentation, secondary containment, air emission controls, and radiation monitoring and controls. Additional information on system controls is provided in each mill area discussion. Other permitting and health and safety

documents prepared for the Project also provide considerably more detail on air emission and radiation monitoring and control.

0.5.1 Mill Instrumentation

The mill is equipped with a variety of instrumentation designed to assist the mill operators in reaching and maintaining an efficient steady-state processing rate. In some areas of the mill, the instrument readings are used to directly control valves while in others, the operator must manually adjust valves based on the instrument readings. Primary instrumentation in each portion of the mill is summarized below.

Ore Handling and Grinding

The belt scale and co-located magnetic flow meters and nuclear density gauges are the primary instruments in this area. The co-located flow and density instruments control the water being added during grinding so that pulp density produced by the SAG Mill meets the required specifications for size separation, screening, and classification. The pulp storage tanks have water level indicators to track the stored volume of raw pulp. A sampler and flow and density gauges are also located between the pulp storage tanks and the pre-leach circuit so that the mill tonnage and head grade can be determined accurately over time.

Leach and CCD Circuits

The temperature is raised and sulfuric acid and other chemical reagents are added in these circuits to dissolve the metals from the pulp. In addition to the aforementioned water level indicators and flow and density gauges, pH and temperature probes are utilized to monitor the chemical and physical properties of the pulp as it moves from the pre-leach to the leach and then to the CCD circuit. The pH meters typically need to be supplemented by sampling and laboratory pH titrations at the lower pH levels. Flow meters on the reagent feed lines are also used to monitor and control the addition of reagents in these circuits.

The heated pregnant solution from the leach circuit is recirculated back to the pre-leach circuit before it is transferred to the Solvent Extraction Building. The pre-leach thickener and clarifier are designed to separate the pregnant solution from the pulp. It is important that the amount of suspended solids in the pregnant solution is reduced as much as possible because the solids can cause emulsification problems in the SX circuit; accordingly, turbidity gauges track the solution overflow at both the thickener and clarifier. They are also equipped with pressure transmitters at their base and torque gauges for the rakes to monitor the buildup of solids at the bottom of each unit.

The CCD circuit consists of a series of thickeners that are monitored in a similar manner to the pre-leach thickener and clarifier; however, turbidity in the overflow is of less concern. The barren pulp leaves the CCD circuit and is pumped to the tailings collection box where it is mixed with raffinate from the vanadium circuit to create a tailings slurry. The tailings slurry is pumped to the active tailings cell for disposal. A sampler, flow meter and density gauge are co-located at this point to allow for calculation of tail grades and quantification of waste streams.

Solvent Extraction (SX)

The uranium and vanadium SX systems do not have as much instrumentation as the leach and CCD circuits, as these are relatively simple systems that require little adjustment once they

reach steady-state operating conditions. Solution level indicators and flow and density gauges are used to track organic and aqueous throughputs, and metering pumps track reagent additions. The pregnant solutions (both uranium and vanadium) are pumped through pressure filters prior to solvent extraction. These filters are equipped with differential pressure gauges and pressure relief valves.

Precipitation and Packaging

As with the other circuits, flow and density meters and tank level indicators are utilized to track throughputs. In both the uranium and vanadium precipitation circuits, the solutions are oxidized and adjusted slightly for pH to promote precipitation; accordingly dissolved oxygen and pH levels are tracked at critical locations. Once the precipitant is formed, it is dewatered using physical processes (i.e., thickening and/or filtering) and then heated to remove the residual moisture content. Temperature is monitored at the dryers and furnaces while moisture content is tracked through flow and density meters and physical sampling and analysis. In the packaging area, a scale under the packaging point and a level indicator above the drum (in the transfer hood) allow the packaging operator to fill the drums to the correct level.

0.5.2 Secondary Containment

Secondary containment is provided for reagent storage, processing, and waste disposal areas so that any leaks or spillage from primary containment does not impact the surrounding environment (i.e., soils, surface water, and groundwater). Leak detection systems are also provided at those locations where visual monitoring is not practical.

Secondary containment within the reagent storage and processing areas consists primarily of concrete curbs or walls around the tanks, pipes, and other mill equipment. The curb/wall height is designed to hold the contents of the largest tank or container within the specified area plus 10 percent additional volume. The concrete containment floors, walls, and floor drains (where present) are inspected routinely for cracks and other defects, which are sealed as soon as practicable after discovery.

The contained areas are typically equipped with one or more sumps where solution and slurry can collect for pumping back into the system or to the active tailings cell. Since the sumps may be subjected to higher levels of hydraulic head, they are also equipped with secondary containment. Primary containment typically consists of a sump constructed of fiberglass, HDPE or an equivalent material that is compatible with the solutions or slurries in that area of the mill. Secondary containment typically consists of a concrete box around the outside of the sump. Washed aggregate is placed between the primary and secondary containment to provide a porous media for capture of any leakage. A standpipe, located in one corner of the secondary containment, is used to monitor for the presence of solution. The standpipe is typically 4-inch diameter PVC or HDPE pipe placed between the primary and secondary containment. The pipe, which is perforated within the sump area, extends several feet above the mill floor and is equipped with a removable cap. This secondary containment standpipe is instrumented with a resistivity probe or similar device that alerts plant personnel should moisture be detected between the sump's primary and secondary containment. The standpipes are also checked manually for solution on a routine basis.

Process and reagent lines, which are not within a curbed secondary containment area, are placed inside an outer pipe sleeve, lined pipe rack, or lined trench. In each case, the secondary

containment discharges into a double containment area with a floor sump. If the inner pipe develops a leak, the solution will drain by gravity to the double containment area and then to the sump. This system provides for containment and detection of leaks. Mill maintenance personnel are required to routinely inspect leak detection points and repair any leaking pipes in a timely manner.

The larger tailings and raffinate disposal lines, which are of HDPE construction, are located in a lined trench that daylights at the tailings cell and evaporation ponds. With the exception of vehicle crossing points, the trench is open and leakage may be detected through direct observation of the pipes. The lined trench slopes down from the mill to the tailings cells and evaporation ponds; therefore, if a leak were to occur in a disposal line, the solution would be contained within the trench liner and flow into a tailings cell or evaporation pond. Tailings personnel are required to inspect the tailings lines daily and repair any leaks in a timely manner.

0.5.3 Air Emission Controls

Air emission controls at the Facility include water and chemical sprays, baghouses, and scrubbers. Water and chemical sprays are used primarily on the roads, ore stockpile area, and ore feed hopper. Process solutions are used to control fugitive dust in the tailings cells and evaporation pond areas. Baghouses are located at the feed hopper, dry (i.e., solid) reagent tanks and bins, and at the yellowcake and vanadium oxide packaging areas. Scrubbers are located at all other process emission points including the emissions from the baghouses in the two packaging areas. A general description of each type of air emission control system follows.

Water, Process Solution, and Chemical Sprays

Water and chemical sprays are used to control fugitive dust outside of the mill buildings where dust emissions may occur over a large area. Water sprays are used to control dust on roads and at the ore dump platform, ore stockpiles, and ore feed hopper. Water is also used to wash down processing areas within the mill so that dust does not collect on the floors and surfaces of the mill equipment. The tailings solution and raffinate solution are sprayed on the tailings beaches and any dry areas within the evaporation ponds, respectively. Roads, parking areas, and other areas heavily traveled by vehicles and equipment are periodically treated with magnesium chloride or a similar chemical dust suppressant. These chemicals are incorporated into the upper surface of the travelway to help bind the fine soil particles together.

Dust Collecting Baghouse

Baghouses come in many sizes; smaller units may be used to capture dust generated from opening bags of reagents while larger units may be used to capture the dust generated at dumping or packaging points. In larger baghouses, a centrifugal fan pulls air from one or more points where the dust is being generated via ductwork. This air is vented through the baghouse, which consists of a cage structure covered with fine-mesh bags. As these bags filter the dust, they are periodically vibrated so that the dust collected on the outside surface of the bags falls into a hopper, which discharges through a rotary valve and into a covered steel container (dust collection tote) at the base of the baghouse. The clean air that passes though the filter bags is vented to the atmosphere through a stack. The stack is sampled for compliance purposes according to air quality permits issued by the Air Pollution Control Division ("APCD") of CDPHE. The bag filters are also monitored using differential pressure gauges,

with high pressures being indicative of potential plugging and low pressures being indicative of potential tears or holes in the bags.

Air Scrubber

Most of the emissions in the mill will be directed through a Venturi air scrubber prior to being emitted to the atmosphere. In this system, a fan pulls the vapors or dust emitted by a source (e.g., mixing tank, SAG Mill) through piping, constructed of PVC or other chemically resistant material, to the scrubber. In a Venturi scrubber, the air is wetted with a fogger as it enters the scrubber and the wet dust particles drop into an internal sump within the bottom of the scrubber. This solution containing the particles is then pumped back to an appropriate tank or sump while the scrubbed/cleaned air is vented to the atmosphere through a stack. As with the baghouses, the stack is sampled according to the requirements of the air quality permit. Wet Venturi scrubbers at the Facility typically have a removal efficiency of 99 percent for particles of 5 microns and larger. Scrubber sizes and materials of construction vary considerably throughout the mill depending on the flow volume and physical and chemical characteristics of the emissions.

0.5.4 Radiation Monitoring and Controls

Numerous monitoring systems are utilized at the Piñon Ridge Mill Facility to identify potential radiation concerns and to verify that the work environment is safe. The radiation monitoring program and procedures are directed by the Facility's RSO. Routine work in the mill is performed in accordance with approved Radiation Health ("RH") Procedures. Non-routine work tasks (i.e., activities for which established procedures do not exist) require a Radiation Work Permit, administered by the RSO, that outlines the health and safety measures required while doing the work.

Uranium and/or radium-bearing dust and accumulation of gamma radiation in confined areas represent potential sources of radiation exposure on site. The dust, when inhaled into the lungs, will emit radon and radon daughters that could cause cancer. Gamma radiation from ore, process streams, and waste streams (i.e., tailings and raffinate) could also impact worker health if the radiation is allowed to build up in a poorly ventilated area.

Stationary air monitors are located throughout the mill to monitor the concentrations of uranium dust in the air. Workers involved in potentially dusty operations wear breathing-zone air monitors to monitor the air that they breathe. They may also wear a half-mask particulate (i.e., canister-type) respirator that is provided for use in dustier areas. For those workers exposed to higher concentrations of uranium dust, bioassays are conducted to determine the total uranium that has been inhaled and ingested.

Workers exposed to higher levels of gamma radiation wear gamma-monitoring badges, similar to what x-ray technicians and airline screeners wear. Other protections to reduce radiation exposure include regular power washing of equipment and vehicles, monitoring the amount of time workers are exposed to radiation, and implementation of good housekeeping and personal hygiene measures.

The Facility is located in a relatively remote area with the nearest downwind residences located three to four miles away. Despite the large buffer area between the mill property and the closest residences, Energy Fuels must still meet regulatory limits for radiation dose at the

Property boundary. To verify compliance with these requirements, air monitoring stations have been established both on site and off site to measure radiation levels prior to, during, and after milling operations. Meteorological stations have also been installed to measure wind direction, wind speed, and other parameters. The meteorological data is combined with emission data from the mill, ore pad, and tailings cells to predict radiation levels at the Property fence line, at the nearest residence, and at communities within an 80-mile radius of the site. These results are used to help maintain and verify compliance with regulatory standards during milling operations and closure activities.

1.0 Area 100 – Ore Handling and Grinding

Area 100 process facilities consist of the ore handling and grinding systems, which include the Ore Storage Pad, feed hopper and conveyor, SAG Mill and pulp storage tanks. Figure 1-1, Area 100 – Ore Handling and Grinding, shows the general layout and location of these facilities.

Ore is hauled to the mill in transport trucks and delivered to the Ore Storage Pad for stockpiling. The trucks are weighed at the onsite truck scale before and after dumping. A front-end loader feeds ore from the stockpiles into a feed hopper, which discharges onto an apron feeder supplying the conveyor belt. The conveyor belt transports the ore into the mill where it dumps onto a vibratory feeder that discharges into the SAG Mill. Water is added to the coarse ore at the vibratory feeder prior to entering the SAG Mill. The SAG Mill grinds the ore, creating a slurry. The slurry is then screened and the undersize is pumped to the pulp storage tanks. The oversize material returns to the vibratory feeder where it is mixed with raw ore and water prior to being fed back into the SAG Mill.

Applicable design documents and drawings include:

1. Energy Fuels Resources Corp., Piñon Ridge Project, Process Control Philosophy, by CH2M HILL;
2. Energy Fuels Resources Corp., Piñon Ridge Project, Process Design Criteria, by CH2M HILL;
3. Ore Stockpile Pad Design Report, Piñon Ridge Project, Montrose County, Colorado by Golder;
4. Energy Fuels Resources Corp., Piñon Ridge Project, Mechanical Equipment List, pgs. 2 and 3 by CH2M HILL;
5. Dwg. 100-PFD-001, Area 100 Ore Handling and Grinding by CH2M HILL;
6. Dwg. 100-GA-001, Area 100 – General Arrangement Ore Handling and Grinding Ore Reclaim and Conveying Plan by CH2M HILL;
7. Dwg. 100-GA-002, Area 100 – General Arrangement Ore Handling and Grinding Ore Reclaim and Conveying Section "A-A" by CH2M HILL;
8. Dwg. 100-GA-003, Area 100 – General Arrangement Ore Handling and Grinding Pulp Storage and Pre-Leach Plan by CH2M HILL; and
9. Dwg. 100-GA-004, Area 100 – General Arrangement Ore Handling and Grinding Pulp Storage and Pre-Leach Sections "A-A", "B-B" and "C-C" by CH2M HILL.

1.1 Ore Storage Pad

1.1.1 Operating Procedures

Ore Delivery

Ore is hauled to the mill by transport trucks with a nominal capacity of 24 tons each. The truck trailers may be end dump units (with or without a pup) or side dump units. As discussed under Area 1000, General Plant, the ore trucks gain access to the site at the facility gate using a pre-programmed swipe card. Once inside the gate, the ore trucks are weighed at the truck scale and then proceed either to the dumping platform or directly onto the ore pad. Following dumping, the empty trucks are scanned where required, reweighed and the driver must obtain a weigh bill before leaving the facility.

Dumping Platform

The dumping platform is a 350-foot ("ft") long by 120-ft wide retaining wall consisting of compacted granular fill placed within welded wire mesh reinforcement. The retaining wall has an exposed height of eight feet, which includes an 18-inch axle-high bumper above the top of the platform. The face of the wall is finished with reinforced shotcrete. The 20 feet of the dumping platform closest to the retaining wall is surfaced with reinforced concrete so that the trucks have a solid base from which to dump. The remaining 100 feet of platform is surfaced with coarse gravel.

The dumping platform is designed to allow trucks to dump ore without entering onto the ore pad and the restricted area of the licensed facility (the Mill License Boundary extends from the mill to the exposed face of the retaining wall). Keeping trucks off the ore pad minimizes the potential for radioactive contaminants accumulating on the truck tires and undercarriages and the need for washing trucks prior to leaving the facility. The majority of the mill feed is delivered via the dumping platform; however, some trucks (as discussed below) must access the ore pad directly to unload.

In general, ore from Energy Fuels' mines and from larger independent mine operations is probed and/or scanned at the mine sites to determine approximate ore grades. Additionally, grab samples are collected from each truck during loading. The grab samples are combined in predetermined lots (typically 25 to 50 truckloads per lot) and then analyzed to determine the average uranium and vanadium ore grade and moisture content. Other chemical analyses may also be performed on the composite samples for milling purposes. The pre-sampled ore is generally hauled to the dumping platform where trucks dump over the 18-inch high wall onto the ore pad eight feet below.

The height of the dumping platform is designed so that a full load (i.e., 24 tons) of ore can be dumped over the dump wall without spilling back onto the platform. Assuming that each individual load spreads out to a width of 17.5 feet, there is capacity to contain 20 loads of ore (i.e., 480 tons) along the 350-ft length of the platform. Designated dumping locations are assigned according to the mine from which the ore is hauled and are clearly marked to avoid confusion and intermixing of different ore types. Following ore dumping, a front-end loader operating on the ore pad loads and hauls the ore to a designated stockpile within the ore pad area.

Ore Pad Operation

The ore pad is designed to:

- minimize penetration of radionuclides into the underlying soils;
- allow for placement of multiple stockpiles of ore from multiple mines; and
- minimize the distance from the stockpiles to the feed hopper.

The ore pad consists of a one-acre concrete pad located immediately adjacent to the feed hopper surrounded by a five-acre horseshoe-shaped gravel pad with a geosynthetic under liner. The concrete pad is one foot thick (with steel reinforcement) and rests on two feet of compacted fill. The gravel pad, from top to bottom, consists of a one-ft thick layer of Class 6 Aggregate, a 30-inch cushion layer consisting of compacted native soils, a reinforced GCL, and compacted subgrade. The concrete pad provides short-term storage of ore currently being processed, while the gravel pad provides longer-term storage of ore to be processed at a later time.

Ore delivered to the site via the dumping platform is moved with a large front-end loader (approximate nine cubic yard bucket capacity) to the appropriate stockpile or directly to the feed hopper if that ore is currently being processed. An identification system ensures that the ore is delivered to the correct stockpile. This includes an alphanumeric and/or color code that links the ore pile location at the dumping platform to a specific stockpile. Daily records of the loads hauled to each stockpile are maintained and cross-checked with the ore delivery records.

Some of the ore delivered to the site must be hauled directly onto the ore pad and unloaded next to the designated stockpile location. This occurs when:

- delivery of ore by a small vendor requires probing and sampling prior to stockpiling;
- ore is delivered by a truck type that cannot easily dump at the dumping platform; and
- delivery of ore occurs when the dumping platform is full or otherwise out of operation.

In the cases requiring ore probing and sampling, a technician probes and samples the ore once it has been unloaded. After unloading within the ore pad area, the empty truck reports to the truck wash for decontamination and scanning (see Truck Wash Facility below).

The ore pad is designed to accommodate 30-feet high stockpiles with overall side slopes of three horizontal to one vertical (3H:1V). The stockpiles are constructed in two, 15-ft high lifts with a catch bench between lifts. The maximum size of a typical stockpile is approximately one-third of an acre, which is equivalent to roughly 10,000 tons of ore or 20 days of mill feed. Allowing for travel ways and space between piles, approximately 10 stockpiles of 10,000 tons each (total of 100,000 tons) can be stored within the ore pad area. This represents 57 percent of the estimated annual production of the mill (175,000 tons per year).

Typically, the stockpiled ore is processed in batches, as ores produced from different mines have different chemical characteristics making it necessary to adjust the milling process for each ore to maximize recoveries and efficiencies. Batch runs also make it possible to accurately track ore grade and tonnage for toll milling and royalty payment purposes. When a stockpile on the five-acre pad reaches a specified volume, the front-end loader transfers ore from the pile to the

concrete pad or directly into the feed hopper. An off-highway truck with a 35- to 40-ton capacity may also be used in conjunction with a loader to transfer the ore to the feed hopper.

Truck Wash Facility

Before an ore truck or other piece of equipment leaves the ore pad area, its tires and chassis are cleaned at the truck wash facility. The truck wash is a partially enclosed and fully automated touch-less system consisting of a platform constructed of heavy-duty angle iron with high-pressure water sprays mounted both below and on the sides. The high-pressure sprays remove dirt or mud tracked off the ore pad area, and requires between one and two minutes to wash a truck.

A concrete sediment basin collects water and sediment from the wash cycle. Water that collects in the sediment basin is pumped back to the truck wash for filtering prior to being reused. The filters are automatically backflushed when they become loaded, with the flushed material directed back to the sediment basin. Stormwater runoff and the mill fresh water system provide makeup water. Sediment collected in the bottom of the sediment basin is removed periodically using a loader or skid-steer. The basin design provides a concrete ramp for easy access. Sediment is scooped out and placed in a designated area on the ore pad where it is allowed to dry. After drying, it is mixed with ore and processed in the mill.

East Stormwater Pond

The ore pad surface slopes downward to the north at a nominal grade of two percent. Runoff from the ore pad flows to the sediment basin, which is hydraulically linked to the East Stormwater Pond. The pond is 12 feet deep and covers slightly less than one acre. It is designed with 3H:1V side slopes and a 60-mil (1.5-millimeter thick) HDPE geomembrane liner underlain by reinforced GCL on a prepared subgrade. The pond has three inlets (north, east and west), which are lined in the same manner as the pond. Runoff from the ore pad collected in the sediment basin can overflow into the pond through the south inlet while the east and west inlets receive runoff from other surrounding areas.

Under normal operations, water that collects in the East Stormwater Pond is used for the truck wash and for dust suppression within the ore pad area. The pond is sized to contain the 100-year storm event with additional capacity to contain a portion of the 1,000-year storm event. A concrete weir box on the west side of the pond is designed to provide overflow (at maximum pond capacity) to a 30-inch diameter HDPE pipe designed to pass the excess stormwater resulting during a 1,000-year storm event to the evaporation ponds.

1.1.2 System Controls

System controls within the Ore Storage Pad area focus primarily on minimizing fugitive dust and preventing radioactive materials from being tracked outside of the Mill License Boundary. Dust controls consist of spraying water and dust suppression chemicals on the roads, dumping and loading areas, and stockpiles. Only fresh water from the mill water supply is used outside the license boundary. Within the license boundary, recycled water and raffinate may be used along with fresh water for dust control purposes. Radiation controls consist of washing and scanning any vehicles that enter within the restricted area. Scanning is performed in accordance with the U.S. Department of Transportation ("USDOT") regulations and the policies

and procedures detailed in Appendix C, Transport Vehicle Radiation Screening and Decontamination Plan, of this plan.

Dust Controls

The gravel roads into the site, including the roads to the dumping platform and ore pad, are treated periodically with magnesium chloride or a similar binding agent. Treatment typically occurs in the late spring followed by two to three additional treatments during the summer and early fall. The treatments are applied by a contractor during dry weather and after the roads have been graded to eliminate any depressions in the road surface. The upper two inches of road surface is loosened and moistened before applying the product to allow for good penetration of the magnesium chloride. Afterwards, the road is rolled and compacted using a pneumatic or smooth drum roller. In addition to the magnesium chloride treatments, a large water truck is also available to spray the roads with fresh water, as needed, to further reduce dust levels during hot, dry and windy conditions.

Fresh water sprays or misters are utilized on the dumping platform to minimize fugitive dust emission during unloading operations. As a truck backs toward the dump wall, a sensor triggers a series of water sprays that spray across the dump point. After unloading, the haul truck moves forward several feet (while remaining on the concrete apron) and the cover tarp is securely re-installed over the top of the truck bed. A mill technician sweeps any loose ore that is on top of the bumpers, cab, or other parts of the truck and trailer, into a bucket.

The temporary ore piles at the dumping point, the stockpiles on the ore pad, and the travel routes on the ore pad are sprayed with water using a water truck and/or a portable water spray system, as necessary, to minimize fugitive dust. A chemical dust suppressant or raffinate from the mill may also be used to control dust within the ore pad area. The raffinate is high in salts and has been proven an effective surface binding agent.

Radiation Controls

A mill technician is responsible for keeping the concrete apron at the dumping platform clean and free of spilled ore during ore dumping operations. To maintain a clean dumping platform, ore spilled and mud tracked onto the concrete pad is scooped up with a square shovel or small skid loader as operating conditions permit. Major spills are cleaned immediately to prevent the contamination of clean trucks. The loader operator is responsible for maintaining the stockpiles on the ore pad in a neat and compact manner so that storage capacity is maximized and there is no ore spillage present in the transport routes between piles.

Mill technicians and loader operators may be required to wear a breathing zone air sampler to check the levels of dust and radioactivity in these work areas. These workers are also provided with a particulate respirator that can be worn while working at tasks having a higher potential to generate dust.

Once a truck has unloaded at the dumping platform, it is scanned by a mill technician if required (see Appendix C). If the truck passes the radiation scan or does not require a scan, it is allowed to proceed directly to the weigh scale and then exit the site. If the truck does not pass the radiation scan or needs to be released for unrestricted use, it is directed to the truck wash facility (via the ore pad) for further decontamination. Scanning records are maintained for all ore haulage units.

All trucks entering the ore pad area or trucks that are to be released for unrestricted use are required to pass through the truck wash prior to exiting. After washing, a mill technician scans the truck and trailer in accordance with the procedures outlined in Appendix C. Once the truck passes the radiation scan, it is allowed to proceed directly to the weigh scale and then exit the site; otherwise, it is washed again. The technician may also utilize a hand-held, high-pressure hose to selectively wash portions of the truck where residual ore and mud may have collected. These procedures are repeated until the truck and trailer pass the radiation screening. Unless the transportation contractor advises mill staff otherwise, the radiation scanning is completed to meet the requirements for uranium ore haulage from the mines to the mill. In some instances, however, trucks and equipment must be released for unrestricted use (e.g., for service and repairs or haulage of non-radioactive materials). In these cases, additional radiation testing is performed as outlined in Appendix C.

1.1.3 Maintenance

In addition to dust control measures, the roads to the dumping platform and ore pad are maintained in good condition year round to allow for efficient and safe site transportation. A motor grader routinely blades the primary gravel roads at the site to provide a smooth, free-draining road surface. During winter, the roads are plowed, as necessary, to remove snow and prevent ice buildup. Culverts are periodically inspected and cleaned, and signage repaired and/or replaced when damaged.

Maintenance on the dumping platform consists of checking and cleaning the water spray system on a daily basis. The concrete dumping pad is cleaned daily and inspected for cracks and deterioration. Cracks are patched on a routine basis. The graveled area of the dumping platform is graded periodically and new gravel added as needed to maintain a dry and free-draining surface.

Ore pad maintenance consists of inspecting the concrete pad for cracking and deterioration after stockpiles have been removed and the concrete is readily visible. Cracks are sealed prior to reloading that portion of the pad. The uniform grade of the gravel pad surface is maintained by filling holes and excavating high spots after each stockpile is consumed. Additional gravel is added from time to time, especially in the primary travelways. Water spray systems on the ore pad (water truck and/or portable system) are checked daily to ensure that the sprays are clean and the pumps are functioning properly.

The East Stormwater Pond is visually inspected on a daily basis. The technician checks for tears or punctures, records the water level, and documents any inflows from recent precipitation events. Solids that collect in the sediment trap at the truck wash facility are removed on a regular basis. The trap is also washed down and inspected for cracks and deterioration when the sediments are removed. Cracks are sealed prior to putting the sediment trap back into service. Water sprays are checked and cleaned at the start of each shift. If frequent plugging becomes a problem, the filters in the pumping system are checked and, where warranted, replaced. Pumps are checked for proper operation and maintained in accordance with the manufacturer's recommendations. If water levels are low, additional water is pumped from the East Stormwater Pond or the raw water supply to the sediment trap.

1.2 Feed Hopper and Conveyor System

1.2.1 Operating Procedures

The feed hopper consists of a three-sided building that sits over a horizontal stationary grizzly upon which the ore is dumped. The ore passes through the grizzly into a 50-ton hopper below, which discharges onto an apron feeder. The apron feeder feeds a 42-inch conveyor belt that dumps onto a vibratory feeder, which discharges into the SAG Mill.

Feed Hopper

The feed hopper building is a 21-ft wide by 27-ft long by 24-ft high metal structure with a large opening on one side, which allows access by the front-end loader for dumping ore onto the grizzly. The grizzly is a heavily reinforced grate with 12-inch square openings. Pieces of ore larger than 12-inches are placed in an oversize pile on the concrete ore pad for later size reduction. These oversized pieces are broken up using a hydraulic rock hammer attached to the back of the loader or skid steer.

Ore passing through the grizzly falls into the coarse ore feed hopper, which is essentially a large metal chute. The hopper discharges onto the apron feeder, which consists of metal pans fixed to a slowly moving track (similar to the tracks on a crawler tractor). The speed of the apron feeder is controlled by the belt scale and the ore demand from the SAG Mill. The system is designed to deliver ore to the mill at the rate of up to 100 tons per hour ("tph").

Conveyor System

The apron feeder drops ore onto a 42-inch wide rubber belt that carries the ore to the vibratory feeder and SAG Mill. The coarse ore feed hopper, apron feeder, and the belt loading area are located below grade within a concrete tunnel. The conveyor system is 270 feet long and rises at a 15-degree angle once it leaves the apron feeder area. As the belt rises above grade, the belt enclosure transitions from concrete to corrugated metal. However, the above grade suspended floor is concrete (rather than open metal grating) so that the conveyor system remains entirely enclosed.

As the conveyor enters the SAG Mill building, a digital conveyor scale provides the Mill Control Room with a continuous reading of the ore feed rate (i.e., tph). A vertically-mounted gravity take-up adjusts the tension on the conveyor belt to a predetermined level and a belt magnet removes scrap metal from the ore as it passes by on the belt. The ore falls into a chute that feeds the vibratory feeder.

1.2.2 System Controls

System controls within the feed hopper and conveyor system are designed to minimize dust, monitor radiation levels, and quickly detect plugging or other mechanical problems that could shut down the system.

Dust Controls

The loader opening into the feed hopper building is covered with a split, heavy-duty plastic curtain to minimize fugitive dust emissions. A series of water sprays and/or misters provide direct dust control at the grizzly. These sprays are mounted on the inside of the feed hopper building and activated by the loader operator as necessary. Some of the ores may be wet or

clayey and do not require wetting, while dryer and finer ores are sprayed to reduce dust at the dumping point. A high-pressure water hose mounted in this area is also used for cleanup.

Primary dust control within the feed hopper area is provided by a dust collecting baghouse. A centrifugal fan pulls air from the grizzly area in the feed hopper building and from the apron feeder dump point at the conveyor belt. This air is vented to a baghouse, which consists of a cage structure lined with fine-mesh bags. As these bags fill with dust, they are periodically vibrated so that the entrained dust falls through a rotary valve and into a covered steel container (dust collection tote) at the base of the baghouse. The air that passes though the filter bags is vented to the atmosphere through a stack. The stack is sampled for compliance purposes according to air quality permits issued by the APCD of CDPHE. The bag filters are also monitored using differential pressure gauges, with high pressures being indicative of potential plugging and low pressures being indicative of potential tears or holes in the bags.

Established, operating and maintenance procedures minimize worker exposure to the dust generated during ore handling. For instance, the loader cab is maintained under positive pressure (i.e., air conditioning and heating systems) to minimize dust infiltration into the cab. Personnel working in these areas are required to wear appropriate personal protective equipment ("PPE") including air filter masks if monitoring indicates that certain areas have elevated dust levels.

Radiation Monitoring

In addition to the dust control measures described above, stationary air monitoring devices are located in the ore handling areas to measure concentrations of uranium dust. Personnel working in these areas wear breathing zone monitors to test the air they breathe and half-mask particulate (i.e., canister type) respirators if warranted. Additionally, the front-end loader operator may wear a breathing zone monitor within the loader cab.

Other Controls

The majority of the control devices within the feed hopper and conveyor system are designed to detect plugging or other mechanical problems at critical points in the system. These points include the grizzly, the feed hopper chute, the apron feeder, and the conveyor belt. The system is electronically interlocked so that if a piece of equipment shuts down for any reason, the other units feeding that piece of equipment unit also shut down (e.g., if the conveyor system shuts down, the apron feeder also shuts down and alarms sound to alert mill personnel).

The loader operator is responsible for monitoring potential plugging problems at the grizzly. If large pieces of ore plug the grizzly, the operator removes these pieces to an oversize stockpile for later size reduction. An ultrasonic probe is used to monitor the chute from the feed hopper to the apron feeder. This probe provides the Mill Control Room with continual information on the status of the chute. If the probe indicates potential plugging, the control room alerts the loader operator, who temporarily shuts down to investigate the situation. If the system is plugged, the operator cleans out the grizzly area and unplugs the chute using hydraulic and/or mechanical methods in accordance with approved SOPs.

A camera mounted at the apron feeder monitors dumping of ore onto the conveyor belt. If the apron feeder is running, but no ore is being fed to the belt, the hopper is either plugged or empty. This camera detects mechanical problems with the apron feeder and spillage at the

dump point. The conveyor system is monitored by the belt scale. In the event of a tear in the belt or other major mechanical problems, electronic controls on the conveyor motor and/or tail pulley sense the problem and the system automatically shuts off.

1.2.3 Maintenance

Under normal operating conditions, the grizzly, hopper, apron feeder, and conveyor are completely unloaded at the end of an operating shift to allow for cleanup and inspection of the system and minimize the potential for start-up problems during the next operating shift. The reclaim tunnel and conveyor support steel are washed down with raw water. The wash water is collected in the reclaim sump at the lower end of the conveyor tunnel. Spilled ore is wetted and shoveled back onto the conveyor belt. The entire conveyor belt is walked and inspected to ensure that the belt is in good condition and properly tracking on the idlers. The apron feeder is inspected while it is running to ensure that the pans are intact and the feeder is turning freely. The dust collection tote is picked up with a forklift, loader, or similar piece of equipment and dumped onto the grizzly. Water sprays are activated to control dust levels while dumping the tote.

Routine maintenance is conducted on a regular schedule and checklists are completed and signed as this work is completed. The apron feeder and associated gearboxes are self-lubricating and are checked to ensure that the reservoirs are full. Motors, idlers, and other bearings within the system are lubricated. Hydraulic oil in gearboxes are checked and changed out after reaching specified hours of operation.

Major maintenance is generally scheduled for non-operating shifts when the mill is not running. This may include repairs or replacement of major system components (e.g., bag filters, motors, pumps, and conveyor belts).

1.3 SAG Mill and Pulp Storage

1.3.1 Operating Procedures

Ore is transferred from the conveyor belt to a vibratory feeder via a metal chute. At the same time, water and return slurry from the classifying screen oversize are also added to the vibratory feeder. This mixture of coarse ore and water is fed into the rotating SAG Mill where the ore is reduced to 28 mesh (0.0232 inch) and smaller. The ground ore slurry passes through a trommel screen at the discharge end of the mill and flows into the SAG Mill discharge sump. The slurry is pumped from the sump to the classifying screens, which are located above the SAG Mill and vibratory feeder. The undersize from these screens flows to another sump where it is then pumped to the pulp storage tanks. The oversize, as discussed above, returns to the vibratory feeder where it is mixed with raw ore and water prior to being fed to the mill. Details of each system component follow.

Vibratory Feeder

The vibratory feeder is a steel, horseshoe-shaped structure mounted on heavy-duty springs. The feeder slopes at a very gradual angle down over the trunnion lip of the SAG Mill. A motor-operated cam causes the feeder to vibrate, which allows the ore and water mixture to flow into the mill at a constant rate of approximately 450 gpm.

Semi-Autogenous Grinding (SAG) Mill

The SAG Mill consists of a 14-ft diameter by 5-ft long rotating drum lined with chrome/molybdenum-hardened steel wear plates. The mill is charged with cast iron and/or forged steel balls, two to three inches in diameter. When the mill rotates, the ore material is reduced in size by the ore pieces breaking against other ore material, the steel liners, and the grinding balls. The mill is powered by a 500-horsepower ("Hp") electric motor through a compressed air activated clutch. The mill, at maximum capacity, process 127 tons of ore slurry (approximately 80 percent solids) per hour. After grinding, the ore leaves the discharge end of the mill through a slotted (3/8-inch) trommel screen and flows by gravity into the discharge sump. Fragments of balls and harder, non-ore material (e.g., mudstone, shale) that collect in the lower end of the screen are removed by a rotating screw to the trommel discharge hopper.

SAG Mill Discharge Sump

The discharge sump is a six-ft square by six-ft high (1,600-gallon) rubber-lined steel tank that sits on the mill floor beneath the trommel screen. Additional process water is added at this sump to dilute the slurry from 80 percent solids to 65 percent solids. The sump also receives small volumes of water from the floor sumps and the SAG Mill dust scrubber. Two rubber-lined, centrifugal slurry pumps (primary and backup) pump the slurry from the sump to the classifying screen feed tank at a nominal rate of 450 gpm.

Classifying Screens

The classifying screens and their feed tank are located several floors above the SAG Mill and vibratory feeder. The ore-bearing slurry flows by gravity from the feed tank onto the classifying screens. The screens are of urethane composition and are vibrated back and forth by a small motor. The oversize (>28 mesh) from the screens flows down to the vibratory feeder where it mixes with the conveyor-fed ore and process water. The undersize (<28 mesh), which averages approximately 53 percent solids by weight, flows into the undersize sump.

Undersize Sump

The six-feet square by 10-feet high (2,700-gallon) undersize sump is located on the main floor. Two rubber-lined, centrifugal slurry pumps (primary and backup) pump the slurry from the sump to the pulp storage tanks at a nominal rate of 300 gpm.

Pulp Storage Tanks

The two pulp storage tanks are located at the south end of the Pre-leach area on a curbed concrete pad, just outside and west of the SAG Mill building. The 39-ft diameter by 39-ft high steel tanks each hold approximately 350,000 gallons of ore slurry. The large storage capacity is necessary because the SAG Mill only operates part time and the tanks must contain the entire output of the SAG Mill until it can be fed into the leach system, which runs 24 hours per day, seven days per week (24/7). The slurry discharges into the top of each open tank and is pumped from the bottom of these tanks to the pre-leach circuit. Rubber-coated steel blade agitators in the center of each tank keep the solids in suspension.

1.3.2 System Controls

Since chemical additions and heating does not occur within the SAG Mill and pulp storage areas, system controls are focused on maximizing ore throughput, controlling dust emissions,

monitoring radiation levels, and quickly identifying and containing ore slurry spills. Each of these control systems are discussed below.

Dust Control

Dust emission controls are in place at the vibratory feeder and the SAG Mill and are unnecessary once the ore is converted to slurry and transferred to the SAG Mill discharge sump. Dust is controlled within the vibratory feeder by the addition of process water and the oversize slurry. Rubber curtains are also present at the feed point to reduce dust emissions.

A fan pulls the air and entrained dust particles from the discharge end of the SAG Mill through a Venturi scrubber. The air is wetted with a fogger as it enters the scrubber and the wet dust particles drop into an internal sump within the bottom of the scrubber. This solution is then pumped back to the SAG Mill discharge sump while the scrubbed air is vented to the atmosphere. The wet Venturi scrubber has a 99 percent removal efficiency for particles of 5 microns and larger.

The air emissions from the Venturi scrubber are sampled for compliance purposes according to an air quality permit issued by the APCD. A differential pressure gauge monitors the system operation. The scrubber is electrically interlocked with the mill so that the handling and grinding system shuts down in a pre-determined sequence if the centrifugal fan is not operating or not pulling sufficient vacuum for the scrubber to operate effectively.

Radiation Monitoring

In addition to the dust control measures described above, a stationary air monitoring device is located at the SAG Mill feed point to measure concentrations of uranium dust. Personnel working in the SAG Mill area wear breathing zone monitors on occasion to test the air they breathe. They are also provided with canister-type particulate respirators for use in dustier locations.

Spill Prevention and Control

The Grinding and Leach Building and the Pulp Storage and Pre-Leach Pad have concrete floors and concrete stem walls or curbs around their perimeters, which provide secondary containment. Curb heights are designed so that the curbing can contain the volume of the largest tank located within each containment area and provide 10 percent surplus capacity. The building and concrete pad also have sumps equipped with automated pumps to capture spilled slurry or water and return the spillage back to the appropriate process tank. If a spill of ore should occur at the vibratory feeder or SAG Mill, the wet ore is cleaned up using shovels and pressurized water hoses. At the discharge end of the SAG Mill, potential spills are limited to slurry material and are directed to the nearest floor sump using water hoses.

HDPE pipe, which is resistant to abrasion, is used for process lines while steel pipe is used for water and compressed air lines. Process lines that are not within a curbed secondary containment area are placed inside an outer HDPE pipe sleeve, or otherwise provided with double containment, that gravity drains back to a sump where solution is detected if the inner pipe develops a leak.

The tanks and sumps are equipped with high- and low-level gauges and alarms that alert the control room and mill operators in the event of upset conditions. There are also automatic

shutoffs that shut down mill systems in a pre-determined sequence if certain conditions are met and manual shutoffs (e.g., pull cords, emergency stops) if an operator detects a potential emergency situation. For instance, if the high-level gauge on the first pulp storage tank is engaged, the system is programmed to divert flow automatically to the second pulp storage tank. If the second tank is full, alarms sound and the ore grinding and handling system is shut down starting with the apron feeder and conveyor belt and continuing through to the vibratory feeder and SAG Mill.

Additional gauges and monitoring devices within the area include temperature sensors on equipment bearings, flow meters, and density gauges. The readouts and associated alarms for these devices are monitored in the control room and allow an operator to identify problems with the equipment (e.g., pump failure, plugging, and leaks) before they result in a serious upset condition and/or equipment failure. Dual pumps (primary and backup) are in place for the principal processing circuits so that a poorly operating pump can be removed from the circuit and replaced by its backup without causing an upset condition or shutting down the system.

1.3.3 Maintenance

Routine maintenance of the SAG Mill includes a wash down at the end of each operating shift starting at the classifying screens on the top level of the building and working down through the vibratory feeder and SAG Mill to the floor sumps. The equipment is inspected and lubricated and centrifugal pumps are checked and packing glands tightened or repacked, when required. Additionally, the sumps are cleaned out and inspected periodically, as necessary.

Maintenance requirements within the pulp storage area are minimal, as the equipment is limited to the two tanks and associated pumps. The pumps in this area, and in much of the rest of the plant, are hose pumps that do not have packing glands. Instead, they have an internal rubber hose that contains the slurry, and the slurry is pushed through the hose by rotating cams. The hose and cams can be observed for leaks through a Plexiglas observation window on the pump casing, and require replacement when showing signs of wear or leaking. Hose pumps were selected for use in the process circuit to minimize water consumption.

There is a large maintenance bay located south of the SAG Mill, which is serviced by an overhead crane for moving heavier equipment. Most maintenance and repairs are completed during non-operating shifts including replacement of impellers and rubber liners on pumps, replacement of steel balls and liners in the SAG Mill, replacement of screens and agitators, replacement of motors, and welding repairs on equipment and structures. The concrete floors, sumps, and curbs are inspected daily, cracks are sealed and any deteriorating concrete is patched or replaced to prevent solutions from entering and contaminating the underlying soil foundation.

2.0 Area 200 – Leaching

Area 200 process facilities consist of the pre-leach and leach systems. Figure 2-1, Area 200 – Leaching, shows the general layout and location of these facilities.

The pre-leach circuit is located outside next to the pulp storage tanks and the leach circuit is located within the north end of the Grinding and Leach Building. Sulfuric acid and flocculents are added to the pre-leach thickener process feed (i.e., the slurry feed from the pulp storage tanks and the solution from the CCD system). The pulp from the pre-leach thickener reports to the leaching circuit, where it is heated and leached with sulfuric acid, causing the uranium and vanadium remaining in the solid particles to dissolve into solution. The overflow from the pre-leach clarifier flows to the uranium SX system.

Applicable design documents and drawings include:

1. Energy Fuels Resources Corp., Piñon Ridge Project, Process Control Philosophy, by CH2M HILL;
2. Energy Fuels Resources Corp., Piñon Ridge Project, Process Design Criteria, by CH2M HILL;
3. Energy Fuels Resources Corp. Piñon Ridge Project Mechanical Equipment List, pg. 3 by CH2M HILL;
4. Dwg. 200-PF-001, Area 200 Pre-Leach Process Flow Diagram by CH2M HILL;
5. Dwg. 200-PF-002, Area 200 Leach Train Process Flow Diagram by CH2M HILL;
6. Dwg. 200-GA-001, Area 200 – General Arrangement Leaching Grinding and Leach Building Plan by CH2M HILL; and
7. Dwg. 200-GA-002, Area 200 – General Arrangement Leaching Grinding and Leach Building Section "A-A" by CH2M HILL.

2.1 Pre-Leach

2.1.1 Operating Procedures

The pre-leach portion of the mill consists of a continuous slurry sampling system, two pre-leach tanks, a pre-leach thickener, and a pre-leach clarifier. These processing units are located outside next to the pulp storage tanks on the same concrete pad. The pre-leach circuit is the first point in the process where reagents are added, as the 0.2 pH solution from the CCD system is added to the pre-leach tanks to consume the excess acid in the solution. As the acid in solution is consumed, additional sulfuric acid is added to the pre-leach thickener process feed. Flocculents are also added at this point to promote settling of the solids.

Slurry Sampling System

A sampler is located between the pulp storage pumps and the pre-leach tanks. At periodic intervals, a mechanical cutter takes a sample of the pulp flow in the line. The samples are composited in a bucket over the entire operating shift. The composite sample is then sent to the

mill lab for analysis of grain size, uranium and vanadium content, and other parameters of interest.

Pre-Leach Tanks

There are two 21-ft diameter by 24-ft high pre-leach tanks, each with a nominal capacity of 60,000 gallons. The steel tanks are equipped with rubber liners and rubber-coated agitators. Paving bricks also line the floor of the tanks and the lower portion of the walls, providing physical protection for the rubber lining.

The first pre-leach tank receives the slurry feed from the pulp storage tanks and the low-pH solution from the CCD system, which are then mixed by the agitator. When processing 500 tpd, the slurry feed averages approximately 100 gpm and 53.5 percent solids by weight. The inflow from the CCD system averages approximately 190 gpm and contains 80 grams per liter of free acid. The resulting mixture, with a pH of approximately 0.6, overflows into the second pre-leach tank where additional mixing occurs. As the acid is consumed during further mixing, the pH in the second pre-leach tank rises to approximately 1.0.

Pre-Leach Thickener

A thickener is a device that separates the solid material in the process stream from the liquid portion by creating a very gradual upward current of solution that is too slow to carry the solid material up with it. Overflow from the second pre-leach tank flows into the rubber-lined, steel feed box for the pre-leach thickener. Sulfuric acid and one or more flocculents are also added within the feed box. The process slurry enters the thickener through the stilling well in the center of the thickener and the solids gradually settle toward the bottom. Adding flocculent(s) to the process feed causes the solids in solution to agglomerate into flocs, which settle much more rapidly than individual dispersed particles.

The 60-ft diameter pre-leach thickener is of steel construction and lined with rubber, and has 12-ft high sidewalls and a bottom that slopes slightly toward the center where the pulp discharge or underflow is located. A series of metal rakes rotate along the bottom of the thicker (like spokes on a bicycle wheel) and push the accumulated solids toward the underflow point where the solids collect and are pumped to the leach tanks by two hose pumps (primary and backup). The liquid portion of the process feed flows upward and out to the perimeter of the thickener where it overflows to the pre-leach clarifier.

Pre-Leach Clarifier

The pre-leach clarifier is similar in size and configuration (50-ft diameter tank with 12-ft sidewalls) to the pre-leach thickener. It is designed to further clarify the liquid feed so that it can be pumped to the uranium SX circuit for recovery of uranium. Additional flocculents may be also be added at the clarifier to promote further settling.

The bottom of the clarifier has a steeper slope than the bottom of the thickener. As the solids settle out in the bottom of the clarifier, they can be recirculated back on themselves to build up larger flocs or pumped to the pre-leach thickener feed box via a hose pump. The overflow from the clarifier flows to the uranium SX system (filter and feed sump).

2.1.2 System Controls

The system controls within the pre-leach circuit are designed to capture and clean air emissions, monitor radiation levels, and contain the process and reagent slurries and solutions. Each of these systems is discussed in more detail below.

Air Emission Controls

The pre-leach tanks are completely enclosed. When the feed pulp is mixed with the low-pH solution from the CCD circuit, acidic fumes are generated. These fumes, as well as the fumes from the leach tanks, are vented to the wet Venturi scrubber located in the northeast corner of the Grinding and Leach Building. The pre-leach thickener and clarifier have open tops and do not generate significant fumes, as the solution reaches equilibrium within the pre-leach tanks before it is transferred to the thickener.

Radiation Monitoring

The pre-leach circuit is a wet process, located outside, with the abovementioned air emission controls. Therefore, radiation monitoring specific to this area is minimal.

Spill Prevention and Control

The system components of the pre-leach circuit are designed to safely contain the low pH process fluids and slurries. The tanks are constructed of steel with rubber liners while the pipes and connections consist of HDPE and reinforced rubber hose, respectively. The pre-leach system is cleaned and inspected on a regular schedule so that any damaged or worn components are identified and replaced before most leaks occur.

The Pulp Storage and Pre-Leach Area facilities are located on a concrete pad enclosed within a 4.5-ft tall concrete containment wall. This wall provides containment equal to the volume of the largest tank on the pad plus 10 percent. The pad drains to the pre-leach floor sump. Should a spill or leak occur in the pre-leach area, the spilled solution or slurry is cleaned up by using water hoses to direct the material to the sump. Solution collected in this sump is pumped back to the one of the pulp storage or pre-leach tanks.

Potential sources of overflows or spills within the pad area include the open-topped pulp storage tanks, pre-leach thickener, and the pre-leach clarifier. The pre-leach tanks are completely enclosed. The occurrence of overflows and spills are minimized by installation and monitoring of instrumentation at critical points. These instruments include high/low level gauges, pH meters, and alarms in the pre-leach tanks and flow meters and nuclear density gauges at the various process pumps. Monitoring of the instrument readouts at the control room allow operators to quickly detect unusual conditions and take corrective action (e.g., switch pumps or tanks, decrease or increase flows, shut down the system) before upset conditions occur.

The thickener and clarifier are equipped with turbidity meters, level gauges, pressure indicators at the bottom, and a torque indicator and alarm for the rake systems. These instruments are designed to alert the operator if the solids are not settling out of the slurry properly (i.e., too fast or too slow). For example, as solids build up in the bottom of the thickener or clarifier, the rakes gradually rise in height and the system torque and bottom pressures increase. At that point, the operator may need to take steps to reduce the level of solids buildup by decreasing the pulp

inflow rate, increasing the outflow rate at the underflow, decreasing the amount of flocculent, or some combination thereof. If the operator fails to act, the rakes ultimately reach their maximum height sounding an alarm, and the rakes are shut down.

2.1.3 Maintenance

Routine maintenance in the pre-leach area includes greasing the thickener, clarifier, and agitator motors, checking and changing hydraulic fluid in the gearboxes, and visually inspecting hose pumps for deterioration of the hoses or cam assemblies. The later becomes more important once acid has been added to the process, because the lower pH solution can damage the pump casing if allowed to leak over an extended period.

Sumps are cleaned, as needed, and any cracks in the floor sump, floor or enclosure wall are repaired. The pre-leach tanks, thickener, and clarifier are periodically cleaned out and inspected during major shutdown periods (e.g., holidays, vacations). At that time, rubber liners, bricks, and other worn components are replaced or repaired.

2.2 Leach

2.2.1 Operating Procedures

Leaching of ore is accomplished by adding sulfuric acid, heat (injected steam), an oxidant (sodium chlorate), and oxygen (compressed air) to the pulp received from the pre-leach thickener. This causes the uranium and vanadium remaining in the solid particles to dissolve and enter into solution.

The leach circuit is located on the north end of the Grinding and Leach Building. Five leach tanks are required to process 500 tpd and eight tanks are required to process 1,000 tpd. The tanks are of the same construction and size as the pre-leach tanks. They are 21-ft diameter by 24-ft high rubber-lined, steel tanks, each with a nominal capacity of 60,000 gallons. As in the pre-leach tanks, paving bricks line the floor and the lower portion of the internal tank walls.

The pulp from the pre-leach thickener has a pH of 1.0 and contains approximately 54 percent solids by weight. Concentrated sulfuric acid is added to the first four tanks at an approximate rate of eight gpm to bring the pH down to minus 0.2. A small amount of sodium chlorate (300 pounds per hour) is added to oxidize the tetravalent uranium (insoluble) in the pulp to hexavalent uranium (soluble). Steam is injected in all the tanks to raise the temperature to 185 degrees Fahrenheit ("°F") so that the dissolution proceeds faster and more efficiently. Air is also added to provide the oxygen needed to complete the chemical reactions.

The slurry feed or pulp enters at the top of each tank and exits at the bottom through a standpipe. A rubber-lined, 40-Hp agitator in each tank stirs the slurry. Sulfuric acid, sodium chlorate, steam, and compressed air are added to the first four tanks. In the fifth tank, only steam and air are added. The tanks are arranged in a stair-step fashion so that the pulp gravity flows from one tank to the next. After leaving the last leach tank, the pulp flows by gravity to the CCD circuit.

2.2.2 System Controls

The system controls within the leach circuit are designed to capture and clean air emissions, monitor radiation levels, and contain the process and reagent solutions. Each of these systems is discussed in more detail below.

Air Emission Controls

The leach tanks are completely enclosed. When reagents and heat are added to the solution, acidic fumes are generated. These fumes, as well as the fumes from the pre-leach tanks, are vented to the wet Venturi scrubber located in the northeast corner of the Grinding and Leach Building. The emission control system consists of a suction fan, gas scrubber, and a scrubber pump that pumps the captured particles in the bottom of the scrubber to the CCD circuit. The scrubbed air is vented to the atmosphere through a stack. The scrubber system is electrically interlocked with the feed pumps so that the circuit first alarms and then shuts down if the emission controls malfunction and are not corrected and brought back to normal operating status.

Radiation Monitoring

In addition to the air emission controls described above, a stationary air monitoring device is located at the leach circuit to measure concentrations of uranium dust that could result from dried leaks or spills.

Spill Prevention and Control

The system components of the leach circuit are designed to safely contain the low pH process fluids and slurries. The tanks are constructed of steel with rubber liners while the pipes and connections consist of HDPE and reinforced rubber hose, respectively. The leach system is cleaned and inspected on a regular schedule so that damaged or worn components are identified and replaced before most leaks occur.

The leach tank area is enclosed within a concrete curb and/or wall along the perimeter of the building and between the tanks and the SAG Mill area. The height of the curbing is sufficient to contain the maximum capacity of a leach tank plus 10 percent. The floor of the leach tank area slopes to two sumps. Should a spill or leak occur, the spilled solution or slurry is cleaned up by using water hoses to direct the material to one or both of the sumps. Solution collected in the sumps is pumped back to the leach tank circuit. The tanks are arranged and valved in such a manner that a leaking tank can be removed from the circuit and repaired while the remaining tanks remain operational.

Since the tanks are completely enclosed, potential spills are limited to leaking pipes, hoses, fittings, and tanks. Reagent lines for sulfuric acid, sodium chlorate, steam, and compressed air also have the potential to leak or rupture. Monitoring instruments include high/low level gauges, pH meters, and alarms in the leach tanks and high/low level gauges and flow meters in the sumps. Reagent lines are equipped with flow meters or pressure gauges to monitor feed rates.

2.2.3 Maintenance

Routine maintenance in the leach area includes washing down the tanks, greasing the agitator motors, and visually inspecting pipes, hoses, and fittings for leaks and signs of deterioration. Sumps are cleaned periodically and any cracks in the sump, floor, or curbing are sealed.

As discussed above, a leach tank and associated piping can be removed from the circuit for cleanout and repairs if a leak develops. The leach tanks are also periodically cleaned out and inspected during major shutdown periods (e.g., holidays, vacations). At that time, rubber liners, bricks, and other worn components are replaced or repaired.

3.0 Area 300 – CCD Thickeners and Waste Disposal

Area 300 process facilities consist of the CCD thickeners and waste disposal systems, which include the CCD thickener tanks, the tailings hopper, the tailings cells, and the evaporation ponds. Figure 3-1, Area 300 – CCD Thickeners and Waste Disposal, shows the general layout and locations of the CCD thickener tanks and the tailings hopper. Figure 0-3, Site Plan, shows the locations of the tailings cells and evaporation ponds.

The CCD circuit consists of a series of thickeners, located outside on a concrete pad just north of the Grinding and Leach Building. The pulp, introduced from the leach circuit, flows through the thickeners in the opposite direction as the acidic solution that becomes loaded with uranium and vanadium. The pulp leaving the last thickener, essentially barren of uranium and vanadium, is pumped to the tailings collection box where it is mixed with raffinate to form a less dense slurry. This slurry then flows into the tailings sump where it is pumped to the tailings cells for disposal. The loaded solution from the first thickener tank, containing high concentrations of both uranium and vanadium, is pumped back to the pre-leach tanks where the excess acid in the solution is consumed prior to transfer to the uranium SX circuit for extraction. The solution remaining after the uranium minerals have been recovered is pumped to the Vanadium SX circuit for recovery of vanadium. Wastewater (i.e., raffinate) from the Vanadium SX circuit is pumped to the tailings box or directly to the evaporation ponds where the solution is allowed to evaporate.

Applicable design documents and drawings include:

1. Energy Fuels Resources Corp., Piñon Ridge Project, Process Control Philosophy, by CH2M HILL;
2. Energy Fuels Resources Corp., Piñon Ridge Project, Process Design Criteria, by CH2M HILL;
3. Energy Fuels Resources Corp. Piñon Ridge Project Mechanical Equipment List, pgs. 3 and 4 by CH2M HILL;
4. Dwg. 300-PF-001, Area 300 CCD Thickeners Process Flow Diagram by CH2M HILL;
5. Dwg. 300-PF-002, Area 300 Tailings Area Process Flow Diagram by CH2M HILL;
6. Dwg. 300-GA-001, Area 300 – General Arrangement CCD and Tailings Disposal CCD Thickeners Area Plan by CH2M HILL;
7. Dwg. 300-GA-002, Area 300 – General Arrangement CCD and Tailings Disposal CCD Thickeners Area Sections "A-A" and "B-B" by CH2M HILL;
8. Dwg. 300-GA-003, Area 300 – General Arrangement Tailings Area Site Plan for Cell A1 by CH2M HILL;
9. Tailings Cell Design Report, Piñon Ridge Project, Montrose County, Colorado by Golder; and
10. Evaporation Pond Design Report, Piñon Ridge Project, Montrose County, Colorado by Golder.

3.1 Counter Current Decantation (CCD) Thickeners

3.1.1 Operating Procedures

The leached pulp from the last leach tank flows by gravity to the CCD circuit. The CCD circuit consists of a series of thickeners in which the pulp (i.e., underflow) goes in one direction while the uranium/vanadium-bearing solution (i.e., overflow) goes in the opposite direction. As the pulp is pumped from one thickener to the next, it is gradually depleted of its uranium and vanadium. By the time the pulp leaves the last thickener, it is essentially barren waste that is disposed of in the tailings cells.

The metal-bearing (loaded) solution that overflows each thickener is added to the feed box of the next upstream thickener. The overflow from the last thickener in the series has relatively low uranium and vanadium values; however, by the time the solution overflows from the first thickener, it contains high concentrations of both uranium and vanadium. This solution contains excess acid that must first be removed prior to transfer to the uranium SX circuit for extraction. Therefore, the solution is pumped back to the pre-leach tanks where the excess acid is consumed by the raw pulp.

CCD Thickeners

The CCD thickeners are located outside on a concrete pad just north of the Grinding and Leach Building. Eight, 40-ft diameter by 10-ft high thickeners are arranged in two rows with an enclosed metal-sided pump house (CCD Thickener Building) located between the two rows.

The thickeners are of steel construction and lined with either epoxy or rubber. The four-ft diameter by six-ft high, rubber-lined, steel feed tanks are mounted just above and on the side of each thickener. A series of eight metal rakes rotate along the bottom of the thicker and push the accumulated solids toward the underflow point where the solids collect and are pumped to the feed tank for the next downstream thickener. The liquid portion of the process feed flows over the top of the thickener and is pumped to the next upstream thickener. The underflow from the leach train vent scrubber is also added to the feed box of the first thickener.

Before the pulp enters a thickener, it flows through a dilution box where flocculent is added. The three-ft diameter by four-ft high dilution boxes are mounted next to the feed boxes. Flocculent is pumped into each dilution box via a metering hose pump and the pulp then flows by gravity into the stilling well in the center of the thickener. The flocculent causes the solids to agglomerate and settle out of the slurry as flocs.

Pump House

The 25-ft wide by 200-ft long pump house is located below the catwalks that provide access to the top of the thickeners. Within the pump house, there is an overflow pump and an underflow pump for each thickener. The overflow pumps are 25-Hp stainless steel centrifugal pumps. The underflow pumps are 40-Hp hose pumps. The pumps are connected to the feed boxes of the adjacent thickeners via HDPE pipe and reinforced rubber hose. The pumps are valved so that individual pumps and tanks can be removed from the circuit while the rest of the system continues to operate.

3.1.2 System Controls

The system controls within the CCD circuit are designed to monitor radiation levels and contain process solutions. Each of these systems is discussed in more detail below. Air emissions are negligible in the CCD area because process streams are in liquid form and processing is limited to physical separation (i.e., no dust or chemical vapors are emitted).

Radiation Monitoring

Maintenance and operations personnel working inside the CCD pump house wear breathing zone monitors to test the air they breathe. A stationary air monitoring device may also be utilized in the pump house if warranted by data obtained from the breathing zone monitors.

Spill Prevention and Control

The system components of the CCD circuit are designed to safely contain the low pH process fluids and slurries. The tanks are constructed of steel with rubber or epoxy liners while the pipes and connections consist of HDPE and reinforced rubber hose, respectively. Pumps are of stainless steel or rubber-lined steel construction. The thickeners, feed boxes, and dilution boxes are cleaned and inspected on a regular schedule so that damaged or worn components are identified and replaced before most leaks occur.

The CCD circuit is located on a concrete pad enclosed within an 18-inch tall concrete containment wall. This wall provides containment equal to the volume of the largest tank on the pad plus 10 percent. The pad drains to three floor sumps. One sump is located near the center of the east thickeners, one is located near the center of the west thickeners, and one sump is located within and near the center of the pump house. Should a spill or leak occur in the CCD area, the spilled solution or slurry is cleaned up by using water hoses to direct the material to the closest sump. Solution collected in a sump is pumped back to one of the thickeners via a steel, rubber-lined sump pump.

Potential sources of overflows, spills, or leaks within the pad area include overflow from the open-topped thickeners and leaks from pipes, feed tanks, pumps, and thickeners. The occurrence of overflows and spills is minimized by installation and monitoring of instrumentation at critical points. These instruments include flow meters and nuclear density gauges at the pumps. Monitoring instruments within the thickeners include turbidity meters, level gauges, pressure indicators at the bottom, and a torque indicator and alarm for the rake systems. The control room operator is alerted if any of these instruments detect abnormal operating conditions and can take appropriate action to correct the problem. This may include increasing and/or decreasing flow rates of pulp and process solutions, shut down of portions of the system, or shut down of the entire system.

3.1.3 Maintenance

Routine maintenance in the CCD area includes greasing the thickener motors, checking and changing hydraulic fluid in the gearboxes, and visually inspecting pumps for leakage and deterioration. Packing glands are tightened or repacked on the centrifugal pumps, while hoses and cams are replaced as needed on the small metering pumps. Spare pumps are available so that entire pumps can be replaced if they need to be rebuilt.

Sumps are cleaned, as needed, and any cracks in the floor sump, floor or enclosure wall are repaired. The thickeners are periodically cleaned out and inspected during major shutdown periods (e.g., holidays, vacations). At that time, rubber liners and other worn components are replaced or repaired.

3.2 Tailings Sump

3.2.1 Operating Procedures

The underflow from the last CCD thickener, a portion of the vanadium raffinate stream, and the intermittent backwash stream from the vanadium polishing filters (see Section 6.0, Area 600 – Vanadium Oxidation and Solvent Extraction) flow into the tailings sump. The tailings are then pumped to the operating tailings cell for disposal. The tailings sump area is located outside and immediately northwest of the CCD thickeners on an extension of the CCD concrete pad. The sump area includes a collection box, sampling system, the tailings sump, and sump pumps.

Collection Box

The collection box is an open-top 8-ft square tank with 4-ft high sidewalls. It is of steel construction and is rubber-lined. The collection box is elevated above the sampler and tailings sump so that the waste solutions flow by gravity to the sump. At a 500 tpd processing rate, the waste pulp from the CCD circuit flows into the box at a nominal rate of 110 gpm containing 50 percent solids by weight. Approximately 70 percent of the raffinate discharged from the vanadium SX circuit and the intermittent backwash from the vanadium polishing filters also flow into the collection box at an average rate of approximately 140 gpm. This creates a waste stream that is approximately 27 percent solids by weight, which is pumped to the tailings cell.

Tailings Sampler

A sampler, similar to the one in the pre-leach circuit, is located between the collection box and the tailings sump. At periodic intervals, a mechanical cutter takes a sample of the waste pulp flow in the line. The samples are composited in a bucket over the entire operating shift. The composite sample is sent to the mill lab for analysis of grain size, uranium and vanadium content, and other parameters of interest. Comparison of the head grades measured in the pre-leach circuit to the tail grades measured at this point provide a means for calculating uranium and vanadium recoveries for each lot of ore processed in the mill.

Tailings Sump and Pumps

The tailings sump is an open-topped, rubber-lined tank of steel construction. The 11-ft square by eight-ft high tank can contain up to 7,200 gallons of tailings. Two centrifugal pumps (primary and backup) are mounted next to the tank. The tails are pumped to the operating tailings cell through a six-inch HDPE pipe at a nominal rate of 250 gpm.

3.2.2 System Controls

The system controls within the tailings sump area are designed to monitor radiation levels and contain the waste solutions. Each of these systems is discussed in more detail below.

Radiation Monitoring

Personnel working in the tailings sump area wear breathing zone monitors to test the air they breathe. The tailings sump is a wet process, located outside; therefore, additional radiation monitoring specific to this area is minimal.

Spill Prevention and Control

The system components within the tailings sump area are designed to safely contain the low pH waste streams. The tanks and pumps are constructed of steel with rubber liners while the pipes and connections consist of HDPE and reinforced rubber hose, respectively. The tailings sump area is cleaned and inspected on a regular schedule so that damaged or worn components are identified and replaced before most leaks occur.

The tailings sump area is located on an extension of the CCD concrete pad and is enclosed within the same 18-inch tall concrete containment wall. This wall provides containment equal to the volume of the largest tank on the CCD pad plus 10 percent. The containment wall also provides secondary containment for the tailings sump area in the event that an overflow occurs. The tailings sump pad area drains to a floor sump. Should a spill or leak occur in the tailings sump area, the spilled solution or slurry is cleaned up by using water hoses to direct the material to the floor sump. Solution collected in this sump is pumped back to the tailings collection box via a rubber-lined, steel sump pump.

Potential sources of overflows, spills, or leaks within the tailings sump area include overflow from the open-topped collection box and sump and leaks from pipes and pumps. The occurrence of overflows and spills are minimized by installation and monitoring of high/low level indicators and density gauges within the collection box and tailings sump, and flow meters in the solution lines. If the primary tailings pump fails, it can be replaced by the backup pump by opening and closing a series of valves. If plugging creates an overflow condition, alarms sound and the upstream portion of the plant, from the pre-leach circuit through the CCD thickeners, shuts down in a predetermined sequence.

3.2.3 Maintenance

Routine maintenance in the tailings sump area includes greasing the pump motors and visually inspecting pumps for leakage and deterioration. Packing glands are tightened or repacked on the centrifugal pumps as needed. The collection box and sump are washed out with high-pressure hoses when solids began to accumulate in the bottom and corner areas. Rubber linings are inspected and replaced, as needed, during down periods.

3.3 Tailings Cells

Tailings are pumped to the operating tailings cell and distributed over a tailings beach area. The solids settle out on the beach while the liquid portion forms a pond (supernatant pond) in the opposite corner of the cell. A barge-mounted pump system returns this solution back to the Return Water Tank at the mill. The tailings cells have multiple liners with a leak collection and recovery system ("LCRS") located below the primary liner. A gravel underdrain system is located on top of the primary liner to minimize hydraulic head and potential seepage through the primary liner. Both the LCRS and underdrain systems are equipped with sump pumps that return any collected fluids back to the operating tailings cell.

3.3.1 Operating Procedures

The tailings disposal system includes the tailings delivery line and distribution system, the lined tailings cells, the LCRS, and solution removal systems (i.e., barge and underdrain). Each of these systems is described below.

Tailings Delivery Line and Distribution System

Tailings are pumped to the active operating cell via a six-inch diameter HDPE pipe (tailings delivery line). The pipe is continuously fused from the mill to the tailings cell and installed within an open trench, which provides secondary containment. The secondary containment channel is constructed of concrete and/or lined with 60-mil HDPE geomembrane (or some combination of both). Crossings for pickup trucks and other mobile equipment are constructed over short sections of the trench for access to the tailings cells and pump-back systems. The tailings delivery line is installed within a culvert at these crossings. The pipe is equipped with combination vacuum/pressure relief valves, as necessary, at high points along the line. The tailings line slopes to the tailings cells without any low points; therefore, pipe leakage and precipitation collection sumps along the secondary containment channel are not necessary.

The tailings delivery line enters the tailings cell at the top of the embankment (i.e., there are no pipes extending through the tailings embankment) and extends down to the lowest active internal bench. Within the tailings cell, six- and/or four-inch HDPE distribution lines extend from the tailings line in both directions around the perimeter of the cell. Two-inch diameter HDPE perforated pipes (i.e., spigots) extend downward from the distribution pipe to the tailings surface on nominal 150- to 200-ft centers. Flow through the spigots is controlled by diaphragm or pinch valves. As the tailings level increases, the perforated spigots are abandoned in place. Distribution lines are either left in place or moved up to the next bench as the tailings level rises. HDPE wear strips are tacked in place under all tailings lines, distribution lines, spigots, and walkways to prevent puncture or tearing of the primary liner.

Tailings Cells

Three 30-acre tailings cells are designed to provide tailings containment for the life of the Project (i.e., 500 tpd for 40 years or 1,000 tpd for 20 years). The cells are approximately 70-feet deep, mostly incised (i.e., below surface grade), and each have capacity for 2.45 million tons of tailings with three feet of freeboard. This represents 13.3 years of capacity at a process rate of 500 tpd and 6.7 years of capacity at a processing rate of 1,000 tpd.

The tailings cells have a multiple liner system with an LCRS system beneath the primary liner. The lining system is designed to prevent significant seepage into the subsurface that could potentially contaminate surface or ground water and consists of the following components from the top down.

- 60-mil (1.5-millimeter thick) HDPE upper (primary) geomembrane;
- LCRS consisting of HDPE geonet on the base of the tailings cells, and a drainage geocomposite on the side slopes;
- 60-mill HDPE lower (secondary) geomembrane;
- reinforced GCL as the underliner component of the secondary composite liner system; and,
- prepared subgrade.

The upper primary liner has a 5-mil (0.125-millimeter thick) white layer over the exposed surface of the geomembrane. The white color results in reduced heat expansion and ultraviolet deterioration of the liner. It also facilitates the identification of tears or punctures in the geomembrane in most cases, as the lower, black portion of the liner is exposed when the liner is damaged.

The initial tailings cell constructed (Tailings Cell A) is divided into two subcells (A1 and A2) by a lined embankment through the center of the cell. Each subcell has its own LCRS and solution removal systems. This configuration allows for decommissioning and repair of a subcell if unforeseen problems with the liner develop, while the other subcell continues to operate.

The central embankment in Tailings Cell A extends approximately 45 feet or two thirds of the way up from the bottom of the cell. Once the tailings level begins to approach the top of the central embankment, Tailings Cell B will be constructed as a backup or secondary tailings area and with a central embankment if production remains at 500 tpd. If production increases, a central embankment may not be necessary. When Tailings Cell A is at full capacity, tailings disposal will transfer to Tailings Cell B. If Tailings Cell B does not have a split-cell configuration, construction will also start on Tailings Cell C. The construction of Cells B and C are planned so that excavated materials from construction activities can be used to cover Tailings Cell A. Energy Fuels will attempt to maintain a contingency tailings disposal area available during most of the life of the facility; however, no more than two 30-acre tailings cells are in operation at any one time.

Leak Collection and Recovery System (LCRS)

Any seepage through the primary liner is collected in the LCRS and routed via gravity flow to an LCRS sump located in each tailings cell (or subcell in the case of a divided tailings cell). The LCRS is designed to minimize the hydraulic head on the lower geomembrane liner.

The LCRS is continuous beneath the primary liner and consists of an HDPE geonet on the base of the tailings cells and a drainage geocomposite on the side slopes. The LCRS drains to a 40-ft square by 5-ft deep sump filled with coarse gravel. Two 10-inch diameter HDPE riser pipes (primary and backup) extend from the sump beneath the primary liner to the surface. The riser pipes are slotted within the sump area and booted to the liner where they perforate the primary liner at the surface. Submersible pumps within the base of the riser pipes automatically remove any water collected in the sump to the tailings cell.

Solution Removal System

The solution removal system consists of a barge-mounted pumping system that removes the clarified solution that collects at the surface of the tailings cell and an underdrain system that intercepts solution that percolates down through the tailings to the top of the primary liner. The underdrain system is designed to allow for more complete dewatering of the tailings and to minimize hydraulic head on the primary liner. HDPE wear strips are placed under pipes and other locations where system components could potentially tear or abrade the primary liner.

The pump barge is anchored to the shore by wire ropes attached to a deadman, and has a floating catwalk to allow easy access for inspection and maintenance of the pump. A six-inch

HDPE return line from the pump to the mill water recovery tank is also attached to the catwalk. The return line is installed with the tailings delivery line in the secondary containment trench.

The barge is generally placed on the opposite end from where the tailings are being discharged into the cell. The coarser particles in the tailings discharge settle out first, followed by the finer particles resulting in a small pond of clarified solution forming at the opposite end of the tailings cell. The locations of the tailings discharge point and the barge are changed periodically through the life of the tailings cell so that layers of coarser material and layers of finer material become interlayered throughout the cell. This condition is expected to provide a more stable base for future closure activities.

The underdrain system rests directly on top of the primary liner in the lowest corner of the tailings cell and consists of three drainage laterals laid at 45-degree intervals and connected to a sump. The underdrain laterals consist of eight-inch diameter, perforated HDPE pipe placed in shallow two-ft deep trenches. The trenches are lined with a geotextile to cushion the underlying primary liner and are filled with one foot of coarse material around the pipe and then one foot of finer material above. The 52-ft square sump is up to seven-feet deep, consisting of five feet of coarse leak detection gravel overlain by one foot of coarse fill and one foot of fine fill. Two 10-inch HDPE riser pipes extend from the sump along the surface of the primary liner to the top of the tailings cell. Submersible pumps within each riser pump return any collected solution back to the tailings cell.

During initial operations, the tailings discharge is located immediately above the underdrain sump. This results in coarser tailings being deposited as the first layer over the underdrain system and minimizes the possibility of finer materials infiltrating and sealing off the drainage system. Once the coarse layer of tailings is in place, tailings discharge points are moved as described above.

3.3.2 System Controls

System controls within the tailings area focus on controlling dust emissions, monitoring radiation levels, preventing solution seepage from contaminating surface or groundwater, and protecting wildlife. Each of these control systems are discussed below.

Dust Control

Fugitive dust levels are expected to be low during the cooler months when the tailings beach is wet or moist. In the summer months, the beach sands can dry out making it necessary to spray these areas with tailings solution or raffinate solution. These solutions contain high concentrations of salts and are effective in forming a hard crust over the tailings. The tailings solution is obtained through a sump pump and portable line attached to the barge and the raffinate is obtained from the return line from the evaporation pond (see Section 3.4.1 below). The solution is applied to the tailings surface using portable pipes and hoses and either drip lines, rain-birds, foggers or similar methods.

Radiation Monitoring

In addition to the dust control measures described above, the stationary air monitoring devices installed to collect baseline air quality data also function to measure concentrations of radioactive particulates generated from the tailings cells and evaporation ponds. These results are compared with the Facility's air emission permit limits. The air monitoring devices are

installed at three onsite locations and two offsite locations both east and west of the Facility. Periodic windblown surveys are also conducted to assess concentrations in the soil, both east and west of the tailings cells.

Seepage Monitoring

Pipes and liner systems are equipped with secondary containment and leak detection and recovery systems. Flow rates from the LCRS system, underdrain system, barge water recovery system, and dust suppression system are automatically recorded and reported in accordance with applicable permits. Water levels within the sumps are also automatically recorded and evaluated on a daily basis. Samples of the various solutions and deposited solids within the tailings area are periodically collected and analyzed to physically and chemically characterize these materials. Tailings and solution elevations within each tailings cell are periodically recorded and compared to the stage capacity curve for the facility. Precipitation and evaporation levels are also recorded on a continuous basis and used to maintain a detailed water balance for the site.

- If a failure occurs in a primary liner system, it is detected by:
- an increase in flow or solution levels within the applicable leak detection system;
- changes in the water balance; or
- a black discoloration on the surface of the white primary liner.

Wherever practicable, leaks are identified and repaired. If leaks cannot be located/repaired due to covering by tailings, but are relatively small and within permit limits, the pump-back systems provide adequate control by maintaining low hydraulic head on secondary and tertiary liner systems. Large seepage rates, should they occur, may require shutting down and repairing that component of the tailings system and/or implementing additional investigation and remediation measures.

Wildlife Protection

The tailings solution can be acutely and chronically toxic to wildlife because of its low pH and elevated metal concentrations. The tailings liners are also slick and relatively steep (3H:1V), which could prevent larger hoofed mammals from exiting a tailings cell if they should accidently enter the area. Therefore, wildlife is excluded from the tailings area by implementation of the following measures.

- A six-ft high chain-link fence topped by three strands of barbed wire installed around the entire perimeter of the tailings cells and evaporation ponds. The fence is inspected daily and repaired, as necessary, to prevent access to the area by wildlife.
- Bird balls placed on top of the ponded portion of the tailings area to prevent birds from landing on the water. The hollow balls are made of plastic and float on top of the water concealing the water surface and creating a physical barrier.
- Mill personnel inspect the tailings cells on a daily basis. As part of their inspection, they identify and record any wildlife mortalities and, where possible, implement measures to reduce or eliminate future occurrences.

3.3.3 Maintenance

Maintenance within the tailings cells includes daily inspections of the tailings line and distribution systems. Identified leaks in the primary lines are either repaired immediately or scheduled for repair during a subsequent maintenance period, depending on the severity. Plugged spigots and valve assemblies are cleaned, repaired, or replaced on a routine basis. Wear strips are added as necessary to protect high-use areas from abrasion and liner damage.

Aboveground pumps are inspected daily and packing tightened or replaced as necessary. Suction lines are observed for potential blockage and flow meter records checked to verify adequate pumping rates. Water level and flow records for submersible pumps are checked daily. If a submersible pump shows a diminishing pumping rate or stops pumping while sump levels remain high, the pump is inspected and repaired or replaced if damaged.

During the warmer months, the dust suppression system is checked for proper operation. Delivery pumps, lines and spray systems are cleaned and/or replaced as necessary to maintain adequate coverage of the tailings beach area.

In most cases, maintenance work within the tailings cells is limited to foot traffic, ATVs, or small pickup trucks. Occasionally, a small mobile crane (i.e., cherry-picker) is used to change out a pump on the barge or move discharge lines.

3.4 Evaporation Ponds

3.4.1 Operating Procedures

Wastewater (i.e., raffinate) from the Vanadium SX circuit (see Section 6.0, Area 600 – Vanadium Oxidation and Solvent Extraction) is pumped directly to the evaporation ponds where the solution is allowed to evaporate. This solution is also recycled to the tailings cell for use in dust suppression. In the event of a large precipitation event (i.e., greater than the 100-year storm), collected runoff in the East and West Stormwater Ponds flows via gravity to the evaporation ponds. The evaporation pond system consists of pipelines to and from the ponds, the lined evaporation ponds, and a bird netting system designed to exclude birds and bats from accessing the raffinate solutions.

Supply and Return Pipelines

A continuously fused, four-inch diameter HDPE raffinate delivery line extends from the mill to the evaporation ponds. The pipeline segment extending from the mill to the tailings cells is installed within the same lined trench used for the tailings delivery and reclaim water lines. The segment extending from the tailings cells to the evaporation pond is installed within a lined trench located along the east side of the tailings cells and the west side of the main access road. The pipeline is installed within a culvert at vehicle access crossings constructed along the trench. The pipe is equipped with combination vacuum/pressure relief valves, if necessary, at the high points in the line. The low spot in the line occurs at the first evaporation pond (i.e., there is positive drainage throughout the length of the trench from the mill to the evaporation ponds).

A four-inch diameter return line conveys raffinate from the evaporation ponds to the tailings cells for use in dust suppression and/or to provide additional water that can be recycled back to the mill. The line is fed by a skid-mounted stainless steel centrifugal pump located on top of the

cell embankment and is installed in the lined trench from the evaporation pond to the operating tailings cells. The lined trench and pipe extends up the side of the tailings cell. Once within the lined area of the cell, the pipe extends to the desired discharge point.

Evaporation Ponds

The evaporation ponds consist of two sets of 10 cells each. The cells average approximately six feet deep and four acres in area, so that a set of 10 cells cover approximately 40 acres. The cells are connected by lined spillways. Initially, only the southern set of cells is constructed. Based on water balance calculations and previous experience in the region, 40 acres of pond surface provides adequate evaporative area for a 500-tpd production level. The ponds gradually fill with precipitants and the second set of ponds comes on line in phases as the initial cells fill. The entire second set of cells could also be constructed at one time should the process rate be expanded to 1,000 tpd; thus, doubling the evaporative capacity of the system.

The liner system for the evaporation ponds is identical to the tailings liner system with two exceptions: 1) the upper primary liner is black to enhance evaporation rates; and 2) a geonet is used for the LCRS along the side slopes of the cells instead of a drainage geocomposite. The evaporation pond liner system has the following components from the top down.

- 60-mil HDPE upper (primary) geomembrane;
- LCRS consisting of HDPE geonet;
- 60-mil HDPE lower (secondary) geomembrane;
- reinforced GCL as the underliner component of the secondary composite liner system; and,
- prepared subgrade.

Some seepage through the primary liner is expected through minor punctures or tears created during operations and through pinhole leaks and minor, undetectable imperfections in the original installation. Therefore, each cell has a dedicated LCRS for seepage collection. The LCRS is continuous beneath the primary liner and drains to a 60-ft by 40-ft by 5-ft deep sump filled with coarse gravel. Two 10-inch diameter HDPE riser pipes (primary and backup) extend from the sump beneath the primary liner to the surface. The riser pipes are slotted within the sump area and booted to the liner where they perforate the primary liner at the surface. The sumps are equipped with water level indicators, and portable submersible pumps installed in the riser pipes, as necessary, to remove any water collected in the LCRS sump. The water is pumped back to the evaporation cell.

Misters are utilized in the warmer months to enhance evaporation. The misters are mounted on the center berm of the six central cells and are fed by one or more submersible pumps located within the evaporation cells. The misters and pumps are constructed of stainless steel or other acid resistant materials. The outer two cells on the east and west sides are not utilized for enhanced evaporation so that overspray beyond the cell limits is minimized.

Bird Netting System

The raffinate solution has a low pH and elevated concentrations of metals that are potentially toxic to wildlife, especially birds and bats that may attempt to drink from or land on the ponds. To prevent this from occurring, bird netting is installed over the entire pond network. The bird

netting has two-inch openings and is clipped to stainless steel cables suspended in a grid between wooden support poles. The 25-ft long wooden poles are implanted 8.5 feet into the ground (i.e., the netting is located 16.5 feet above ground) and supported by wire strung from a series of concrete anchor points.

3.4.2 System Controls

System controls within the tailings area focus on controlling dust emissions, monitoring radiation levels, preventing solution seepage from contaminating surface or groundwater, and protecting wildlife. Each of these control systems are discussed below.

Dust Control

Under normal conditions, fugitive dust levels are expected to be minimal at the evaporation cells because the cells are covered with water. If one or more cells dry out during the summer months, the mister system is used to spray raffinate on the exposed precipitants to keep them moist.

Radiation Monitoring

In addition to the dust control measures described above, the stationary air monitoring devices installed to collect baseline air quality data also function to measure concentrations of uranium dust from the evaporation ponds and to verify compliance with the Facility's air emission permit limits. These air monitoring devices are installed at three onsite locations and two offsite locations both east and west of the Facility.

Seepage Monitoring

The lined pipe trench from the mill and tailings cells to the evaporation ponds daylights at Evaporation Cell No. 1. If flow occurs on the liner during dry periods, the raffinate lines are inspected to determine the source of the leak. Leaking pipes are repaired in a timely manner. If flow occurs under the liner, the liner is also be inspected for tears and punctures and repaired, if present.

As discussed above, each of the cells has a dedicated LCRS system. Automatic water level indicators in each sump allow mill personnel to identify seepage through the primary liner. A dedicated sump pump and flow meter will be installed in any sump that requires daily pumping. A portable sump pump may be used for those sumps that collect minimal amounts of water and only require occasional pumping. By documenting sump levels and flow rates for each LCRS, personnel are able to track seepage rates over time. If the seepage rates are high enough, a cell can be taken out of service temporarily and repaired. This requires sandbagging its spillways and installing a temporary diversion (an HDPE pipe within a lined trench) bypassing that cell. The cell can then be pumped out, hosed down, and inspected for punctures or tears.

Wildlife Protection

The raffinate solution can be acutely and chronically toxic to wildlife because of its low pH and elevated metal concentrations. The pond liners are also slick and relatively steep (3H:1V), which could prevent larger hoofed mammals from exiting a pond if they should accidentally enter the area. Therefore, wildlife is excluded from the tailings area by implementation of the following measures.

- A six-ft high chain link fence topped by three strands of barbed wire installed around the entire perimeter of the tailings cells and evaporation ponds. The fence is inspected daily and repaired, as necessary, to prevent access to the area by wildlife.
- Two-inch woven bird netting installed over and along the sides of the evaporation pond network.
- Mill personnel inspect the evaporation ponds on a daily basis. As part of their inspection, they identify and record any wildlife mortalities and, where possible, implement measures to reduce or eliminate future occurrences.

3.4.3 Maintenance

Routine maintenance within the evaporation pond area includes inspecting and maintaining the pumps and mister systems. The bird netting is inspected and repaired or replaced where necessary. The anchor posts and cables for the bird netting system are designed to withstand high wind speeds and icy conditions; however, the polyclips that fasten the netting to the cables can release under severe tension. Accordingly, after severe storm events, it may be necessary to reattach bird netting or replace entire sections of netting if damage occurs. Sections of netting are replaced by pulling the leading edge of the netting over the top of the steel cable system. In most cases, this requires the use of a mobile crane and one or more winches.

4.0 Area 400 – Uranium Solvent Extraction (SX)

Area 400 is the uranium SX circuit, which consists of the filter, extraction, and stripping systems. Figure 4-1, Area 400 – Uranium Solvent Extraction (SX), shows the general layout and locations of these facilities.

Loaded solution from the pre-leach clarifier is pumped to the SX Building, where it is filtered prior to flowing into the uranium SX feed tank. In the uranium SX circuit, an organic solution selectively removes the uranium from the acid solution and concentrates it in the organic solution. The loaded organic is pumped to the uranium scrub and strip circuit where the uranium is stripped from the organic carrier. The stripped organic is pumped back to the barren organic tank for reuse in the extraction circuit and the loaded strip solution is pumped to the uranium precipitation circuit. After removal of the uranium, the depleted acid solution reports to the vanadium SX extraction circuit.

Applicable design documents and drawings include:

1. Energy Fuels Resources Corp., Piñon Ridge Project, Process Control Philosophy, by CH2M HILL;
2. Energy Fuels Resources Corp., Piñon Ridge Project, Process Design Criteria, by CH2M HILL;
3. Energy Fuels Resources Corp. Piñon Ridge Project Mechanical Equipment List, pgs. 4 and 5 by CH2M HILL;
4. Dwg. 400-PF-001, Area 400 Uranium SX – Feed System and Extraction Train A Process Flow Diagram by CH2M HILL;
5. Dwg. 400-PF-002, Area 400 Uranium SX Extraction Train B, Scrub and Strip Process Flow Diagram by CH2M HILL;
6. Dwg. 400-GA-001, Area 400 – General Arrangement Uranium Solvent Extraction, Solvent Extraction Building – West Uranium SX Plan by CH2M HILL; and
7. Dwg. 400-GA-002, Area 400 – General Arrangement Uranium Solvent Extraction, Solvent Extraction Building – West Uranium SX – Sections "A-A" and "B-B" by CH2M HILL.

4.1 Polishing Filters and Feed Tanks

4.1.1 Operating Procedures

The overflow from the pre-leach clarifier is pumped to the clarifier overflow pipe in the SX Building. The loaded (pregnant) solution is then pumped from the clarifier overflow pipe to the polishing filters, which remove fine-grained particles that could potentially contaminate the extraction system (i.e., cause emulsification within the mixer-settler tanks). Diatomaceous earth is used to coat the filtering leaves within the polishing filters to increase their efficiency and to help prevent them from plugging. After filtering, the solution flows into the uranium SX feed tank, while the solids removed by the filters are pumped to the tailings cell.

Clarifier Overflow Pipe and Feed Pumps

The clarifier overflow pipe is a vertical HDPE pipe that is four feet in diameter and 24-ft high. Two stainless steel centrifugal pumps (four-inch by six-inch), consisting of a primary and a backup, are used to pump the pregnant solution to the uranium polishing filters. The clarifier overflow pipe also provides solution to the vanadium vent scrubber via a smaller stainless steel pump.

Uranium Polishing Filters

These cylinder-shaped, pressurized leaf filters are four to five feet in diameter by nine-ft long with a stainless steel shell and internals. The polishing filters contain 25 to 30 leaves, each fitted with a woven polypropylene filter cloth. The filter leaves are designed to remove particles down to three microns in size. The filters are precoated with diatomaceous earth to help prevent the cloths from plugging. A one percent solution of diatomaceous earth is also trickled into the filter to increase their efficiency. When the solids build up on the filter screens, as evidenced by an increase in pressure, internal water (i.e., barren vanadium raffinate) sprays are activated to wash down the filters. The solids are collected in the area sump and then pumped to the tailings collection box.

Diatomaceous Earth (DE) Mixing System

The DE Mixing System provides DE slurry to both the uranium and vanadium polishing filters. The DE Mixing System consists of three seven-ft diameter by 8-ft high FRP tanks equipped with steel agitators. The DE is mixed with barren vanadium raffinate to create DE solutions of varying strengths. DE is delivered and stored in bulk bags, and the bags are broken and added in the first tank (preparation tank) where a 30 percent DE solution is created. This concentrated solution is pumped into the Precoat Tank or Body Feed Tank where it is diluted. The Precoat Tank is diluted to create a 10 percent DE solution that is used to precoat filter screens in both the uranium and vanadium polishing filters prior to startup. The Body Feed Tank is diluted to create a one percent DE solution that is slowly fed into the polishing filters during operation to maintain the DE coating on the screens.

Uranium SX Feed Tank

The filtered solution from the polishing filters flows into the uranium SX feed tank. This is a 26-ft diameter by 20-ft high rubber-lined steel tank located outside of the building (southwest corner). The tank provides buffering storage capacity between the filter circuit and the uranium extraction circuit. Two, two-inch by three-inch stainless steel centrifugal pumps at this location feed the uranium extraction circuit.

4.1.2 System Controls

The system controls within the polishing filter and feed tank area are designed to monitor radiation levels and identify and contain solution spills from piping and tanks. There are no significant air emissions as the solutions are not being heated or chemically treated. Mill personnel are required to wear respirators when adding the powdered DE to the mixing tank.

Radiation Monitoring

A stationary air monitoring device is located in the SX Building to measure concentrations of radioactive dust particles that could result from dried leaks or spills. Mill personnel working in this area may also be required to occasionally wear breathing zone air samplers.

Spill Prevention and Control

Both the SX Building and the concrete pad containing the uranium SX feed tank are curbed to contain any solution spills. The curbs are designed to contain the volume of the largest tank in the area plus 10 percent. The polishing filters and DE mixing system are located at the east end of the SX Building and any spills in this area report to the area sump that pumps to the tailings collection box. The feed tank has its own sump that pumps into the uranium extraction circuit.

The tanks are equipped with level indicators and pressure relief valves while the pumps are controlled using flow meters, variable frequency drive ("VFD") controllers, and flow control valves.

4.1.3 Maintenance

When the differential pressure in one of the polishing filters increases to a preset level, the feed solution is directed to the second filter. The filter cloths within the first polishing filter are washed down by a series of water sprays and then precoated with the DE solution. Should holes develop in the leaves or filter cloths, a loss of differential pressure occurs. The leaves and filter cloths can be accessed for inspection and replacement by sliding the metal shell off the filter housing.

Most of the remaining maintenance in this area of the mill consists of tightening or replacing packing seals on centrifugal pumps and periodically washing down the filtering and DE mixing area. The tanks are all equipped with two sets of pumps (a primary and secondary) so that processing can continue if one of them needs to be taken off line for repairs. Tanks are inspected and relined, as necessary, during down times.

4.2 Uranium SX Circuit

4.2.1 Operating Procedures

In the uranium extraction circuit, an organic solution, consisting primarily of kerosene with an amine extractant, is circulated counter current to the pregnant solution. The organic solution selectively removes the uranium from the acid solution and concentrates it by two- to three-fold in the organic solution. The process starts by pumping the pregnant solution in the uranium SX feed tank to the first of four uranium mixer-settler tanks and pumping the barren organic solution to the fourth mixer settler tank. The pregnant solution then advances from mixer-settler tanks No. 1 through No. 4 while the barren organic extracts the uranium as it advances from mixer-settler tanks No. 4 through No. 1. The organic is less dense than the acid solution, so it separates from the aqueous solution within the settling portion of each tank and floats on top. The loaded organic is skimmed off the top of mixer-settler tank No. 1 while the acid solution, depleted of uranium, is removed from the base of mixer-settler tank No. 4. The loaded organic is pumped to the Loaded Organic Tank and then to the uranium scrub and strip circuit. The depleted acid solution flows into a raffinate settler to remove residual organics and then is

pumped to the uranium SX raffinate tank that feeds the vanadium oxidation and extraction circuit.

Mixer-Settler Tanks and Raffinate Settler

There are two trains of mixer-settler tanks (Trains A and B), each containing four mixer-settlers and a raffinate settler. The trains are located within the west end of the SX Building. The tanks are constructed of materials resistant to acid and organics (e.g., stainless steel) and are mounted on a settler platform with the pumps located underneath. In the first mixing compartment, the organic solution is fed into the bottom of the tank while the denser, uranium-bearing acid solution is fed in above. After mixing, the mixture passes through a baffle located near the top of the tank into a second mixing compartment where the process is repeated. The mixture then flows through a second baffle into the settling area where the organic containing the extracted uranium separates and floats to the top while the depleted aqueous solution settles to the bottom. The settlers are approximately 20-ft long by 10-ft wide by three to four-ft deep. They contain internal "picket fences" that slow the flows and allow greater time for separation of the aqueous and organic phases.

The raffinate settler is similar in size to the mixer settlers but does not contain mixing compartments. It is located downstream of the fourth mixer settler and is designed to remove the small amount of residual organic remaining in solution at that point.

The mixer-settler system operates via gravity flow between tanks with the lighter organic phase flowing through a weir located at the top end of each tank while the denser aqueous phase flows out the bottom end of each tank. The loaded organic flows from mixer-settler tank No. 1 to a steel centrifugal pump located below the platform that pumps to the Loaded Organic Tank. Similarly, the barren organic that flows from the raffinate settler is pumped to the uranium SX barren organic tank via a small hose pump. The aqueous underflow from the raffinate settler is pumped to the uranium SX raffinate tank by a three-inch by four-inch stainless steel centrifugal pump mounted below the settler platform.

Uranium SX Barren Organic Tank

The uranium SX barren organic tank is located in the southwest end of the SX Building. It is a 24-ft diameter by 19-ft high FRP tank with a closed top. As mentioned above, it receives barren organic from the raffinate settlers. The tank also receives barren organic from the uranium SX stripper-mixer-settlers (see Section 4.3, Uranium Scrub and Strip). A small amount of makeup organic feed is also added to replenish the organic solution lost during the extraction process. Two, two-inch by three-inch stainless steel centrifugal pumps (primary and backup) transfer the barren organic to mixer-settler tank No. 4.

The barren organic consists of kerosene (carrier) plus amine (collector) and alcohol (phase control). The kerosene is stored in a large tank located outside and west of the SX Building while the amine and alcohol are stored in liquid totes and/or steel drums within the SX Building (see Section 8.4, Organics Storage Areas). The organics are fed into a small (10-ft diameter by 10-ft high) makeup tank by metering pumps. This tank, which is located between the uranium and vanadium barren organic tanks, provides makeup feed to both.

Uranium SX Loaded Organic Tank

The uranium SX loaded organic tank is identical in construction and size to the barren organic tank and is located next to the barren organic tank in the southwest end of the SX Building. The tank receives loaded organic from the first mixer-settler in Trains A and B, and provides buffering capacity between the uranium extraction and uranium scrub and strip circuit. Two, three-inch by four-inch stainless steel centrifugal pumps (primary and secondary) feed the scrub and strip circuit.

Uranium SX Raffinate Tank

The uranium SX raffinate tank is located in the southwest corner of the SX Building. It is an 18-ft diameter by 18-ft high FRP tank. It receives the uranium-depleted solution from the Train A and Train B raffinate settlers and provides buffering capacity between the uranium and vanadium extraction circuits. Two four-inch by six-inch stainless steel centrifugal pumps (primary and backup) transfer the solution from the raffinate tank to the vanadium oxidation tank.

4.2.2 System Controls

System controls within the uranium SX area focus on radiation monitoring, spill identification and control, and fire safety. The organics used in this portion of the mill present a fire danger, which is addressed through monitoring and fire suppression devices.

Radiation Monitoring

A stationary air monitoring device is located in the SX Building to measure concentrations of radioactive dust particles that could result from dried leaks or spills. Mill personnel working in this area may also be required to occasionally wear breathing zone air samplers.

Spill Prevention and Control

The SX Building concrete floor is curbed to contain any solution spills. The concrete curbing is designed to contain the volume of the largest tank in the area plus 10 percent. The extraction area sump collects any spilled solution or wash-down water and returns it to the mixer-settler system. As discussed above, the tanks between circuits provide buffering capacity in the event that a portion of the system has to be temporarily shut down for any reason. Flow meters on pumps and solution level indicators in the tanks are also interlocked so that upstream processing shuts down in a programmed manner should a portion of the extraction system shut down or experience upset conditions. For example, if the loaded organic feed pump shuts down, the uranium SX feed pumps automatically shut down also.

Fire Alarm System and Controls

Given the flammable nature of the organics used in the extraction process, the SX Building is equipped with smoke and heat detectors that activate a water spray system, and fire extinguishers are present at key locations throughout the building. Any work task that could potentially generate a spark (e.g., welding, cutting with a torch) requires a Radiation Work Permit with strict controls and monitoring. Additionally, explosion-proof equipment and instrumentation is utilized in accordance with electrical code requirements.

4.2.3 Maintenance

Maintenance in the uranium extraction area focuses on maintaining and repairing the various pumps (e.g., tightening or replacing packing seals on centrifugal pumps, replacing hoses and cams on hose pumps, and replacing worn metering pumps). All critical pumping systems are equipped with both a primary and backup pump so that repairs can be performed without shutting down uranium extraction operations.

The mixer-settler system may become gradually contaminated with suspended solids that form an emulsification between the aqueous and organic phases resulting in poor extraction rates. If this occurs, the organic is drained off the raffinate settler and then the emulsified material (a.k.a., crud) is drained off and pumped to the crud centrifuge where the emulsification is separated into aqueous and organic phases (recycled) and suspended solids (wasted to the tailings area).

Tanks are periodically cleaned and inspected during down times. The tanks are very durable, constructed of acid- and organic-resistant materials, and are expected to require minimal maintenance. The stainless steel agitators and associated motors require replacement over time as they become worn.

4.3 Uranium Scrub and Strip

4.3.1 Operating Procedures

In the scrub and strip circuit, the uranium is stripped from the organic carrier in one scrubber-mixer-settler and two stripper-mixer-settlers using a caustic sodium carbonate solution. The uranium is concentrated in the stripping solution by a ratio of approximately 40 to 1, which is the ratio of the flow rate for the loaded organic to that for the sodium carbonate solution. The stripped organic is pumped back to the barren organic tank for reuse in the extraction circuit while the loaded high-grade strip solution is pumped to the uranium precipitation circuit.

Scrubber-Mixer-Settler

The loaded organic solution is pumped from the Loaded Organic Feed Tank to the Scrubber-Mixer-Settler, which is approximately 15-ft long by 8-ft wide by three- to four-ft deep. It is similar in configuration to the mixer-settlers with two agitation compartments and a settling basin. A small volume of raw water and sulfuric acid are added in the first mixing compartment to scrub the organic of contaminants prior to stripping. The acid is removed from the bottom of the settling tank and pumped back to the mixer-settler circuit via a small hose pump, while the scrubbed organic overflows from the settling tank into the first of two stripper-mixer-settlers.

Stripper-Mixer-Settlers

There are two stripper-mixer-settlers that are identical in construction and size to the scrubber-mixer-settler described above. The only difference between the scrubber-mixer-settlers and the stripper-mixer-settlers is their application.

The sodium-carbonate solution, with a pH between 11 and 12 standard units, is pumped from the sodium carbonate slurry storage tank (see Section 8.0, Area 800 – Reagents) to the second of the two stripper-mixer-settlers. There, the concentrated sodium carbonate solution mixes with

the organic overflow from the first mixer settler and the two phases then separate in the settling basin. This separation process strips the remaining uranium from the organic solution. The partially loaded strip solution at the bottom of the settling tank flows to the first stripper-mixer-settler while the barren organic is pumped to the barren organic tank by a 1.5-inch by three-inch stainless steel centrifugal pump.

In the first stripper-mixer-settler, the partially loaded strip solution of sodium carbonate is mixed with the scrubbed loaded organic prior to flowing into the settling basin. The organic overflow, largely depleted of uranium, flows over the tail end of the basin to the second stripper-mixer-settler. The loaded sodium carbonate solution at the base of the tank, now with a near neutral pH of between 7 and 8 standard units, is pumped to the uranium precipitation feed tank by a hose pump.

4.3.2 System Controls

System controls within the scrubber-stripper circuit include radiation monitoring, spill identification and control, and fire safety.

Radiation Monitoring

A stationary air monitoring device is located in the SX Building to measure concentrations of radioactive dust particles that could result from dried leaks or spills. Mill personnel working in this area may also be required to occasionally wear breathing zone air samplers.

Spill Prevention and Control

The SX Building concrete floor is curbed to contain any solution spills. The concrete curbing is designed to contain the volume of the largest tank in the area plus 10 percent. The stripping area sump collects any spilled solution or wash-down water and returns it to the stripper-mixer-settler system. The feed from the loaded organic tank automatically shuts off to prevent large spills in cases where the stripping system shuts down or tanks overflow due to plugging.

Fire Alarm System and Controls

Given the flammable nature of the organics present in the stripping process, the SX Building is equipped with smoke and heat detectors that activate a water spray system, and fire extinguishers are present at key locations throughout the building. Any work task that could potentially generate a spark (e.g., welding, cutting with a torch) requires a Radiation Work Permit with strict controls and monitoring. Additionally, explosion-proof equipment and instrumentation is utilized in accordance with electrical code requirements.

4.3.3 Maintenance

Maintenance in the uranium scrub and strip area focuses on maintaining and repairing the various pumps (i.e., replacing packing seals on the organic recycle pump and replacing hoses and cams on the two hose pumps). The pumps within the uranium strip circuit are small and do not require backup units. Tanks are periodically cleaned and inspected during down times. The stainless steel agitators and associated motors are routinely inspected and replaced as they become worn.

5.0 Area 500 – Uranium Precipitation

Area 500 is the uranium precipitation circuit, which is located in the Precipitation and Packaging Building. The circuit consists of the uranium precipitation tanks, dewatering thickeners, and drying and packaging systems. Figure 5-1, Area 500 – Uranium Precipitation, shows the general layout and locations of these facilities.

In the uranium precipitation circuit, hydrogen peroxide is added to the loaded uranium solution to precipitate the uranium as yellowcake. Uranium leaves the last precipitation tank as solid particles in suspension, and is pumped to the thickener where the precipitate is thickened and partially dewatered. The underflow containing the precipitate is pumped on a batch basis to the filter press, which removes additional water and produces a filter cake. The wet yellowcake discharges into a decant tank which feeds a zero emission vacuum dryer. The yellowcake is dried and then packaged in drums for temporary storage prior to shipment off site.

Applicable design documents and drawings include:

1. Energy Fuels Resources Corp., Piñon Ridge Project, Process Control Philosophy, by CH2M HILL;
2. Energy Fuels Resources Corp., Piñon Ridge Project, Process Design Criteria, by CH2M HILL;
3. Energy Fuels Resources Corp. Piñon Ridge Project Mechanical Equipment List, pgs. 5 and 6 by CH2M HILL;
4. Dwg. 500-PF-001, Area 500 Uranium Precipitation, Drying and Packaging Process Flow Diagram by CH2M HILL;
5. Dwg. 500-GA-001, Area 500 – General Arrangement Precipitation and Packaging Building, Precipitation and Thickening Area Plan by CH2M HILL;
6. Dwg. 500-GA-002, Area 500 – General Arrangement Precipitation and Packaging Building, Drying and Packaging Area Plan by CH2M HILL;
7. Dwg. 500-GA-006, Area 500 – General Arrangement Precipitation and Packaging Building, Precipitation and Thickening Area Section "A-A" by CH2M HILL; and
8. Dwg. 500-PF-001A, Area 500 – Uranium Precipitation, Drying and Packaging Process Flow Diagram Revision by Energy Fuels.

5.1 Uranium Precipitation Tanks

5.1.1 Operating Procedures

Loaded sodium carbonate solution from the SX scrub and strip circuit is pumped to the uranium precipitation feed tank in the central portion of the Precipitation and Packaging Building. This tank feeds into a series of five agitated tanks where hydrogen peroxide is added to precipitate the uranium as yellowcake (U_3O_8). During precipitation, the uranium solution is continuously agitated to keep the solid particles of uranium in suspension. The tanks are

arranged in a cascading pattern so that the solution flows by gravity from Uranium Precipitation Tanks No. 2 through No. 6.

Uranium Precipitation Feed Tank (Tank No. 1)

The Feed Tank is an eight-ft diameter by 10-feet high rubber-lined steel tank with a capacity of 3,700 gallons. The tank serves as a buffer between the SX and precipitation circuits. Pregnant solution is pumped by two small (¾ Hp) hose pumps (spare and backup) to Uranium Precipitation Tank No. 2. A third hose pump of the same size pumps a small bleed stream of the pregnant solution into Tank No. 4.

Uranium Precipitation Tanks No. 2 and No. 3

Tanks No. 2 and No. 3 are both five-ft diameter by 6-ft high rubber-lined steel tanks that serve primarily as mix tanks. A small volume of water and sulfuric acid are added to Tank No. 2 to adjust the solution pH while hydrogen peroxide is added in Tank No 3. Hydrogen peroxide is a strong oxidizing agent and its addition initiates the precipitation of uranium oxide.

Uranium Precipitation Tanks No. 4, No. 5 and No. 6

Tanks No. 4, No. 5, and No. 6 are eight-ft diameter by 8-ft high rubber-lined steel tanks with a nominal capacity of 3,000 gallons each, which provides sufficient residence time for uranium to precipitate with the excess oxygen. A small volume of sulfuric acid and pregnant solution is added in Tank No. 4, as necessary, to control the solution pH level. Reagents are not added in Tanks No. 5 and No. 6.

5.1.2 System Controls

The system controls within the precipitation circuit are designed to capture and clean air emissions, monitor radiation levels, and contain the process and reagent solutions. Each of these systems is discussed in more detail below.

Air Emission Controls

The precipitation tanks are completely enclosed. When reagents are added to the solution, acidic and caustic fumes are generated. These fumes are vented to the wet Venturi scrubber located in the northeast end of the Precipitation and Packaging Building. The system consists of a suction fan, gas scrubber, and a scrubber pump that recycles the captured particles in the bottom of the scrubber to the pre-leach circuit. The scrubbed air is vented to the atmosphere through a stack. The scrubber system is electrically interlocked with the feed pumps so that the circuit shuts down if the emission controls are not operating.

Radiation Monitoring

In addition to the air emission controls described above, a stationary air monitoring device is located at the uranium precipitation circuit to measure concentrations of uranium in the air that could result from dried leaks or spills. Personnel in this area may also be occasionally required to wear breathing zone air samplers to verify individual exposure levels.

Spill Prevention and Control

The system components of the precipitation circuit are designed to safely contain the acidic and caustic reagents used to adjust the solution pH level and precipitate uranium. The tanks are

constructed of steel with rubber liners while the pipes and connections consist of PVC and reinforced rubber hose, respectively. The feed and metering pumps used in the circuit are hose pumps. The precipitation system is cleaned and inspected on a regular schedule so that damaged or worn components are identified and replaced before most leaks occur.

The uranium precipitation tanks and adjacent uranium thickener are enclosed within a concrete curbed area designed to contain the contents of the largest tank (i.e., the thickener) plus 10 percent. This area drains to the Uranium Precipitation Area Sump, which is equipped with a stainless steel centrifugal pump that returns captured liquids (i.e., spilled solution or reagents and wash-down water) to the precipitation tanks. Should a spill or leak occur in the tank area, the spilled solution or slurry is cleaned up by using water sprays to direct the material to the sump. Control measures for the Hydrogen Peroxide Storage Tank, which is located in a separately curbed area within the central portion of the Precipitation and Packaging Building, are discussed under Section 8.0, Area 800 – Reagents.

Since the precipitation tanks are completely enclosed, potential spills are limited to leaking pipes, hoses, fittings, and tanks. Reagent lines for sulfuric acid and hydrogen peroxide also have the potential to leak. Monitoring instruments include high/low level gauges, pH meters, and alarms in the precipitation tanks and high/low level gauges and flow meters in the sump. Reagent lines are equipped with flow meters or pressure gauges to monitor feed rates.

5.1.3 Maintenance

Routine maintenance in the precipitation area includes visually inspecting hose pumps for deterioration of the hoses and cams, greasing the agitator motors, and washing down and inspecting tanks, pipes, and connections.

The sump is cleaned, as needed, and any cracks in the sump area, concrete floor, or containment curbs are repaired as soon as practical. The agitators and motors are replaced as they become worn. The tanks are also cleaned and inspected during major shutdown periods and repaired/refurbished as necessary.

5.2 Uranium Dewatering

5.2.1 Operating Procedures

Uranium leaves Precipitation Tank No. 6 as solid particles in suspension and is pumped to the Uranium Thickener where the precipitate is thickened and partially dewatered. The overflow from the thickener is pumped back to the Process Water Tank where it is used as makeup water for the SAG Mill. The thickener underflow containing the precipitate is pumped to a filter press where additional water is removed and a filter cake containing approximately 35 percent moisture is produced. The filter cake then drops through a chute into the Uranium Filter Cake Decant Tank where the precipitate settles and excess water is decanted off the top.

Uranium Thickener Feed Box

The solution containing the suspended uranium precipitate is pumped from Precipitate Tank No. 6 to the feed box of the Uranium Thickener. The feed box is a small (two-ft cubed) rubber-lined steel box, in which a number of inflows are mixed together prior to flowing into the thickener. Flocculent is added at the feed box to accelerate the settling process within the

thickener. Recycled uranium-bearing solutions from the filter press and the sump in the uranium packaging area are also pumped to the feed box.

Uranium Thickener

The uranium thickener is a 32-ft diameter by 12-ft high rubber-lined steel tank with a sloped bottom. Rotating rakes near the bottom of the tank assist in the separation of the yellowcake precipitate from the less-dense barren solution. The uranium precipitate settles to the bottom of the thickener where a pair of hose pumps (primary and backup) feed the yellowcake to the filter press. The Uranium Thickener has a capacity of approximately 100,000 gallons and, because of its relatively large size, can be used to store yellowcake slurry over a number of consecutive operating shifts. This allows the downstream filter and yellowcake dryer to be operated in batch mode, rather than continuously.

The barren solution from the thickener overflow enters the Uranium Thickener Overflow Pipe, which is a vertical 20-ft high by 2-ft diameter HDPE pipe. From the overflow pipe, a stainless steel centrifugal pump transfers the barren solution to the Process Water Tank in the central portion of the Precipitation and Packaging Building. The 12-ft diameter by 12-ft high Process Water Tank also receives barren solution from the vanadium circuit. Water from this tank supplies makeup water to the SAG Mill (See Section 9.4, Water Supply System).

Uranium Filter Press

The thickener underflow containing the yellowcake is pumped to the filter press located on the upper floor in the northwest corner of the Precipitation and Packaging Building. The filter press removes additional water from the yellowcake using a high-pressure filtering system. It also has a water wash cycle that remove impurities from the filter cake. The filter press is approximately 20-ft long by four-ft wide and consists of a series of leaves on a hydraulically activated track. Each leaf, which is concave in shape, is covered with a filter cloth and has a central port for inflow of the slurried precipitate and perimeter ports for outflow of the filtrate water. Prior to filtering a batch of uranium precipitate, the hydraulic ram is activated and the leaves of the filter press are squeezed together. The underflow from the thickener is then pumped into the press through the center of the leaves. The solids in the slurry settle in the concave depression between the leaves while the liquid is forced through the filter cloths and exit the filter press through the perimeter ports. This liquid flows into the uranium thickener feed box.

After the pressure in the filter press reaches a predetermined level, pumping from the thickener is discontinued and the solids (or cake) collected in the filter press are washed to remove impurities. The cake is washed with clean water pumped through the central port of the leaf filters. This water exits through the perimeter ports and flows to the uranium thickener feed box. After washing, the hydraulic ram is activated and the leaves are pulled apart, which allows the filter cake to drop into a chute below that discharges into the Uranium Filter Cake Decant Tank. A mill operator then uses a plastic scraper to remove residual cake from the filters and lightly rinses off the filters using a water hose.

Uranium Filter Cake Decant Tank

The filter cake, containing approximately 35 percent moisture, drops through a chute beneath the filter press into the Uranium Filter Cake Decant Tank where the cake is allowed to settle. As

the cake settles, water separates out at the top. This excess water is decanted through a series of valved nozzles located along the side of the tank and flows to the uranium thickener feed box. A level probe within the tank allows for the decanting to be done automatically from the Control Room.

The decant tank has a cone bottom that connects to the yellowcake dryer below via a pneumatic slide gate. When this valve is opened, the filter cake feeds into the yellowcake dryer. To minimize plugging, the tank is equipped with a low-volume/high-pressure water spray system, which lubricates the interior surface of the cone and is mounted on a vibratory system that shakes the tank as the cake is loaded into the dryer.

5.2.2 System Controls

The uranium dewatering system physically separates the uranium precipitate from the solution. No heating or chemical reactions occur in this area that could generate air emissions and the wet yellowcake does not represent a source of fugitive dust. For these reasons, system controls in this area focus on radiation monitoring, and preventing and cleaning up spills. These systems are discussed in more detail below.

Radiation Monitoring

A stationary air monitoring device is located in the area of the precipitation and dewatering circuits to measure concentrations of uranium in the air that could result from dried leaks or spills. Personnel in this area may also be occasionally required to wear breathing zone air samplers to verify individual exposure levels.

Spill Prevention and Control

The majority of the control devices within the uranium thickener and filter press area are designed to detect plugging or spillage at critical points in the system. Potential sources of overflows or spills include the open-topped thickener feed box and thickener, and the leaves of the filter press. Plugging could occur in the lower portion of the thickener, pipelines feeding the filter press, the filter press chute, and within the Uranium Filter Cake Decant Tank.

The thickener is equipped with turbidity meters, level gauges, pressure indicators at the bottom, and a torque indicator and alarm for the rake systems. These instruments are designed to alert the operator when solids are not settling out of solution properly (i.e., too fast, or too slow). The filter press leaves are equipped with gaskets that seal the edges where the leaves abut against each other. Water can leak out the edges if a gasket is damaged or worn. The filter press is electrically interlocked with the underflow thickener pumps so that the pumps recirculate the underflow back to the thickener when the filter press reaches full capacity. The entire contents of the filter press and the decant tank discharge to the dryer on a batch basis so that no residual cake is left where it could set up and cause plugging problems.

In the event of spills or plugging, the material is washed down with high-pressure hoses and directed toward the nearest floor sump. In the case of the thickener, the spill/wash solution flows into the Uranium Precipitation Area Sump Pump where the solution is pumped back to the precipitation tanks. The filter press and decant tank are located in the uranium packaging area, which drains to Uranium Package Area Sump. Solution collected in this sump is pumped back to the thickener feed box. Both the packaging area and thickener/precipitation area are

enclosed within concrete curbs, sized to contain the contents of the largest tank or container plus 10 percent.

5.2.3 Maintenance

Routine maintenance of the dewatering system includes greasing motors, checking and changing hydraulic fluid in the gearboxes, inspecting and replacing drive belts, and visually inspecting hose pumps for deterioration of the hoses and cam assemblies. The filter press is washed down and inspected for cracks in the frame or tears in the filter cloth.

Sumps are cleaned, as needed, and any cracks in the floor sump, floor or enclosure wall are repaired. The thickener is periodically cleaned out and inspected during major shutdown periods (e.g., holidays, vacations). At that time, rubber liners, rakes, and other worn components are replaced or repaired, as necessary.

5.3 Uranium Drying and Packaging

5.3.1 Operating Procedures

The wet yellowcake containing 35 percent moisture by weight is transferred from the decant tank into the yellowcake vacuum dryer, which is a zero emission dryer where the cake is indirectly heated to evaporate the contained moisture. The dried cake is then transferred to 55-gallon drums via a rotary valve and an enclosed packaging system. The drums move on a roller conveyor system that has a weigh scale under the rotary valve.

Yellowcake Dryer

The yellowcake dryer is a horizontal, stainless steel vacuum dryer that can hold up to 150 cubic feet of wet yellowcake. It is located below the decant tank and above the rotary valve/packaging system in the northwest corner of the Precipitation and Packaging Building. The drying chamber has a top port for loading the wet yellowcake and a bottom port for unloading the dry powder. A third port is provided at the top for venting hot air to a baghouse mounted on top of the dryer. The dryer has a rotating shaft with blades (plows) that continually turn the yellowcake during the drying process.

The dryer system circulates steam through both the heated external jacket and heated shaft. The moisture that evaporates from the cake is drawn off by a vacuum through the baghouse to the condenser and vacuum/filtrate receiver system. When the yellowcake is dry, as indicated by a low moisture content in the airflow to the condenser, the yellowcake is transferred to the Feed Hopper/Packaging System by an enclosed chute.

Packaging System

A rotary valve and transfer hood are incorporated into the yellowcake dryer. The transfer hood lowers directly to the top of an open drum. Filling of the drums is controlled by the rotary valve that is electrically connected and calibrated with a level probe in the transfer hood and a weigh scale located under the drum being loaded. Each drum, when full, contains approximately 900 pounds of yellowcake. After each drum is filled, the packaging operator removes the hood and collects a sample of the yellowcake for lab analyses. The operator then seals the top of the drum with a USDOT-approved lid and clamping ring. The operator also hoses down the outside of each drum after sealing to remove any fine dust that may have

collected on the surface and attaches a label containing a unique identification number, gross weight, and other pertinent information.

Roller Conveyor and Drum Storage Areas

A roller conveyor is used to move empty drums from the Empty Drum Storage Area to the feed hopper/packaging system and filled drums from the packaging area to the Packaged Drum Storage Area. The on-and-off controls for the system are operated by the packaging operator. The empty drums are manually placed on the conveyor at the Empty Drum Storage Area. After the drums have been filled, they are conveyed to the end of the conveyor where the seals are cracked to allow the contents of the drums to equilibrate. At the end of the shift, all drums are resealed and removed from the conveyor and placed in storage using a barrel lift.

5.3.2 System Controls

System controls within the uranium drying and packaging area are designed to control dust and vapors, monitor radiation, and prevent and control spills. Most equipment in this area is automated for security reasons and to reduce the potential for inhalation of uranium dust by the packaging operators.

Dust and Vapor Control

The yellowcake packaging area has its own heating, ventilating, and air conditioning ("HVAC") system, and two sets of doors (vestibules) remain closed at the exits to provide additional containment of air-borne particles. Only required operations personnel are allowed within the packaging area and they are required to wear appropriate PPE including air-purifying respirators, gloves, and coveralls. A viewing area is provided above the packaging area for guests and non-operations personnel. As described in Section 5.3.3 below, the packaging area is routinely washed down to prevent the accumulation of dust on the surface of equipment and walls.

As air is heated and water evaporates in the yellowcake dryer, the moist air is drawn through the dryer's baghouse unit where particles are captured on the filter socks. When the socks become loaded, an automatic shaker shakes the sock cage and the dust falls back through the baghouse port into the dryer. The air flowing from the baghouse is drawn by a vacuum to a condenser where the water and any remaining particulates are removed from the air and pumped to the uranium thickener feed box. The clean air is vented back to the yellowcake packaging room.

Radiation Monitoring

In addition to the dust and vapor control measures described above, a stationary air monitoring device is located in the packaging area to measure concentrations of uranium in the air. Personnel working in the packaging area and drying room wear breathing zone monitors and are required to wear canister-type particulate respirators. Additionally, routine bioassays are conducted on these personnel to determine the total uranium that has been inhaled and ingested.

Spill Prevention and Control

The dryer, feed hopper and packaging system are totally enclosed and interconnected, so the primary source for potential spills occurs where drums are being filled. Trained packaging

operators operate the packaging system so that drums are fastened securely to the packaging system during filling and are not overfilled. In the event of a spill, the spilled yellowcake is lightly wetted and swept up or shoveled using hand tools. Spilled material may be recycled through the processing system or directly loaded into subsequent drums, depending on whether or not it has been contaminated. The spill area is then hosed down with wash water and directed to the Packaging Area Sump. Operators are required to wear appropriate PPE including air-purifying respirators, gloves, and coveralls during packaging operations and during any cleanup of spilled material.

5.3.3 Maintenance

Routine maintenance of the drying and packaging system includes greasing motors, checking and changing hydraulic fluid in the gearboxes, inspecting and replacing drive belts, and visually inspecting all components for proper operation. The dryer and packaging areas are thoroughly hosed down after each operating shift to remove any accumulated dust.

The system components are opened, cleaned out, and inspected periodically. If a system component requires repair, the component is washed down as it is disassembled. The baghouse socks are inspected, and replaced where appropriate, when a decrease in differential pressure occurs that may be indicative of worn or damaged filter socks. Sumps are cleaned, as needed, and any cracks in the floor sump, floor or enclosure wall are repaired.

6.0 Area 600 – Vanadium Oxidation and Solvent Extraction

Area 600 is the vanadium SX circuit, which consists of the vanadium oxidation/filtering, extraction and stripping systems. Figure 6-1, Area 600 – Vanadium Oxidation and Solvent Extraction (SX), shows the general layout and locations of these facilities.

The vanadium SX circuit uses a similar process as the uranium SX circuit (i.e., an organic solution selectively removes vanadium from the acid solution and concentrates it in the organic solution). The raffinate from the uranium SX circuit is oxidized and re-filtered prior to being pumped to the vanadium SX circuit for extraction

of vanadium. The loaded organic is then pumped to the vanadium scrub and strip circuit where the vanadium is stripped from the organic carrier. The stripped organic is pumped back to the barren organic tank for reuse in the extraction circuit and the loaded strip solution is pumped to the vanadium precipitation circuit. After removal of the vanadium, the depleted acid solution reports to the tailings collection box and/or the evaporation ponds.

Applicable design documents and drawings include:

1. Energy Fuels Resources Corp., Piñon Ridge Project, Process Control Philosophy, by CH2M HILL;
2. Energy Fuels Resources Corp., Piñon Ridge Project, Process Design Criteria, by CH2M HILL;
3. Energy Fuels Resources Corp. Piñon Ridge Project Mechanical Equipment List, pgs. 6 and 7 by CH2M HILL;
4. Dwg. 600-PF-001, Area 600 Vanadium Oxidation and SX – Extraction Train A Process Flow Diagram by CH2M HILL;
5. Dwg. 600-PF-002, Area 600 Vanadium SX – Extraction Train B, Scrub and Strip Process Flow Diagram by CH2M HILL;
6. Dwg. 600-GA-001, Area 600 – General Arrangement Vanadium Oxidation and Solvent Extraction, Solvent Extraction Building – East Vanadium SX and Oxidation Plan by CH2M HILL;
7. Dwg. 600-GA-002, Area 600 – General Arrangement Vanadium Oxidation and Solvent Extraction, Solvent Extraction Building – East Vanadium SX Sections "A-A" and "B-B" by CH2M HILL; and
8. Dwg. 600-GA-003, Area 600 – General Arrangement Vanadium Oxidation and Solvent Extraction, Solvent Extraction Building – East Vanadium SX Sections "C-C" and "D-D" by CH2M HILL.

6.1 Vanadium Oxidation and Polishing Filters

6.1.1 Operating Procedures

After the uranium has been removed in the uranium SX circuit, the raffinate from that process is pumped to the vanadium SX circuit for extraction of vanadium. However, before the dissolved vanadium can be extracted from the solution, it must first be oxidized and re-filtered. The oxidation is performed in a series of five agitated tanks where sodium chlorate is added. Ammonia is also added in these tanks to increase the pH level slightly. After oxidation, the solution is filtered to remove suspended solids and pumped to the vanadium SX feed tank.

Vanadium Oxidation Tanks

Five oxidation tanks are located within the east end of the SX Building. Each of the tanks is equipped with a rubber-lined steel agitator. The tanks are set up so that the solution flows by gravity from Tank No. 1 through Tank No. 5. Tanks No. 1, 2 and 3 are 11-ft diameter by 10-ft high FRP tanks, each containing approximately 7,000 gallons of solution. These three tanks serve primarily as mix tanks as sodium chlorate and ammonia are added to each tank. Tanks No. 4 and 5 are much larger, 23-ft diameter by 23-ft high, FRP tanks with a nominal capacity of 70,000 gallons each. Although some ammonia is added in Tank No. 4, these larger tanks are sized primarily to provide sufficient retention time for the chemical reactions to complete.

Vanadium Polishing Filter Feed Tank

Downstream of Oxidation Tank No. 5, the solution flows into an adjacent storage tank of similar size, which feeds the Vanadium Polishing Filter. The feed tank is also FRP, but does not contain an agitator. A three-inch by four-inch stainless steel centrifugal pump feeds the polishing filter.

Vanadium Polishing Filter

The Vanadium Polishing Filter is adjacent and identical to the Uranium Polishing Filters. These cylinder-shaped, pressurized leaf filters are four to five feet in diameter by nine-ft long with a stainless steel shell and internals. The polishing filters contain 25 to 30 leaves, each fitted with a woven polypropylene filter cloth. The filter cloths are designed to remove particles down to three microns in size. The filters are precoated with DE to help prevent them from plugging. A one percent DE solution is also trickled into the filters to maintain their efficiency during the filtering process. When the solids build up on the filter screens, as evidenced by an increase in pressure, internal water (i.e., barren vanadium raffinate) sprays are activated to wash down the filters. The solids are collected in the area sump and then pumped to the tailings collection box. The Vanadium Polishing Filter receives its DE solutions from the same DE Mixing System utilized by the Uranium Polish Filters (refer to Section 4.1, Polishing Filters and Feed Tanks).

Vanadium SX Feed Tank

The filtered solution from the polishing filter flows into the vanadium SX feed tank. This 26-ft diameter by 20-ft high rubber-lined steel tank is located outside of the building (southeast corner). The tank provides buffering storage capacity between the filter circuit and the vanadium extraction circuit. Two, three-inch by four-inch stainless steel centrifugal pumps at this location feed the two trains of the vanadium SX circuit.

6.1.2 System Controls

The system controls within the oxidation, filtering, and feed tank areas are designed to identify and contain solution spills from piping and tanks. Mill personnel are required to wear respirators when adding the powdered DE to the DE Mixing Tank. Chemical reactions occur and heat is generated within the closed-topped oxidation tanks; however, no toxic emissions are produced by these reactions and the tanks are vented directly to the atmosphere.

Spill Prevention and Control

Both the SX Building concrete floor and the concrete pad containing the vanadium SX feed tank are curbed to contain any solution spills. The concrete curbing is designed to contain the volume of the largest tank in the area plus 10 percent. The polishing filter and DE mixing system are located between the vanadium oxidation tanks and the vanadium mixer settlers, and any spills in this area report to the area sump that pumps to the tailings collection box. The sump that serves the oxidation tank area, pumps back to Oxidation Tank No. 1. The feed tank has its own sump that pumps into the vanadium extraction circuit.

6.1.3 Maintenance

Most of the maintenance in this area of the mill consists of tightening or replacing packing seals on centrifugal pumps and periodically washing down the oxidation, filtering and DE mixing area. Tanks are inspected and relined, as necessary, during down times. Filter cloths are automatically washed down by a series of water sprays and then precoated with the DE solution as the cloths become plugged and pressure increases. The leaves and filter cloths are replaced once they began to show signs of deterioration (i.e., holes, weave separation or fraying).

6.2 Vanadium SX Circuit

6.2.1 Operating Procedures

The vanadium SX circuit is very similar to the uranium SX circuit. An organic solution, consisting primarily of kerosene with an amine extractant, is circulated counter current to the pregnant solution. The organic solution selectively removes the vanadium from the acid solution and concentrates it by two- to three-fold in the organic solution. The process starts by pumping the pregnant solution from the vanadium SX feed tank to the first of five vanadium mixer-settler tanks, and pumping the barren organic solution to the fifth mixer settler tank. The pregnant solution then advances from mixer-settler tanks No. 1 through No. 5 while the barren organic extracts the vanadium as it advances from mixer-settler tanks No. 5 through No. 1. The organic is less dense that the acid solution, so it separates from the aqueous solution within the settling portion of each tank and floats on top. The loaded organic is skimmed off the top of mixer-settler tank No. 1 while the acid solution, depleted of vanadium, is removed from the base of mixer-settler tank No. 5. The loaded organic is pumped to the Loaded Organic Tank and then to the vanadium scrub and strip circuit. The depleted acid solution flows into a raffinate settler for removal of residual organics and then is pumped to the tailings collection box and/or the evaporation ponds.

The vanadium SX circuit differs in some minor aspects from the uranium SX circuit. In the vanadium SX circuit, the pH is more critical to extraction operations and is measured in the

aqueous discharge of the first four mixer-settlers and controlled by sparging ammonia gas into the aqueous feed of these units. Sulfuric acid is added in the fifth mixer-settler to neutralize the barren organic returned from the strip circuit. The organic solution used in the vanadium circuit also contains higher concentrations of the amine extractant (i.e., approximately three percent of the organic solution as compared to one percent for the uranium SX circuit).

The vanadium SX circuit is also more susceptible to organic entrainment in the aqueous solution than the uranium SX circuit. An additional storage tank has been added to this circuit to allow the operator to temporarily store aqueous solution with high organic entrainment levels, which allows the organic additional time to separate from the aqueous phase.

Mixer-Settler Tanks, Raffinate Settler, and Raffinate Buffer Tank

There are two trains of mixer-settler tanks (Trains A and B), each containing five mixer-settlers and a raffinate settler. The trains are located within the east end of the SX Building. The tanks are constructed of acid- and organic-resistant materials (e.g., stainless steel) and are mounted on platforms with the pumps located underneath. In the first mixing compartment, the organic solution is fed into the bottom of the tank while the denser, vanadium-bearing acid solution is fed in above. After mixing, the solution passes through a baffle located near the top of the tank into a second mixing compartment where the process is repeated. The mixture then flows through a second baffle into the settling area where the organic containing the extracted vanadium separates and floats to the top while the depleted aqueous solution settles to the bottom. The 20-feet long by 10-feet wide by three- to four-ft deep settlers contain internal "picket fences" that slow the flows and allow greater time for separation of the aqueous and organic phases.

The raffinate settler is similar in size to the mixer settlers but does not contain mixing compartments. It is located downstream of the fifth mixer settler and is designed to remove the small amount of residual organic remaining in solution at that point. The presence of finely-sized bubbles in the aqueous solution coming from the settler is an indication of organic entrainment. To prevent excessive loss of the organic, solution with high levels of organic entrainment is pumped to the Raffinate Buffer Tank where the two phases are allowed to separate with the organic floating to the top of the aqueous solution. The organic material is then skimmed off and recycled to the Barren Organic Tank. Emulsified material, if present, reports to the crud centrifuge for further separation. The Raffinate Buffer Tank is constructed of rubber-lined carbon steel and is 26 feet in circumference by 26 feet high.

The mixer-settler system operates via gravity flow between tanks with the lighter organic phase flowing through a weir located at the top end of each tank while the denser aqueous phase flows out the bottom end of each tank. The loaded organic flows from mixer-settler tank No. 1 to a steel centrifugal pump located below the platform that pumps to the Loaded Organic Tank. Similarly, the barren organic that flows from the raffinate settler is pumped to the vanadium SX barren organic tank via a small hose pump. The aqueous underflow from the raffinate settler is pumped to the vanadium SX raffinate tank by a three-inch by four-inch stainless steel centrifugal pump mounted below the settler platform.

Vanadium SX Barren Organic Tank

The 24-ft diameter by 19-ft high FRP vanadium SX barren organic tank is located in the south-central portion of the SX Building. This closed-top tank receives barren organic from the

raffinate settlers and vanadium SX stripper-mixer-settlers (see Section 6.3, Vanadium Scrub and Strip). A small amount of makeup organic feed is also added to replenish the organic solution lost during the extraction process. Two, two-inch by three-inch stainless steel centrifugal pumps (primary and backup) transfer the barren organic to mixer-settler tank No. 5.

The barren organic consists of kerosene (carrier) plus amine (collector) and alcohol (phase control). The kerosene is stored in a large tank located outside and west of the SX Building while the amine and alcohol are stored in liquid totes or drums within the SX Building (see Section 8.4, Organics Storage Areas). Metering pumps feed the organics into a small (10-ft diameter by 10-ft high) makeup tank. This organic makeup tank, which is located between the uranium and vanadium barren organic tanks, provides makeup feed to both.

Vanadium SX Loaded Organic Tank

The vanadium SX loaded organic tank is identical in construction and size to the barren organic tank and is located next to the barren organic tank in the south-central portion of the SX Building. The tank receives loaded organic from the first mixer-settler in Trains A and B and provides buffering capacity between the vanadium extraction and vanadium scrub and strip circuit. Two, three-inch by four-inch stainless steel centrifugal pumps (primary and secondary) feed the scrub and strip circuit.

Vanadium SX Raffinate Tank

The vanadium SX raffinate tank is located next to the loaded organic tank. It is an 18-ft diameter by 18-ft high rubber-lined steel tank and receives the vanadium-depleted solution from the Train A and B raffinate settlers. The raffinate is either pumped to the evaporation ponds for disposal, or recycled to the tailings collection box and used to dilute the tailings for transport to the tailings cell. Additional information on the operation of the tailings cells and evaporation ponds is provided under Area 300, CCD Thickeners and Tailings Disposal. A primary and backup centrifugal stainless steel pump is available for each disposal/recycling option.

6.2.2 System Controls

System controls within the vanadium SX area focus on spill identification and control, and fire safety. The organics used in this portion of the mill present a fire danger, which is addressed through monitoring and fire suppression devices. Since the vanadium SX system is co-located with the uranium SX system, radiation monitoring in this area is identical to that specified for Area 400.

Spill Prevention and Control

The SX Building concrete floor is curbed to contain any solution spills. The concrete curbing is designed to contain the volume of the largest tank in the area plus 10 percent. The extraction area sump collects any spilled solution or wash-down water and returns it to the mixer-settler system. The tanks between circuits provide buffering capacity in the event that a portion of the system has to be temporarily shut down for any reason. Flow meters on pumps and solution level indicators in the tanks are also interlocked so that upstream processing shuts down in a programmed manner should a portion of the extraction system shut down or experience upset conditions.

Fire Alarm System and Controls

Given the flammable nature of the organics used in the extraction process, the SX Building is equipped with smoke and heat detectors that activate a water spray system, and fire extinguishers are present at key locations throughout the building. Any work task that could potentially generate a spark (e.g., welding, cutting with a torch) requires a Radiation Work Permit with strict controls and monitoring. Additionally, explosion-proof equipment and instrumentation is utilized in accordance with electrical code requirements.

6.2.3 Maintenance

Maintenance in the vanadium extraction area focuses on maintaining and repairing the various pumps (e.g., tightening or replacing packing seals on centrifugal pumps, replacing hoses and cams on hose pumps, and replacing worn metering pumps). All critical pumping systems are equipped with both a primary and backup pump so that repairs can be performed without shutting down extraction operations.

As with the uranium extraction circuit, the mixer-settler system can become gradually contaminated with suspended solids that form an emulsification between the aqueous and organic phases. If this occurs, the organic is drained off the raffinate settler and then the emulsified material (a.k.a., crud) is drained off and pumped to the crud centrifuge where the emulsification is separated into aqueous and organic phases (recycled) and suspended solids (wasted to the tailings area). If an upset condition occurs where a substantial amount of crud is formed, the aqueous solution containing the crud is pumped to the Raffinate Buffer Tank where the crud may be stored until it can be run through the crud centrifuge.

Tanks are periodically cleaned and inspected during down times. The tanks are very durable, constructed of materials resistant to acid and organics, and are not expected to require much maintenance. The stainless steel agitators and associated motors require replacement over time as they become worn.

6.3 Vanadium Scrub and Strip

6.3.1 Operating Procedures

In the vanadium scrub and strip circuit, vanadium is scrubbed in a mixer-settler with an acid solution and then stripped from the organic carrier in three stripper-mixer-settlers using a caustic sodium carbonate/sodium hydroxide solution. The vanadium is concentrated in the stripping solution by a ratio of approximately 25 to 1, which is the ratio of the flow rate for the loaded organic to that for the caustic solution. The stripped organic is pumped back to the barren organic tank for reuse in the extraction circuit while the loaded strip solution is pumped to the vanadium precipitation circuit.

Scrubber-Mixer-Settler

The loaded organic solution is pumped from the Loaded Organic Feed Tank to the Scrubber-Mixer-Settler, which is approximately 15-ft long by 8-ft wide by three- to four-ft deep. It is similar in configuration to the mixer-settlers with two agitation compartments and a settling basin. A small volume of raw water and sulfuric acid is added in the first mixing compartment to scrub the organic of entrained base metals prior to stripping. The acid is removed from the bottom of the settling tank and pumped back to the mixer-settler circuit by a small hose pump,

while the scrubbed organic overflows from the settling tank into the first of three stripper-mixer-settlers.

Stripper-Mixer-Settlers

There are three stripper-mixer-settlers, which are identical in construction and size to the scrubber-mixer-settler described above. The only difference being their application.

The sodium carbonate/sodium hydroxide solution, with a pH between 11 and 12 standard units, is pumped from storage tanks (see Section 8.0, Area 800 – Reagents) to the third of the three stripper-mixer-settlers. The concentrated sodium carbonate solution mixes with the organic overflow from the second mixer settler and the two phases then separate in the settling basin. This separation process strips vanadium from the organic solution. The partially loaded strip solution at the bottom of the settling tank flows to the second stripper-mixer-settler while the barren organic is pumped to the barren organic tank by a two-inch by three-inch stainless steel centrifugal pump.

In the second stripper-mixer settler, the mixing and stripping process is repeated with the strip solution advancing to the first stripper-mixer settler and the organic solution advancing to the third stripper-mixer settler. In the first stripper-mixer settler, the strip solution is mixed with the organic solution from the Loaded Organic Feed Tank and becomes fully loaded. The pregnant solution is then pumped to the vanadium precipitation feed tank while the partially depleted organic solution overflows to the second stripper-mixer settler.

6.3.2 System Controls

System controls within the scrubber-stripper circuit include spill identification and control, and fire safety. Radiation monitoring is identical to that specified for the uranium SX circuit.

Spill Prevention and Control

The SX Building concrete floor is curbed to contain solution spills. The concrete curbing is designed to contain the volume of the largest tank in the area plus 10 percent. The stripping area sump collects any spilled solution or wash-down water and returns it to the stripper-mixer-settler system. The feed from the loaded organic tank is equipped with automatic shutoffs to prevent large spills in the event that the stripping system shuts down or tanks overflow due to plugging.

Fire Alarm System and Controls

Given the flammable nature of the organics present in the stripping process, the SX Building is equipped with smoke and heat detectors, which activate a water spray system, and fire extinguishers are present at key locations throughout the building. Any work task that could potentially generate a spark (e.g., welding, cutting with a torch) requires a Radiation Work Permit with strict controls and monitoring. Additionally, explosion-proof equipment and instrumentation is utilized in accordance with electrical code requirements.

6.3.3 Maintenance

Maintenance in the vanadium scrub and strip area focuses on maintaining and repairing the various pumps (i.e., replacing packing seals on the organic recycle pump and replacing hoses and cams on the two hose pumps). The pumps within the vanadium strip circuit are small and

do not require backup units. Tanks are periodically cleaned and inspected during down times. The stainless steel agitators and associated motors are routinely inspected and replaced as they become worn.

7.0 Area 700 – Vanadium Precipitation

Area 700 is the vanadium precipitation circuit, which includes the vanadium precipitation tanks, and the filtering, drying, and packaging systems. The vanadium precipitation circuit is located in the Precipitation and Packaging Building. Figure 7-1, Area 700 – Vanadium Precipitation, shows the general layout and locations of these facilities.

In the vanadium precipitation circuit, ammonium sulfate is added to the vanadium strip solution to precipitate vanadium out as ammonium metavanadate. This precipitate is then pumped to a belt filter for water removal and cleaning. The wet filter cake is passed through a vanadium steam dryer, rotary kiln and fusion furnace. The vanadium oxide melt from the furnace is cooled and solidified into a black-flake product, which is packaged in drums for temporary storage prior to shipment off site.

Applicable design documents and drawings include:

1. Energy Fuels Resources Corp., Piñon Ridge Project, Process Control Philosophy, by CH2M HILL;
2. Energy Fuels Resources Corp., Piñon Ridge Project, Process Design Criteria, by CH2M HILL;
3. Energy Fuels Resources Corp. Piñon Ridge Project Mechanical Equipment List, pgs. 7 and 8 by CH2M HILL;
4. Dwg. 700-PF-001, Area 700 Vanadium Precipitation, Process Flow Diagram by CH2M HILL;
5. Dwg. 700-PF-002, Area 700 Vanadium Drying and Packaging, Process Flow Diagram by CH2M HILL;
6. Dwg. 700-GA-003, Area 700 – General Arrangement Precipitation and Packaging Building, Drying and Packaging Area Plans by CH2M HILL;
7. Dwg. 700-GA-004, Area 700 – General Arrangement Precipitation and Packaging Building, Drying and Packaging Area Section "A-A" by CH2M HILL; and
8. Dwg. 700-GA-005, Area 700 – General Arrangement Precipitation and Packaging Building, Precipitation and Thickening Area Section "B-B" by CH2M HILL.

7.1 Vanadium Precipitation Tanks

7.1.1 Operating Procedures

Loaded vanadium strip solution is pumped to the vanadium precipitation tanks in the Precipitation and Packaging Building. The solution is heated in the tanks with steam and ammonia is added to raise the pH level. The solution is then placed in one of four separate batch precipitation tanks where ammonium sulfate is added and ammonium metavanadate precipitates out as the solution cools under mild agitation.

Vanadium Precipitation Feed Tank

The eight-ft diameter by 12-ft high vanadium precipitation feed tank provides buffering capacity between the SX strip circuit and the precipitation circuit. It is located in the southwest corner of the first floor of the Precipitation and Packaging Building and is constructed of FRP, as the loaded strip solution is not corrosive (pH = 9.2). A 1.5-inch hose pump feeds Tank No. 1.

Vanadium Precipitation Tank No. 1

Tank No. 1, which serves primarily as a mix tank, is an eight-ft diameter by 10-ft high FRP tank located next to the feed tank. Ammonia is sparged into the tank to raise the pH from 9.2 to 10.8 standard units and steam is added to raise the temperature from ambient levels to 149°F. A rubber-coated steel agitator provides mixing and a 1.5-inch hose pump feeds the solution to Tanks No. 2, 3, or 4, which are located above Tank No. 1 at the top of the building.

Vanadium Precipitation Tanks No. 2 – No. 5

Precipitation Tanks No. 2 through No. 5, which are located on the upper floor, are FRP tanks equipped with rubber-coated steel agitators. Tanks No. 2, 3, and 4 are the primary precipitation tanks while Tank No. 5 is a spare. Each of the primary tanks serves as a batch precipitation unit into which ammonium sulfate solution is added under very slow agitation. The precipitate takes approximately 48 hours to fully form; after which, the remaining solution is decanted and the precipitate is discharged directly onto a belt filter. The decanted solution is pumped back to the process water storage tank on the first floor.

If precipitation does not occur properly in a precipitation tank, the contents of that particular tank are transferred to Tank No. 5 for additional conditioning and precipitation. This spare tank is provided because vanadium precipitation is sensitive to small changes in physical and chemical properties and can be disrupted relatively easily.

7.1.2 System Controls

System controls within the vanadium precipitation circuit include air emission controls and spill prevention and control.

Air Emission Controls

All tanks in the vanadium precipitation circuit are enclosed at the top. Tanks No. 1 through No. 5 are vented to a packed-bed wet scrubber to remove the ammonia fumes and cool the air prior to venting. This system, which is located on the first floor near the center of the building, provides 99 percent removal efficiency for particle sizes down to five microns. The scrubber water supply is provided from the pre-leach clarifier. The water that collects in the base of the scrubber is pumped to the pre-leach thickener.

Spill Prevention and Control

The Precipitation and Packaging building concrete floor is curbed to contain solution spills. The concrete curbing is designed to contain the volume of the largest tank in the area plus 10 percent. The vanadium precipitation area sump collects any spilled solution or wash-down water and returns it to Tank No. 5. Since all of the precipitation tanks have closed tops, spills are more likely to occur during the subsequent filtering process.

7.1.3 Maintenance

The hose pumps within the precipitation circuit are small and do not require backup units; hoses and cams are replaced as they become worn. The rubber-lined steel agitators and associated motors are routinely inspected and the motors greased. Tanks are periodically cleaned and inspected during down times.

7.2 Vanadium Filtering and Drying

7.2.1 Operating Procedures

Vanadium Belt Filter and Wet Cake Conveyor

The precipitate from the precipitation tanks is inspected by the operator as it is discharged from the bottom of each tank. This inspection is performed from an enclosed observation corridor located between the precipitation tanks and the belt filter. If the precipitate has crystallized properly, it is pumped to the belt filter for water removal and cleaning. If the precipitate is poorly formed, the operator redirects the pumped solution to Tank No. 5 for additional conditioning.

The belt filter removes additional water from the vanadium precipitate using a vacuum filtering system and washes contaminants out of the produced filter cake using a series of water sprays. The belt filter is approximately 30-ft long by eight-feet wide and consists of a synthetic filter cloth placed over a grooved rubber belt. The liquid portion of the underflow is pulled through the filter cloth by a vacuum and directed via a filtrate manifold to a receiver. The vacuum is created by an electrically-powered vacuum pump. The excess liquid that collects in the receiver is pumped to the process water storage tank for reuse. A second receiver and seal tank is included in the system to equilibrate water pressures. The air from the vacuum system is scrubbed in a Venturi scrubber before being vented to the atmosphere.

The filter cake, containing approximately 24 percent moisture, drops through a chute at the discharge end of the belt filter into the wet cake conveyor. This conveyor is an enclosed four-inch diameter steel screw conveyor. The rotating screw transfers the wet filter cake from the belt filter into the vanadium dryer.

Vanadium Dryer and Dry Cake Conveyor

The vanadium dryer consists of a U-shaped steel trough with a screw-type shaft that advances the cake through the dryer. It is approximately 30-ft long by four-ft wide by four-ft high and is powered by a 75-Hp motor. The dryer jacket is heated with steam, which raises the temperature of the cake to 248°F and evaporates most of its remaining moisture. The heated air is drawn through a baghouse and then through a scrubber to remove dust particles prior to venting to the atmosphere. The vanadium cake, now containing approximately three percent moisture by weight, is transferred to rotary kiln feed hopper via a four-inch diameter steel screw conveyor. Both the dryer and conveyor are completely enclosed.

Rotary Kiln Feed Hopper and Conveyor

The four-ft diameter by four-ft high steel feed hopper provides buffering capacity between the steam dryer and rotary kiln. The hopper feeds the kiln through a four-inch diameter steel screw conveyor.

Rotary Kiln and Granular Conveyor

The 30-ft long by 30-inch diameter rotary kiln is constructed of stainless steel. The cake is fed in at one end of the kiln and gradually moves to the other end as the kiln rotates. The kiln is indirectly heated with propane to a temperature of 698°F, which removes the remaining three percent moisture and ammonia in the cake, creating a granular vanadium oxide product. This dry, granular material is then conveyed to the fusion furnace via a four-inch diameter screw conveyor. The kiln and conveyor are completely enclosed.

7.2.2 System Controls

System controls within the vanadium filtering and drying systems focus on controlling air emissions (mainly ammonia fumes), and preventing and cleaning up spills. Each of these systems is discussed in more detail below.

Air Emissions

Two sets of scrubbers are located in the Precipitation and Packaging Building. The first scrubber is a packed bed wet scrubber and the second is a wet Venturi scrubber. The gas emissions from the steam dryer and rotary kiln along with the vacuum flow from the belt filter are all directed to the packed bed wet scrubber. The emissions from the dryer are first vented through a baghouse before entering the scrubber. As mentioned previously, the emissions from the vanadium precipitation tanks are also vented to this scrubber.

Spill Prevention and Control

In the filtering and drying portion of the vanadium circuit, the precipitate is reduced from 60 percent moisture by weight to three percent moisture by weight. At the beginning of this process, the material is in a slurry form and could be spilled or released at the belt filter, especially if a poorly crystallized batch is run through the system. Spill prevention in this area focuses on maintaining the containment skirts of the belt filters in good condition so that the slurry does not leak through cracks or punctures. In the event of a spill at the belt filter, the spilled slurry is directed to the vanadium packaging area sump pump using pressurized wash water. The entire area is enclosed with a concrete curb designed to contain the contents of the largest tank (i.e., one of the precipitation tanks feeding the belt filter).

After filtering, the vanadium cake is in a solid form and the primary concern becomes plugging of the conveyors, chutes and hoppers. To minimize this possibly, the moisture content of the cake is closely monitored and all the material in the system is processed and packaged prior to completing a batch run (i.e., vanadium cake is not normally stored in the system between batch runs). In the event of a plug, the unit is opened and cleaned. Pressurized water sprays can be used early in the process when the cake is still wet; however, after most of the moisture is removed, use of a rod may be necessary to physically remove the accumulated solids. Personnel are required to wear appropriate PPE during cleaning operations, which includes air-purifying respirators in dusty areas.

7.2.3 Maintenance

Routine maintenance of the filtering and drying system includes greasing motors and bearings, and checking and changing hydraulic fluid in the gearboxes. The belt filter is washed down and inspected for cracks or tears in the shroud, belt, wear belts, and filter cloth. The vacuum

box collects fines during operation and must be periodically cleaned to maintain adequate vacuum. The screw conveyors, feed hopper, steam dryer, and rotary kiln are also periodically opened, inspected, and cleaned. Sumps are cleaned, as needed, and any cracks in the floor sump, floor or enclosure wall are repaired.

7.3 Vanadium Fusion and Packaging

7.3.1 Operating Procedures

The granular vanadium oxide produced by the rotary kiln is melted in the fusion furnace. The furnace discharges to a casting water wheel where the vanadium oxide melt is solidified into a fused black-flake product. A bucket conveyor then moves the product to a hopper and packaging system where the black-flake is packed, weighed, and sealed for shipment in 55-gallon drums.

Fusion Furnace

The granular vanadium oxide is conveyed from the rotary kiln to the 5-ft diameter by 10-ft long fusion furnace. The direct-fired furnace is lined with refractory brick and heated to a temperature of 1,472°F, which causes the product to melt. The molten metal is then discharged to a casting wheel.

Casting Water Wheel

The casting wheel is a 10- to 12-ft diameter horizontal steel plate that rotates on a vertical shaft. The upper surface of the wheel is continually wetted by flowing water as the wheel turns. The molten metal from the furnace is dripped onto the wheel where it cools instantly into a black flake ribbon. The unit has a roller breaker that reduces the ribbon flakes to the appropriate size for shipment. A scraper continuously removes the broken flake product from the wheel into a bin. A suspended hood above the wheel vents gas emissions to the Venturi scrubber.

Bucket Conveyor

An enclosed vertical bucket conveyor moves the black flake from the bin to the feed hopper and packaging system. The conveyor consists of a series of steel buckets that are fixed to a rotating roller chain. As each bucket descends into the bin, it scoops up the black flake material. The buckets remain in a carrying position until they reach the apex of the conveyor system, at which point they tip and discharge into the feed hopper.

Feed Hopper/Packaging System

The black flake feed hopper is a small steel bin with a packaging system at its base. The packaging system includes a vibrating feeder and a sealed hood that fits tightly over the top of each drum as it is filled. The packaging system is calibrated by weight via a belt scale (approximately 570 pounds of black flake per drum) so that the precise quantity of black flake needed to fill a 55-gallon drum is metered out by the vibrating feeder. The hood is also equipped with a level probe that allows the operator to monitor the height of the product in the drum while the hood is down. The hood and feed hopper are vented to the Venturi scrubber. After a drum is filled, the packaging operator collects a sample of the black flake for lab analyses and then seals the top of the drum with a USDOT-approved lid and clamping ring. The operator also wipes or washes down the outside of each drum after sealing to remove any

fine dust that may have collected on the surface and attaches a label containing a unique identification number, gross weight, and other pertinent information.

Roller Conveyor and Drum Storage Areas

A roller conveyor is used to move empty drums from the Empty Drum Storage Area to the feed hopper/packaging system and filled drums from the packaging area to the Packaged Drum Storage Area. The on-and-off controls for the system are operated by the packaging operator. Empty drums are manually placed on the conveyor at the Empty Drum Storage Area. Filled drums, weighing close to 600 pounds each, are removed from the end of the conveyor and placed in storage using a forklift.

7.3.2 System Controls

System controls within the vanadium fusion and packaging area are designed to control gas vapors and dust, and to prevent spills. Most equipment in this area is automated for security reasons and to reduce the potential for inhalation of vanadium dust by the packaging operators.

Vapor and Dust Control

The furnace, casting wheel, and packaging hood are all vented to the Venturi scrubber, which is one of two scrubbers located on the main floor of the vanadium portion of the building. The scrubber utilizes water from the belt filter receivers for its spray system. The sprayed water is then collected in the bottom of the scrubber and pumped back to form part of the makeup water for the belt filter.

Spill Prevention and Control

The fusion furnace and bucket conveyor are enclosed systems with little potential for spills. The casting-water wheel, bins and hoppers, and the drum packaging system have greater potential for spills. Packaging operators are trained to properly operate and monitor these systems so that they are not overloaded. Systems are also interlocked and shut down in an orderly fashion if a downstream component shuts down. In the event of a spill, the spilled black flake is lightly wetted and swept up using hand tools. The spill area is hosed down with the wash water directed to the Packaging Area Sump. Operators are required to wear coveralls, gloves, air-purifying respirators and other appropriate PPE during packaging operations and during any cleanup of spilled material.

7.3.3 Maintenance

Routine maintenance of the drying and packaging system includes greasing motors, checking and changing hydraulic fluid in the gearboxes, inspecting and replacing roller chains and drive belts, and visually inspecting all components for proper operation. The dryer and packaging areas are thoroughly hosed down after each operating shift to remove any accumulated dust.

The system components are opened, cleaned out, and inspected periodically. If a system component requires repair, the component is washed as it is disassembled. Sumps are cleaned, as needed, and any cracks in the floor sump, floor or enclosure wall are repaired.

8.0 Area 800 – Reagents

Area 800 facilities consist of the chemical reagent handling and storage systems as generally described in Section 8.1 below. Figure 8-1, Area 800 – Reagents, shows the general layout and locations of these facilities.

Applicable design documents and drawings include:

1. Energy Fuels Resources Corp., Piñon Ridge Project, Process Control Philosophy, by CH2M HILL;
2. Energy Fuels Resources Corp., Piñon Ridge Project, Process Design Criteria, by CH2M HILL;
3. Energy Fuels Resources Corp. Piñon Ridge Project Mechanical Equipment List, pgs. 8 and 9 by CH2M HILL;
4. Dwg. 800-PF-001, Area 800 – Sulfuric Acid, Ammonia and Ammonia Sulfate, Process Flow Diagram by CH2M HILL;
5. Dwg. 800-PF-002, Area 800 – Sodium Hydroxide and Sodium Carbonate, Process Flow Diagram by CH2M HILL;
6. Dwg. 800-PF-003, Area 800 – Flocculent and Organics, Process Flow Diagram by CH2M HILL;
7. Dwg. 800-PF-004, Area 800 – Sodium Chlorate and Hydrogen Peroxide, Process Flow Diagram by CH2M HILL;
8. Dwg. 000-GA-003, Area 000 – General Arrangement, General Plant Area, Process Plant Area, Process Plant Area Site Plan by CH2M HILL;
9. Dwg. 800-GA-001, Area 800 – General Arrangement, Reagents Unloading, Unloading Building Plan by CH2M HILL; and
10. Dwg. 800-GA-002, Area 800 – General Arrangement, Reagents Unloading and Storage Outside Bulk Storage Tanks Plans by CH2M HILL.

8.1 General Overview

During operations, varieties of reagents are used in the uranium and vanadium recovery processes. Licensed haulers deliver the reagents to the site in semi-trailer and tanker trucks using approved USDOT containers, with the majority of deliveries occurring during daylight hours. The reagents are stored on site in prepackaged totes, barrels, and bulk bags within weatherproof buildings and/or in closed bulk storage tanks. Containers are properly labeled with both the name of the product and safety placards that meet the requirements outlined in the USDOT Emergency Response Guidebook. The containers are chemically and physically compatible with the media stored and meet applicable local, state and federal storage regulations, including secondary containment.

Some of the process reagents are delivered to the site ready for use, while others require dilution, mixing, or other onsite preparation prior to use. Energy Fuels employees and

contractors are trained in proper handling, storage and use of the reagents consumed on site. Unloading and handling procedures require the use of proper PPE. Material Safety Data Sheets ("MSDS") for all reagents, appropriate first aid equipment, and dedicated safety shower/eyewash stations are provided where the reagents are used and stored.

The storage and use of these products, including procedures for emergency response, cleanup of spills, and spill reporting are defined in Energy Fuels safety policies and in the Facility's Material Containment and Spill Prevention Control and Countermeasure ("MC/SPCC") Plan. Reagent storage capacity is designed for a two-week supply, unless otherwise noted.

The primary reagents required in the uranium and vanadium leaching and extraction processing are listed in Table 8-1, Primary Reagents. For discussion purposes, the reagents are categorized into tank storage, organic storage, and other storage.

Table 8-1
Primary Reagents

Tank Storage	Organic Storage	Other Storage
Sulfuric Acid	Kerosene	Sodium Hydroxide
Ammonia	Amine	Flocculent Polymer
Ammonia Sulfate	Isodecanol	Diatomaceous Earth
Sodium Chlorate		
Sodium Carbonate		
Hydrogen Peroxide		

With the exception of ammonia, reagents are offloaded at the Reagent Unloading Area, located on the south side of the mill. Ammonia is offloaded directly from a tanker truck into the onsite storage vessel located west of the Solvent Extraction Building. Both the Reagent Unloading Area and the ammonia storage tank are located outside of the restricted area (i.e., Mill License Boundary) so that delivery trucks are not exposed to mill process areas.

8.1.1 System Controls

The handling and storage systems for each chemical reagent use similar controls to provide safe containment and to prevent and control spillage. Primary controls are listed below:

- Tanks, piping and equipment are constructed of materials resistant to the chemicals being handled and stored;
- Pipelines conveying reagents from the Reagent Unloading Area to the storage vessels and from the storage vessels to the points-of-use in the process are supported on an aboveground pipe rack;
- Concrete secondary containment with a floor sump and sump pump is provided at unloading and storage areas;
- Reagent pipelines, which extend outside of concrete secondary containment areas, are double contained via pipe-in-pipe systems; and

- Reagent storage, mixing and feed tanks are equipped with automatic level indicators to prevent overfilling, whereby sensors activate audible (siren) and visual (flashing light) alarms when solution volumes reach predetermined levels.

8.1.2 Maintenance

Routine maintenance at the reagent unloading and storage areas includes performing preventative maintenance on pumps and conducting visual inspections of tanks, piping, pumps, valves, gauges and other equipment for signs of corrosion and leakage. Concrete containment areas are also routinely inspected for cracks and spalling. The sumps within the concrete containments are cleaned, as needed, and any cracks in the concrete containment pads, floors, aprons, walls, curbs and sumps are repaired and sealed.

8.2 Reagent Unloading and Warehouse Area

8.2.1 Operating Procedures

Bulk shipments of reagents received in liquid form (e.g., sulfuric acid, sodium chlorate, hydrogen peroxide, and kerosene) and in dry form (e.g., ammonia sulfate and sodium carbonate) are offloaded from tanker trucks at the Reagent Unloading Area via hose connections, and pumped/blown into mixing and/or storage tanks located within various areas of the mill. Reagents delivered in prepackaged totes, barrels and bulk bags are offloaded at the Reagent Storage Area and subsequently moved to the warehouse for storage or directly to the area of the mill where they are used.

8.2.2 System Controls and Maintenance

System controls within the Reagent Unloading and Warehouse Area focus on the safe unloading of chemical reagents, and preventing and containing spillage during offloading activities. Trucks delivering reagents to the Reagent Unloading Area park on a 75-ft long by 60-ft wide concrete apron. The concrete apron is curbed and has a floor sump to collect and contain any spills that may occur during offloading activities. Minor spills collected in the sump are pumped to the tailings storage facility. In the event of a major spill of a reagent, mill operations and health and safety personnel are to evaluate the spilled material for (1) potential use in the mill, (2) offsite shipment and recycling, and/or (3) appropriate disposal. Reagents received at the Reagent Unloading Area are unloaded one at a time.

Prepackaged reagents stored in the warehouse (e.g., amine, isodecanol, sodium hydroxide, diatomaceous earth and flocculent) are kept within a heated, dry area with curbed, concrete containment. Additional system controls utilized at the Reagent Unloading and Warehouse Area, common to each reagent handling and storage system, are listed in Section 8.1.1 above. Routine maintenance activities are described in Section 8.1.2 above.

8.3 Tank Storage Areas

8.3.1 Operating Procedures

Tank storage of inorganic reagents includes sulfuric acid, ammonia, ammonia sulfate, sodium chlorate, sodium carbonate, and hydrogen peroxide. The storage facilities and procedures for

each of these reagents are summarized below. Additional storage and containment details are provided in the MC/SPCC Plan.

Sulfuric Acid Storage Area

Sulfuric acid ("H_2SO_4"), 93 percent by weight, is received via tanker truck, unloaded at the Reagent Unloading Area and pumped to two 129,000-gallon carbon steel tanks located outside of the restricted area (i.e., Mill License Boundary) at the southeast corner of the process facility. The 28-ft diameter by 28-ft tall vertical tanks provide an approximate two-week storage capacity for a 500 tpd processing rate. The majority (95 percent) of the sulfuric acid is used in the leach circuit, with small amounts used in the uranium and vanadium scrubbers and vanadium mixers and settlers.

Ammonia Storage Area

Ammonia ("NH_3") is received in liquid form via tanker truck and offloaded directly into the onsite storage tank located west of the SX Building, outside of the restricted area (i.e., Mill License Boundary), at the northwest corner of the process facility. Trucks delivering ammonia to the Ammonia Storage Area park on a concrete apron. The concrete apron is curbed and drains to the concrete containment provided for the ammonia storage tank. The ammonia storage tank is a carbon steel, stationary pressure tank (horizontal cylinder) with a 12,000-gallon capacity. The tank is located outside and situated within concrete containment (reinforced concrete pad and walls), which also serves to protect the tank from vehicular traffic. The ammonia is transferred from the tanker truck to the storage tank via pumping.

Ammonia Sulfate Storage Area

Ammonium sulfate ["$(NH_4)_2SO_4$"] is received in dry powder form via tanker truck and offloaded at the Reagent Unloading Area. The ammonium sulfate is blown (via compressed air) from the tanker truck to a storage hopper and then conveyed to a solution tank equipped with an agitator, where it is dissolved in water. The storage hopper is a 6,280 cubic feet (20-ft diameter by 20-ft high) enclosed steel tank with a cone bottom and is located outside, along the south wall of the Precipitation and Packaging Building. The hopper is situated within a concrete containment and is equipped with an internal baghouse that returns the collected dust back to the hopper. A screw conveyor transfers ammonium sulfate from the storage hopper to the solution tank. The solution tank is an 11,800-gallon (12-ft diameter by 14-ft high) steel tank located inside the Precipitation and Packaging Building, and provides an approximate two-week storage capacity. A small stream of ammonium sulfate (i.e., approximately one gpm) is vaporized and transferred as a gas to the vanadium precipitation tanks located on the upper level of the Precipitation and Packaging Building.

Sodium Chlorate Storage Area

Sodium chlorate ("$NaClO_3$") is received in liquid form (50 percent, by weight, solution) via tanker truck and offloaded at the Reagent Unloading Area. The reagent is pumped to a mix tank where it is diluted with water (to 39 percent, by weight, solution) and then pumped to a storage tank. The mix tank is a 14-ft diameter by 16-ft high, FRP tank with a capacity of 18,400 gallons. The storage tank is a 24-ft diameter by 29-ft high FRP tank with a capacity of 98,100 gallons. Both the storage and mix tanks are located outside of the Precipitation and Packaging Building along its south wall and are situated within a common concrete containment.

Sodium chlorate is pumped from the storage tank to the leach tanks located in the Grinding and Leach Building where it serves as a catalyst to speed up the leaching process, and to the vanadium oxidation tanks located in the Precipitation and Packaging Building. The reagent is consumed at the rate of approximately one to two gpm, and the storage tank provides an approximate two-week storage capacity.

Sodium Carbonate Storage Area

Sodium carbonate ("Na_2CO_3") is delivered in dry form via tanker truck and offloaded at the Reagent Unloading Area using a water eductor to create a slurry (i.e., 31 percent, by weight, liquid). The slurry is pumped to a slurry storage tank, which is a 15-ft diameter by 20-ft high, steel tank with a capacity of 26,400 gallons. The slurry is further diluted with water (to a 15 percent, by weight, solution) and stored in a dilute sodium carbonate storage tank (mix tank). The dilute solution storage tank is a 12-ft diameter by 18-ft high steel tank with a capacity of 15,200 gallons. Both tanks are located outside, at the southeast corner of the Precipitation and Packaging Building, and situated within a common concrete containment.

Sodium carbonate is pumped from the dilute solution storage tank to the uranium and vanadium SX stripper mixer settlers located in the SX Building. The reagent is consumed at the rate of approximately 1.5 to 2.5 gpm, and the storage tank system provides an approximate one-week storage capacity.

Hydrogen Peroxide Storage Area

Hydrogen Peroxide ("H_2O_2") is offloaded at the Reagent Unloading Area and transferred to a storage tank located inside the Precipitation and Packaging Building using a stainless steel centrifugal pump. The storage tank is a 9-ft diameter by 15-ft high, stainless steel tank with a capacity of 7,100 gallons, which provides an approximate 7-week supply. The storage tank and two feed pumps share a containment sump with the return water and process water storage tanks. Hydrogen Peroxide is pumped from the storage tank to the uranium precipitation tanks also located in the Precipitation and Packaging Building.

8.3.2 System Controls and Maintenance

System controls at the bulk storage tank areas focus on the safe unloading of the reagents, and preventing and containing spillage during handling activities. The tanks are equipped with level indicators, alarm systems, automatic interlocks, or similar systems that are designed to prevent overfilling of tanks. The storage tanks and feed pumps are located within concrete containment (i.e., curbed, reinforced concrete floor or pad) that is designed to contain the contents of the largest tank within the containment plus 10 percent. The secondary containment is equipped with a floor sump and sump pump (either permanent or portable). Permanent sump pumps are valved to allow pumping of any spillage or accumulated precipitation to the tailings sump or a point of use within the mill. The permanent sump pumps can also be equipped with a float valve that automatically activates the pump when liquid levels reach a specified height in the sump. Additional system controls utilized at the tank storage areas, which are common to each reagent handling and storage system, are listed in Section 8.1.1 above. Routine maintenance activities are described in Section 8.1.2 above.

8.4 Organics Storage Areas

8.4.1 Operating Procedures

Organic reagents used in the uranium and vanadium recovery processes include kerosene ("$C_{14}H_{30}$"), amine ["Alamine 336 (R_3N)"] and isodecanol ["Exxal 13($C_{10}H_{22}O$)"]. These three reagents serve as transporting agents (kerosene) and collector agents (amine and isodecanol) in the uranium and vanadium SX process circuits located within the SX Building.

Kerosene Storage Area

Kerosene is offloaded at the Reagent Unloading Area and pumped to an 18-ft diameter by 20-ft high carbon steel storage tank with a capacity of 38,100 gallons. The kerosene storage tank is located outside of the restricted area (i.e., Mill License Boundary) on the west side of the SX Building near the Ammonia Storage Area and is situated within concrete containment. Kerosene is pumped from the storage tank to a 10-ft diameter by 10-ft high, 5,900-gallon carbon steel organic make-up tank located in the SX Building.

Amine and Isodecanol Storage Areas

Amine and isodecanol are received in 275-gallon Intermediate Bulk Container ("IBC") totes (isodecanol may also be received in 55-gallon drums). The totes are offloaded and stored at the warehouse, with approximately four totes (1,100 gallons) of each reagent stored on site at any one time. One or two totes of each reagent are kept at the point-of-use (i.e., the organic make-up tank located in the SX Building).

Organic Make-Up Tank

The three organic reagents (kerosene, amine, and isodecanol) are mixed together in the organic make-up tank and pumped to the uranium and vanadium barren organic tanks for use in the SX process circuits. The 10-ft diameter by 10-ft high organic make-up tank is located between the uranium and vanadium barren organic tanks within the SX Building. See Section 4.2, Uranium SX Circuit, and Section 6.2, Vanadium SX Circuit, for additional details.

8.4.2 System Controls and Maintenance

System controls at the organic reagents storage areas focus on the safe unloading of kerosene, amine, and isodecanol, preventing and containing spillage during handling activities, and fire safety. The kerosene storage tank is located within a concrete containment (i.e., reinforced concrete pad and walls) sized to contain the storage tank volume plus 10 percent. The pump that feeds the kerosene from the storage tank to the organic make up tank is also located within the concrete containment. Any leakage from the tank or pump is collected in the containment and returned to the storage tank via a portable pump. The IBC totes are heavy-duty plastic containers within protective steel cages and bottom pallets. Additionally, the totes are equipped with built-in valves for easy and safe dispensing.

Because of their flammability, processing and maintenance personnel are trained to avoid creating any type of spark or flame when working in the vicinity of stored organic materials. Fire extinguishers are available at each storage location and fire hydrants are located in close proximity in the event of a fire or explosion. Storage locations within the SX Building are also protected by a water spray system that is activated by smoke and heat detectors.

Additional system controls utilized at the organic reagents storage areas, common to each reagent handling and storage system, are listed in Section 8.1.1 above. Routine maintenance activities are described in Section 8.1.2 above.

8.5 Other Reagent Storage Areas

8.5.1 Operating Procedures

Other reagents used in the uranium and vanadium recovery processes include sodium hydroxide, flocculent polymer, and diatomaceous earth. Sodium hydroxide is used in the vanadium SX circuit; flocculent is used primarily in the pre-leach and CCD thickeners, and to a lesser extent, in the uranium thickener; and DE is used in the uranium and vanadium SX circuit.

Sodium Hydroxide Storage Areas

Sodium hydroxide ("NaOH") is delivered in 275-gallon totes, which are offloaded at the Reagent Storage Area and subsequently moved to the warehouse for storage within a heated, dry area with curbed concrete containment. The totes are also moved via a forklift and stored at the point-of-use (i.e., the dilute sodium hydroxide storage tank located inside the SX Building). The reagent is pumped from the totes to the tank and diluted with raw water (to an eight percent, by weight, solution) prior to being fed to the vanadium stripper mixer settlers, where it is used to control pH levels. The tank is an eight-ft diameter by 12-ft high vertical steel tank with a capacity of 4,500 gallons.

Flocculent Storage Areas

Flocculent is received in bulk bags, Flexible Intermediate Bulk Containers ("FIBC") Super Sacks, which are offloaded at the Reagent Storage Area and subsequently moved to the warehouse for storage within a heated, dry area with curbed concrete containment. Bags of flocculent are also stored at the point-of-use (i.e., the flocculent mix and storage tanks located in the Grinding and Leach Building). The flocculent system consists of a steel feed hopper, a 7.5-ft diameter by 9.5-ft high FRP storage tank with a capacity of 3,000 gallons, and a 7.5-ft diameter by 8-ft high FRP mix tank with a capacity of 2,500 gallons. Bags of flocculent are emptied into a feed hopper and blown into the mix tank for mixing with water. The flocculent solution is then pumped to the storage tank, from which it is fed to the pre-leach and CCD thickeners and the uranium thickener.

Diatomaceous Earth Storage Areas

Diatomaceous earth ("DE") is also received in Super Sacks, which are offloaded at the Reagent Storage Area and subsequently moved to the warehouse for storage within a heated, dry area with curbed concrete containment. Bags of DE are also stored at the point-of-use (i.e., the SX Building). The bags are emptied into a 7-ft diameter by 8-ft high, 2,300-gallon FRP preparation tank, where the DE is mixed with vanadium raffinate and then pumped to a feed tank and used to pre-coat the uranium and vanadium polishing filters.

8.5.2 System Controls and Maintenance

System controls at sodium hydroxide storage areas focus on the safe unloading of the reagent, and preventing and containing spillage during handling activities. The storage tank and totes in use are located within curbed, concrete containment draining to a floor sump. Spills and

leaks are collected in the sump and returned to the storage tank. Additionally, the tank is heated and insulated and all associated pipelines are heat traced.

The flocculent material is slimy and can create a slipping hazard. Therefore, system controls at the flocculent system focus on good housekeeping to maintain a clean dry floor. The system is a fully enclosed and automated vendor-packaged facility with a separate dry storage room for the bags of dry material.

System controls at the point-of-use of DE focus on controlling dust emissions. The DE preparation tank is equipped with a localized dust suppression system (i.e., a bin ventilator with baghouse) to collect fugitive dust emissions resulting from emptying DE powder into the tank.

Additional system controls, common to each reagent handling and storage system, are listed in Section 8.1.1 above. Routine maintenance activities are described in Section 8.1.2 above.

9.0 Area 900 – Utilities and Buildings

Area 900 facilities consist of the utility and building systems, which include electric power, propane heating, fuel storage, water supply, septic, buildings and parking systems. Figure 9-1, Area 900 – Utilities and Buildings, and Figure 0-3, Site Plan, show the general layout and locations of these facilities. This section provides detailed descriptions of these systems and related infrastructure.

Applicable design documents and drawings include:

1. Energy Fuels Resources Corp., Piñon Ridge Project, Process Design Criteria, by CH2M HILL;
2. Energy Fuels Resources Corp. Piñon Ridge Project Mechanical Equipment List, pgs. 9 and 10 by CH2M HILL;
3. Dwg. 900-PF-001, Area 900 – Water Storage, Process Flow Diagram by CH2M HILL;
4. Dwg. 900-PF-002, Area 900 – Boilers and Compressors, Process Flow Diagram by CH2M HILL;
5. Dwg. 900-PF-003, Area 900 – Fuel Storage, Process Flow Diagram by CH2M HILL;
6. Dwg. 000-GA-003, Area 000 – General Arrangement, General Plant Area, Process Plant Area, Process Plant Area Site Plan by CH2M HILL;
7. Dwg. 100-GA-001, Area 100 – General Arrangement, Ore Handling and Grinding, Ore Reclaim and Conveying Plan by CH2M HILL;
8. Dwg. 800-GA-002, Area 800 – General Arrangement, Reagents Unloading and Storage Outside Bulk Storage Tanks Plans by CH2M HILL; and
9. Dwgs. 900-GA-001 through 900-GA-018, Area 900 – General Arrangements, "Building Plans and Elevations" by CH2M HILL.

9.1 Electric Power Distribution

9.1.1 Operating Procedures

San Miguel Power Association, Inc. ("SMPA") plans to supply electric power to the facility via an existing 69 kilovolt ("kV") overhead distribution line paralleling Highway 90. The power supply system includes SMPA installation (and ownership) of a new overhead power line within the utility corridor along the east edge of the site as well as a 7.5 Megavolt Ampere ("MVA") substation at the south end the site. A 4.16 kV (2,000 kilowatt) diesel-powered generator, located at the mill, provides backup power during line outages to operate the critical mill facilities (e.g., agitators, pumps, lights, air emission controls).

At the substation, switchgear transforms the incoming power to 13.8 kV and 4.16 kV distribution lines. A 13.8 kV overhead distribution loop extending around the perimeter of the plant powers the outlying buildings and motors. One 4.16 kV feeder line from the switchgear is connected to an automatic transfer switch ("ATS"), which switches power from normal utility

power to the standby generator in the event of a power loss. The other 4.16 kV line provides normal utility power. Power within the plant is distributed by use of trays and conduits. Underground duct banks are also used in some of the outlying areas, as necessary. The nominal Project utilization voltage for power distribution, as well as for the SAG Mill motor, is 4.16 kV. For the low voltage system, the utilization voltages are 480 volt ("V"), 208 V and 120 V.

Small (500 to 2,000 square ft) concrete block electrical rooms, constructed at each of the primary mill buildings, house the electrical breakers for the various pumps, mixers and other mill equipment. These rooms are equipped with air conditioning units to maintain positive pressure in the rooms.

9.1.2 System Controls

System controls for the electric power distribution system focus on protecting personnel and wildlife from the electrical equipment. The electrical substation is surrounded by six-ft high, chain-link fence posted with high-voltage warning signs. Buried ductbanks are also posted with warning markers.

9.1.3 Maintenance

Routine maintenance of the electric power distribution system includes performing preventative maintenance and routine inspections of the equipment and security fencing. The diesel-powered emergency generator is started regularly, and receives electrical and mechanical maintenance according to the manufacturer's recommended hours of operation.

9.2 Propane Heating System

9.2.1 Operating Procedures

Liquid propane is received via tanker truck and offloaded directly into an 18,000-gallon, steel, horizontal pressure tank located west of the Reagent Unloading Area. The tank is located outside and situated within concrete containment (reinforced concrete foundation and walls), which also serves to protect the tank from vehicular traffic. Propane is transferred from the tanker truck to the storage tank via pumping.

Propane is used to heat the Administration Facility and mill buildings, the steam boilers, and the rotary kiln and fusion furnace used in the processing circuit. A natural gas line may be installed to the mill in the future if the operating income of the mill justifies the added capital cost of installing six to seven miles of new feeder line.

Steam Boilers

Steam is supplied to the process plant via three steam boilers rated at 10,000 pounds per hour and 150 pounds per square inch gauge ("psig") each. An eight-inch diameter, steel header pipe directs steam generated by the boilers to the leach tanks, the vanadium precipitation tanks, and the uranium and vanadium dryers. The boilers are approximately 18-ft long by 9-ft wide by 8-ft high each, and housed within a 75-ft by 76-ft building located adjacent to the east wall of the Grinding and Leach Building. The Steam Boiler Building also contains the system control panel, deaerator, blowdown tank; four water feed pumps, and three combustion air fans. A four-ft diameter, 100-ft high vent stack releases combustion exhaust from the boilers to the atmosphere.

Water for the boilers is supplied from the raw water header after passing through a water-conditioning unit. Two boilers operate at any one time, with the third on standby. In the event a boiler fails, the standby boiler is activated and an alarm signal is sent to the control room indicating a fault. The boiler system is operated from a stand-alone programmable logic controller ("PLC") control panel and alarms are sent from this panel to the plant control system.

Rotary Kiln and Fusion Furnace

The rotary kiln and fusion furnace are located in the vanadium drying and packaging circuit within the Precipitation and Packaging Building. The kiln is heated to approximately 700°F and functions to dry the vanadium cake and create a granular vanadium oxide product. The fusion furnace operates at approximately 1,500°F to melt the vanadium oxide product discharging from the drying kiln. The melted material is poured onto a water-cooled casting wheel to produce a solidified black-flake product, which is packaged in steel drums for shipment off site.

9.2.2 System Controls

System controls for the heating and steam generation system focus on the safe storage and handling of propane and controlling air emissions from heating equipment. System controls within the vanadium fusion and packaging area are designed to control gas vapors and dust, monitor radiation, and prevent spills (refer to Section 7.3, Vanadium Fusion and Packaging).

Air Emission Control

Combustion exhaust from the steam boilers is released to the atmosphere through a 100-ft tall vent stack extending through the roof of the Steam Boiler Building. The sealed vanadium area within the Precipitation and Packaging Building is operated with all handling equipment and transfer points ventilated to prevent vanadium dust. Additionally, most of the equipment in this area is automated for security reasons and to reduce the potential for inhalation of vanadium dust by the packaging operators. The vent gases are scrubbed and monitored before venting to the atmosphere.

Worker Health and Safety

Energy Fuels employees and suppliers are trained in proper handling, storage and use of propane. The propane storage area is secured with chain link fence and located a safe distance from the nearest building, other tanks, and the property line. The storage tank and delivery system is equipped with pressure relief valves, excess flow valves, line valves, and remote and passive shutoff systems.

Operators working in the rotary kiln and fusion furnace area are required to wear coveralls, gloves, air-purifying respirators, safety glasses (or face shields) and other appropriate PPE during drying operations and during any cleanup of spilled material.

9.2.3 Maintenance

Routine maintenance of the heating and steam generation system includes performing preventative maintenance and routine inspections of the equipment, tanks, valves and piping for signs of corrosion and leakage. This equipment includes components located within the propane storage area and Steam Boiler Building. Blowdown of the steam boilers is performed regularly to control solids in the boiler water and protect surfaces from severe scaling and corrosion. Refer also to Section 7.3, Vanadium Fusion and Packaging, for a description of the

maintenance activities performed on the equipment associated with the drying kiln and fusion furnace within the vanadium drying and packaging circuit.

9.3 Diesel and Gasoline Storage

9.3.1 Operating Procedures

Diesel and gasoline are stored north of the Truck Shop and just outside the Mill License Boundary (restricted area). The diesel storage tank is an 8.5-ft diameter by 32.5-ft long steel tank with a 12,000-gallon capacity. The gasoline storage tank is a 5.8-ft diameter by 12.5-ft long steel tank with a 2,000-gallon capacity. The double-walled storage tanks are situated within a common concrete containment area (reinforced concrete pad and walls) provided with a floor sump. Concrete aprons extend out from the concrete containment on both the east and west sides. These aprons drain back into the containment area and provide secondary containment during transfer of fuel into and out of the storage tanks.

Two diesel transfer pumps, located within the concrete containment, transfer diesel from the storage tank to the day tanks provided for the standby generator and the firewater pump, and to two fueling stations (one inside the restricted area and one outside the restricted area). A third pump transfers gasoline to two gasoline fueling stations that are co-located with the diesel fueling stations. The gasoline and diesel fueling stations are located within the concrete apron areas and are used to refuel vehicles, heavy equipment (including the front-end loader), and miscellaneous small equipment. In most cases, a maintenance truck is filled at the pump station and used to transport fuel to the larger pieces of equipment.

9.3.2 System Controls

System controls at the diesel and gasoline storage area focus on the safe unloading of fuel, and preventing and containing spillage during offloading activities. Each of these control systems are discussed below.

Spill Prevention and Containment

The concrete containment provided for the diesel and gasoline storage tanks is sized to contain the volume of the larger diesel tank plus 10 percent. Concrete secondary containment is also provided for the fueling stations, consisting of a curbed concrete fueling apron and concrete containment walls surrounding the fuel dispensers The west apron that is outside of the restricted area is large enough to accommodate a fuel delivery truck. Containment for the tanks and fueling station has a sump to collect any leakage from the tanks, pumps, dispensers, fuel lines and hoses. Large quantities of fuel collected in the containments are removed by a vacuum truck for offsite recycling. Precipitation water and small quantities of fuel collected in the containments are allowed to evaporate or pumped to the tailings storage facility.

The fuel storage tanks are equipped with automatic level indicators and alarm systems to prevent overfilling. Sensors activate audible (siren) and visual (flashing light) alarms when the solution volume reaches a predetermined level.

Pipelines conveying diesel fuel from the storage tanks to other points-of-use are supported on an aboveground pipe rack. The pipelines are double contained (i.e., pipe-in-pipe) systems wherever they cross outside concrete containment areas. The maintenance truck also carries

portable containment and absorbent materials that can be used to contain and cleanup fuel and oil spills that may occur while servicing mobile equipment.

Worker Health and Safety

Energy Fuels employees and contractors are trained in proper handling, storage and use of diesel and gasoline fuels. Fire extinguishers are located next to both the restricted and unrestricted fueling areas. Additionally, safety shower/eyewash stations are located nearby in the SX Building (restricted area) and the Truck Shop (unrestricted area).

9.3.3 Maintenance

Routine maintenance at the fuel storage facilities includes performing preventative maintenance on pumps and conducting visual inspections of the tanks, valves, gauges, and piping for signs of corrosion and leakage. The concrete apron, containment walls, and sump are inspected for cracks and repaired, as necessary. Routine maintenance and inspections are also performed on the nearby safety shower/eyewash stations.

9.4 Water Supply System

9.4.1 Operating Procedures

The average water requirement for the 500-tpd operation is 144 gpm or 232 acre-feet per year. The milling and process facilities require 130 gpm (non-potable); provisions for dust suppression, the truck wash and fire suppression systems require 11 gpm (non-potable); and the washrooms, showers and drinking uses require three gpm (potable). The majority of water is used for processing purposes; therefore, process water is recycled wherever feasible to minimize consumption.

Non-Potable Water

The primary, non-potable water source is groundwater, which is pumped from a series of onsite and adjacent offsite deep production wells. Energy Fuels has installed three production wells to date, including Wells PW-1 and PW-2 on the south side of the Property and Well PW-3 on adjacent private land west of the Property. Figure 0-3, Site Plan, shows the locations of these existing production wells. Wells PW-1, PW-2 and PW-3 are screened across the contact between the Chinle and Moenkopi Formations and are 380, 420, and 380 feet deep, respectively. The intercepted aquifer extends to the northwest and southeast along the toe of Davis Mesa and to the southwest under the mesa. The aquifer does not extend to the northeast under the mill site. When tested over a two-day period, the three wells sustained pumping rates of 52, 10, and 68 gpm (130 gpm total), respectively. Energy Fuels plans to install at least two additional wells (Wells PW-4 and PW-5) west of the site to supplement this source. Additional information on the well water supply system is provided in the Water Supply and Wastewater Systems report.

Energy Fuels has arranged for a contingency water supply from the Town of Naturita in the event that the well field cannot sustain the 141-gpm requirement for non-potable uses. The contingency water supply secured with the Town of Naturita, includes an agreement, which allows Energy Fuels to purchase up to 150,000 gallons of water per 24-hour period (equivalent to 104 gpm). Untreated, non-potable water is obtained from the town's Old Water Treatment Plant and delivered to the site via truck on an as-needed basis. Non-potable water purchased from the Town of Naturita is stored in the onsite raw water storage tank (described below).

Water pumped from the Energy Fuels production wells is conveyed to an onsite storage tank via a buried pipeline. The raw water storage tank is a 37-ft diameter by 40-ft high, epoxy-coated, carbon steel tank with a capacity of 321,700 gallons and is located at the north end of the Precipitation and Packaging Building. This tank supplies water to process components at the mill, dust suppression systems at the ore pad facility, steam boilers, truck wash, firewater pumps, and water trucks. Specifically, water stored in the raw water tank is supplied to the following process components:

- Mill and leach area;
- CCD thickener area;
- Uranium and vanadium packaging area;
- Reagent preparation and storage area;
- Tailings return water tank; and
- Pump gland service.

The location of the water outlet pipe in the raw water storage tank is designed to maintain a dedicated firewater reserve of 179,500 gallons in the lower portion of the tank at all times. Fire suppression water is pumped via a diesel-powered water pump and an electric-powered jockey pump to the plant via a firewater header pipe. The Fire suppression water pumps are installed in the mechanical room at the north end of the Precipitation and Packaging Building and a fire protection monitoring station is included in plant control room. Fire hydrants are strategically located throughout the Facility. The SX Building and Facility offices are protected using fire suppression water mist systems.

Recycled Process Water

Recycled process water is supplied from the vanadium filtrate receivers, vanadium precipitation decant, and the uranium thickener overflow. These streams are collected and stored in two, 12-ft diameter by 12-ft high, 10,200-gallon carbon steel tanks (i.e., the process water storage and day tanks) located inside the Precipitation and Packaging Building. The tanks feed the SAG Mill discharge sump and are recirculated to the SAG Mill circuit to minimize freshwater consumption. These streams can contain undissolved or dissolved uranium or vanadium; therefore, to facilitate metallurgical accounting, the streams are collected as a batch in the two tanks and then sampled prior to return to the mill circuit.

Return water from the tailings storage facility is pumped to a 12-ft diameter by 12-ft high, epoxy-coated, carbon steel return water storage tank with a capacity of 10,200 gallons. The tank is located inside the Precipitation and Packaging Building next to the process water storage and day tanks. Raw water is also added to the return water storage tank as necessary. Water is pumped from the storage tank to the leach train vent gas scrubber and the CCD thickener circuit.

Potable Water

Potable water (three gpm) is required for the washrooms, showers and drinking. Treated potable water, purchased from the town of Naturita, is the potable water source for the operation, as the onsite groundwater quality exceeds primary and secondary drinking water

standards for certain constituents. Trucks deliver the treated water to the site at the average rate of 30,000 gallons (approximately six truckloads) per week. Potable water is stored in a tank located at the administration building and a tank located at the mill near the laboratory and change house. All water systems are designed and constructed according to state and county requirements.

9.4.2 System Controls

System controls for the water supply system focus on minimizing impacts to existing neighboring supply wells, the efficient operation of all water systems to store, recycle, and conserve water, and preventing and containing spillage of process water and return water. Each of these control systems are discussed below.

Minimizing Impacts to Neighboring Wells

There are no neighboring wells in the immediate vicinity of the facility. The nearest known well to the site, located 1.4 miles northeast of the nearest production well, is completed in a different formation to a depth of 213 feet and is reportedly dry. Other wells in the vicinity range between 160 and 320 feet deep and are located approximately 2.8 and 4.5 miles southeast and 2.5 miles northwest of the closest production well. Pumping tests at the production wells indicate that, radii of groundwater drainage into the pumping wells extended only 500 to 1,000 feet (i.e., 0.1 to 0.2 mile); making it very unlikely that long-term pumping of the production wells will impact any of the known wells in the vicinity.

Energy Fuels has agreed to monitor its production wells and offsite wells and springs in the area as a condition of its Special Use Permit with Montrose County. The condition of approval also requires that Energy Fuels mitigate impacts to offsite water resources should they occur as a result of groundwater extraction at the Facility production wells. The monitoring program is summarized in Section 10.4, Environmental Monitoring Systems, of this document and described in detail in the Operational Monitoring Plan.

Water Conservation

As described under Operating Procedures, process water and return water from the tailings storage facility is recirculated, where possible, to minimize raw water consumption. Additionally, the raw water storage tank, which is located outside, is covered to minimize evaporative losses.

Spill Prevention and Containment

The process water and return water tanks are located inside the Precipitation and Packaging Building within curbed concrete containment. The containment area drains to a concrete floor sump and a portable pump is used to transfer water collected in the sump back to the appropriate storage tank. Process water pipelines, downstream of the process water storage tank, are double contained (i.e., pipe-in-pipe) systems wherever they cross outside concrete containment areas.

9.4.3 Maintenance

Routine maintenance of the water supply system includes performing preventative maintenance on pumps and conducting visual inspections of the tanks, valves, and piping for

signs of corrosion and leakage. The sump for the process and return water tanks is cleaned, as needed, and any cracks in the sump or concrete floor repaired.

9.5 Septic Systems

9.5.1 Operating Procedures

Two separate absorption field septic systems, designed according to state and county health and sanitation requirements, are located on site. One system is located north of the parking area at the Administration Facility and receives effluent, via gravity flow, from the restroom facilities located in the administration building. The other system is located south of the Change House and Laboratory Building and receives effluent, via gravity flow, from the toilets and urinals located in the mill buildings. The field at the administration building is approximately 50-ft long and 12-ft wide with two distribution lines. The field at the mill is approximately 100-ft long and 40-ft wide with six distribution lines.

The mill also has shower facilities located in the mill change rooms. In order to minimize freshwater consumption, a gray-water system at the mill collects and recycles water from the showers and restroom sinks for use in the milling process. Additional details of the septic systems are presented in the Water Supply and Wastewater Systems report.

9.5.2 System Controls

System controls for the septic systems focus on proper care of the septic tanks and absorption fields so that the systems function properly. Aside from the maintenance activities discussed below, additional measures include restricting materials allowed into the systems and keeping vehicles and heavy equipment off the systems.

9.5.3 Maintenance

Routine maintenance of the septic systems includes periodically removing solids from the septic tanks, maintaining surface drainage to keep stormwater runoff away from the absorption fields and maintaining an adequate vegetation cover over the absorption fields.

9.6 Buildings and Parking Requirements

9.6.1 Buildings

Ten onsite buildings accommodate offices, process equipment, maintenance facilities, and utility systems. These onsite buildings include the:

- Administration Facility;
- Guardhouse;
- Grinding and Leaching Building;
- Control Room Building
- CCD Thickener Building;
- Solvent Extraction Building;
- Precipitation and Packaging Building;
- Change House and Laboratory Building;

- Truck Shop Building; and
- Warehouse and Shop Building.

Administration Facility

The Administrative Facility is located east of the main access road at the north end of the Project site outside of the Mill License Boundary fence. The facility is a 9,000 square foot ("sf"), single-story structural steel frame building, comprised of two areas, with insulated metal siding and roofing. One area is approximately 170-ft long by 30-ft wide with a main hallway running east to west, and the other is approximately 80-ft long by 50 f-t wide, located north of and centered on the first area. The building accommodates office facilities for both milling and mining personnel employed by Energy Fuels and is configured to allow for a 5,000-sf future expansion if necessary. Approximately 26 offices/work areas, three conference rooms, a training room, break room, and storage and restroom facilities are located within the building. Additionally, the facility includes a garage for the onsite ambulance. The building foundation is comprised of spread footings with beams and a non-structural concrete floor slab.

Guardhouse

The guardhouse is located at the entrance to the plant, east of the evaporation ponds outside of the Mill License Boundary fence. The building is a 20-ft square metal-framed building with insulated metal roofing and siding on a reinforced concrete foundation.

Grinding and Leaching Building;

The Grinding and Leaching Building is located west of the ore pad inside of the Mill License Boundary fence. The building is a 225-ft long by 77-ft wide by 97-ft tall structural steel building with an insulated metal roof and siding. The building houses the grinding process equipment, classifying screens, leach process equipment, battery charging area, instrument equipment area, and all ancillary equipment required for grinding and leaching operations. Equipment is serviced by a 25-ton capacity bridge crane installed inside of the building. The foundation is comprised of spread footings bearing on compacted engineered fill and floors are non-structural concrete slabs. Equipment is installed on reinforced concrete pads and piles as necessary.

Control Room Building

A three level Control Room Building is situated adjacent to the west side of the Grinding and Leach Building inside of the Mill License Boundary fence. This building is a 36-ft long by 28-ft wide by 48-ft tall structural steel building with an insulated metal roof and siding. The first level is used for offices; the second level is used to house the hardware for the process control equipment; and the third level comprises the control room with a clean lunchroom. Additionally, the third level includes a 19-ft long by 10-ft wide cantilever area extending into the Grinding and Leach Building with full viewing capacity of the SAG Mill and the leach tanks. The west side of the control room has a door accessing the pre-leach clarifier platform walkway.

CCD Thickener Building;

The CCD Thickener Building is located north of the Grinding and Leach Building, inside of the Mill License Boundary fence, between two rows of CCD thickener tanks. The building is a 200-

ft long by 24-ft wide by 21-ft tall structural steel building with an insulated metal roof and siding, and houses the thickener underflow and overflow pumps, auxiliary process equipment, piping, and electrical cables. The foundation is comprised of spread footings bearing on compacted engineered fill. The CCD thickener tanks themselves are located outside the building on a concrete pad. The area is fully contained via concrete curbs and a double-contained sump, with equipment installed on reinforced concrete pads and piles as necessary.

Solvent Extraction Building;

The Solvent Extraction Building is located at the northwest corner of the process facility inside of the Mill License Boundary fence. The building is a 140-ft long by 370-ft wide by 68-ft tall structural steel building with an insulated metal roof and siding, and houses the polishing filters for both the uranium and vanadium circuits, uranium and vanadium SX equipment, crud centrifuge, vanadium process tanks, auxiliary process equipment, pumps, piping, and electrical cables. The foundation is comprised of spread footings bearing on compacted engineered fill. Building floors are non-structural concrete slabs and equipment is installed on reinforced concrete pads and piles as necessary.

Precipitation and Packaging Building;

The Precipitation and Packaging Building is located south of the Solvent Extraction Building and west of the Grinding and Leach Building inside of the Mill License Boundary fence. This building houses the uranium and vanadium precipitation process equipment, uranium thickener, product drying equipment, product packaging equipment, drum storage, auxiliary process equipment, pumps, piping, and electrical cables. The building is of structural steel construction, divided into two sections, with insulated metal roofing and siding. One section is 75-ft long by 175-ft wide by 54-ft tall, and the other is 75-ft long by 250-ft wide by 97-ft tall. The foundation is comprised of spread footings bearing on compacted engineered fill. Building floors are non-structural concrete slabs, and equipment is installed on reinforced concrete pads and piles as necessary. Truck loading docks are located on the west side of the building.

The Precipitation and Packaging Building is designed to minimize operator exposure in both the uranium and vanadium handling areas. Both the uranium dewatering and packaging area and the vanadium precipitation, dewatering, conversion and packaging area are sealed and under negative pressure. These areas are also equipped with stationary air monitoring stations and the mill operators are required to wear breathing zone air samplers. The uranium vacuum drying and packaging system vents through a baghouse that, in turn, vents through a condenser to remove any small particles remaining in the air stream. The clean air is then recirculated back into the drying and packaging area. An air scrubber system captures and removes dust from emission points within the vanadium circuit, prior to air discharge to the atmosphere. Empty drums and packaged product are stored in the west half of the building and block walls separate the drum storage and handling area from the drum filling area for both the uranium and vanadium processes.

Change House and Laboratory Building;

The Change House and Laboratory Building is located southwest of the Grinding and Leach Building outside of the Mill License Boundary fence. The 125-ft long by 175-ft wide by 27-ft tall building is of structural steel construction with insulated metal roofing and siding, and houses

laboratory equipment, chemicals, and changing facilities. Separate rooms within the building provide sample receipt, sample preparation, sample analysis, metallurgical testing, chemical storage, and changing facilities. The foundation is comprised of spread footings bearing on compacted engineered fill, and building floors are non-structural concrete.

Truck Shop Building;

The Truck Shop Building is located on the west side of the processing facilities, southwest of the Solvent Extraction Building outside of the Mill License Boundary fence. The building houses truck and heavy equipment maintenance supplies and is used for maintenance purposes. The 75-ft long by 75-ft wide by 33-ft tall building is of structural steel construction with insulated metal roofing and siding. The foundation is comprised of spread footings bearing on compacted engineered fill with non-structural concrete slab floors. Equipment is installed on reinforced concrete pads and piles as necessary. An overhead bridge crane services the heavy-duty maintenance bays.

Warehouse and Shop Building

The Warehouse and Shop Building is located north of the Truck Shop Building outside of the Mill License Boundary fence. The building houses spare process equipment, spare parts, reagents, shop equipment, and work space for maintenance operations. The 100-ft long, by 100-ft wide, by 36-ft tall building is of structural steel construction with insulated metal roofing and siding. The foundation is comprised of spread footings bearing on compacted engineered fill and building floors are non-structural concrete slabs. Equipment is installed on reinforced concrete pads and piles as necessary.

9.6.2 Parking

At full operation, the facility employs approximately 85 people and operates three eight-hour shifts per day, seven days per week. Twenty-five employees work straight days, five days per week. The remaining 60 employees make up four, 15-person crews working rotating shifts. Therefore, Monday through Friday during the day shift, approximately 40 people are onsite and during all other shifts, approximately 15 people are on site.

Assuming that each employee drives separately to the site, a maximum of 55 employee vehicles are onsite at any one time. This scenario potentially occurs during the shift changes at the beginning and end of the day shift, when the starting and ending shifts (two crews) and the straight-day employees are on site at the same time.

Based on this worse case scenario, with seven straight day shift employees and the 15-person crews parking at the mill facility, and providing additional parking for vendors and visitors, the parking lot at the administration building must accommodate approximately 43 vehicles. Nonetheless, Montrose County development standards require 62 spaces for a "professional office" building having 9,000 sf of gross floor area, and four disabled accessible spaces, including one van-accessible space, for a parking lot with 51 to 75 regular spaces. Therefore, the parking at the Administration Facility provides 62 regular spaces, three disabled accessible spaces and one van-accessible space. The parking lot is surfaced with gravel with the exception of the disabled accessible parking area, which is paved with asphaltic concrete.

The area south of the Change House and Laboratory Building and the Warehouse and Shop Building is used for parking at the mill facility. The parking area accommodates the personal

vehicles of the 15-person crews and the seven straight day employees working in the mill, as well as company vehicles, and vendors accessing the buildings. Therefore, the parking lot at the mill buildings provides 32 regular spaces, two disabled accessible spaces and one van-accessible space. The parking lot is surfaced with gravel with the exception of the disabled accessible parking area, which is paved with asphaltic concrete.

9.6.3 System Controls

System controls for the buildings and parking areas focus on worker and public safety. The Administration Facility is equipped with a fire suppression sprinkler system, and fire hydrants are strategically located to service the buildings at the mill. The parking areas are designed to provide adequate room for safe vehicular movement. Facility access and security is discussed under Section 10.1, Facility Access, Screening, and Security.

9.6.4 Maintenance

Routine maintenance is performed on the buildings to keep all systems in good working order. Parking areas are periodically graded and snow removal is performed as necessary.

10.0 Area 1000 – General Plant

Area 1000 facilities consist of the general plant and ancillary facilities and systems, which include access, security, warehouse, shop and laboratory facilities, and environmental monitoring and emergency response systems. Figure 10-1, Area 1000 – General Plant, and Figure 0-3, Site Plan, show the general layout and locations of these facilities. This section provides detailed descriptions of these systems and related infrastructure.

Applicable design documents and drawings include:

1. Dwg. 900-GA-003, Area 900 – General Arrangements, Change House and Laboratory Building Plan by CH2M HILL
2. Dwg. 900-GA-004, Area 900 – General Arrangements, Change House and Laboratory Building Elevations "A" and "B" by CH2M HILL
3. Dwg. 900-GA-007, Area 900 – General Arrangements, Warehouse and Shop Building Plan and Elevations "A" and "B" by CH2M HILL
4. Dwg. 900-GA-008, Area 900 – General Arrangements, Truck Shop Building Plan and Elevations "A" and "B" by CH2M HILL

10.1 Facility Access, Screening, and Security

10.1.1 Operating Procedures and System Controls

Access

The access point to the site is located near milepost 23 on State Highway 90. A gravel road provides access to the mill facility from the highway. Gravel roads branching off the main access road provide access to the ore pad and administration building. Figure 0-3, Site Plan, shows the site access point and primary road locations. Secondary dirt or gravel roads provide access to all facility locations (e.g., tailings cells, evaporation ponds, water well field, etc.).

Site access is designed with a left-turn deceleration lane for westbound traffic on Highway 90 and a 10-foot wide shoulder along the south side (eastbound side) of Highway 90, east of the site access point to provide safe ingress and egress. Additionally, the design includes highway widening along a length of approximately 2,175 feet to accommodate these improvements and additional warning signs along the highway on either side of the site access point to warn vehicles of the truck traffic.

The Property boundary is fenced with barbed wire and the Mill License Boundary is surrounded by six-ft high, chain-link fence topped with three strands of barbed wire. Both fences are posted with warning signs indicating that unauthorized access is not allowed and points of access are strictly controlled. A secondary road around the perimeter of the fence allows for daily security inspections.

A guardhouse near the entrance of the site allows for the inspection and control of traffic entering the Facility. The guardhouse is manned 24 hours per day, seven days per week. Only authorized personnel and vehicles are allowed to continue beyond the gate to the mill area. Ore

deliveries are directed to a truck scale and then to either the ore pad dumping platform or directly onto the ore pad. Delivery of process reagents and fuel are directed to the south and west side of the mill to the Reagent Unloading Area, warehouse or other unloading area, as appropriate. These vehicles are not allowed to enter the mill restricted area, which corresponds to the licensed portion of the site where access is controlled and radiation is closely monitored.

Access to the restricted area is limited to mill employees and authorized visitors. All personnel enter the mill through the Laboratory/Change Room/Mill Offices Building where they are required to check in and put on radiation badges before entering the mill restricted area. Upon the conclusion of each shift, employees are scanned with a handheld gamma meter before they can check out. If the scanned readings indicate radioactivity above background levels, the employees are required to clean their clothes (typically shoes) and/or shower before being rescanned. Additional details regarding security are provided in the Piñon Ridge Mill Security Plan.

10.1.2 Maintenance

Routine maintenance of the security systems includes performing preventative maintenance and testing on the systems, instrumentation, and equipment. Routine visual inspections of the Property boundary fencing and security fencing are also conducted.

10.2 Warehouse and Shops

10.2.1 Operating Procedures and System Controls

Refer to Section 9.6, Buildings and Parking Requirements, for a description of the Truck Shop Building and the Warehouse and Shop Building. The truck shop includes three service bays for servicing light vehicles and heavy equipment. Lubricants are dispensed from lube cubes and drums, and used oil is stored in a tank set within concrete containment. The warehouse includes a large area for storage of spare process equipment, spare parts, reagents and shop equipment; a separate shop area for maintenance operations; and a loading dock. Both buildings have concrete floor slabs with sumps to provide secondary containment and collection of any spilled reagents or petroleum-based products.

10.2.2 Waste Products

Solid waste, special waste and any hazardous waste produced on site is handled and disposed of in accordance with all applicable regulations. Solid waste produced on site may include, but is not limited to, domestic and lunchroom wastes, paper, cardboard packaging, packing materials, empty cans, and scrap metal and lumber. Special waste produced on site may include, but is not limited to, used batteries, tires, fluorescent light bulbs, paint, used oil, solvents and antifreeze. Hazardous waste may include certain used solvents, and old pesticides and cleaning products.

Recurring solid waste is routinely collected and removed from the Project site by a local contractor for disposal in an approved, offsite, public landfill. Solid waste is temporarily stored on site in bear-proof, roll off dumpsters located next to the Truck Shop Building and the Warehouse and Shop Building. Scrap metal and lumber is temporarily stored in a bin and/or pallets near the shop buildings prior to removal by a vendor for recycling.

Special and hazardous waste products are sorted and transported to approved, offsite recycling and/or disposal facilities. Solvents, used oil and antifreeze, contaminated fuel and other similar wastes from the workshops are collected in tanks and smaller containers located in Truck Shop for recycling or disposal. Solvent-cleaning stations, installed in the shop areas, consist of a cleaning sink mounted on a small drum of solvent. The solvent is pumped into and used in the sink, and then recycled back to the drum via a gravity drain. A vendor periodically replaces the drums of solvent for recycling. Used oil filters are drained, crushed, and recycled. Batteries, tires, light bulbs, and other similar materials are stored until they can be picked up and recycled.

Any waste materials coming from within the restricted area (i.e., Mill License Boundary) are scanned prior to leaving the Project site for disposal. Any waste products that do not pass the scan criteria, and which cannot be properly decontaminated, are disposed of on site, in the active tailings cell. Additionally, certain wastes are manifested prior to leaving the site.

Minimization of special waste streams is accomplished by recycling, removing packaging prior to taking parts and consumables into the restricted area, and by using mercury-free fluorescent light bulbs, non-hazardous oils and solvents and electrical transformers that do not contain Polychlorinated Biphenyls ("PCBs"). Additionally, paint is used completely from open paint containers, when possible. Otherwise, the partially filled paint containers are removed from the Project site for proper recycling and disposal. Empty spray paint cans are punctured over a 55-gallon drum so that any residual paint flows into the drum, and the cans are then crushed. The residual paint is recycled when the drum becomes full. Empty paint cans and containers are disposed of with the solid waste.

10.3 Laboratory

10.3.1 Operating Procedures and System Controls

Refer to Section 9.6, Buildings and Parking Requirements, for a description of the Change House and Laboratory Building. The laboratory portion of the building is separated from the change house area by a pass through hallway, which provides access to the scanning area and secured entrance into the Mill License Boundary area. The laboratory facility provides rooms for sample receipt and preparation, reagent storage, assays, and related wet chemical and metallurgical test work. The laboratory is designed to meet all State codes and includes alarms and a fire suppression sprinkler system. Dust emission controls include dry baghouse systems and scrubbers fitted to fume hoods. Rock dust and rejects from sample preparation are returned to the process. A sump with a pump is located in the metallurgical lab room.

Appendix D, Laboratory Facilities and Plans, provides a description of the onsite laboratory facilities, including the analytical equipment and methods, and contains the laboratory procedural plans for quality assurance, quality control and chemical hygiene. Design drawings, depicting the final layout of the laboratory facilities, will be provided to CDPHE upon completion of the final design for the Piñon Ridge Mill Facility. Additionally, the Chief Chemist, with assistance from the laboratory technicians, will develop detailed SOPs for each test/analysis conducted in the laboratory. Appendix D provides a summary of the elements required in an SOP and establishes basic safety rules for the laboratory facilities.

10.4 Environmental Monitoring Systems

10.4.1 Operating Procedures and System Controls

Energy Fuels selected the Piñon Ridge site for a mill facility based on an evaluation of seven potential sites conducted by several engineering and environmental consulting firms. The company also consulted informally with state regulators and local community leaders prior to purchasing the Property. From an environmental perspective, the site appears ideal since no ground or surface waters are in close proximity, thereby greatly reducing the potential risk of water quality degradation. The groundwater table is either absent or greater than 400 feet below ground surface at the proposed locations of the mill, tailings cells and evaporation ponds, and there are no rivers or perennial streams near the Property. The site is also relatively remote with the nearest downwind resident located three miles east of the Property boundary.

Although the environmental risk at the site is low, Energy Fuels is required to meet strict water and air quality control standards. All process and waste solutions must be contained within the mill and waste disposal system components. This containment is verified through monitoring of surface water, groundwater and soils prior to operations, during operations, and after the Facility is shutdown and decommissioned. Air emissions are minimized through use of modern technology and pollution control equipment (e.g., baghouses, scrubbers). Air emissions are monitored on and off site and must meet state regulations for fugitive dust (i.e., PM-10) and radiation at the Property boundary. This Facility Operating Plan provides additional detail regarding environmental control measures for each area of the Facility.

Baseline Monitoring

Energy Fuels conducted baseline monitoring of the Property including drilling and trenching to characterize the geology, installation of monitoring wells to characterize groundwater, mapping and testing of physical soil conditions, and assessment of seismic potential. Surface water sampling stations are installed to allow for collection and analysis of precipitation runoff. Background radiation levels were measured throughout the site. Two onsite meteorological stations measure wind speed and direction, temperature, evaporation levels and other climate-related parameters. Five air monitoring stations are installed including three on site and two off site. A series of groundwater monitoring wells are installed throughout the site. Vegetation and wildlife studies were completed on a quarterly basis over a one-year period and biota was collected and analyzed for pre-milling background radiation levels. The intent of this comprehensive baseline monitoring program is to establish background conditions that can later be used to assess any environmental impacts from milling operations. The results of the baseline monitoring program are presented in detail in the reports accompanying the 2009 Mill License Application and are summarized in the Environmental Report for the Project.

Operational Monitoring

Energy Fuels has developed detailed plans for inspecting and monitoring the environment and the facilities and systems designed to protect the environment during operations. These plans include procedures for monitoring and characterizing:

- Air emissions from point sources and air quality at air monitoring stations;
- Meteorological conditions;

- Leak detection systems at mill sumps, tailings cells, and evaporation ponds;
- Ore and waste materials;
- Traffic counts for vehicles entering and leaving the site;
- Onsite groundwater wells;
- Onsite surface water runoff;
- Production wells and offsite wells and springs;
- Soils/windblown tailings; and
- Flora and fauna.

Monitoring results are periodically reported to the CDPHE and Montrose County (where appropriate). Details of the monitoring program are provided in the Environmental Monitoring Program for the Piñon Ridge Mill.

Closure and Post-Closure Monitoring

Operational monitoring will continue through the closure period. Additional monitoring requirements specific to closure activities are described in the Decommissioning Plan for the Facility. Post-closure monitoring and maintenance will include an ongoing assessment of air and water quality and periodic inspections to ensure the integrity of soil covers, erosion control structures and successful reestablishment of vegetation. Water and air quality monitoring results are reported to the CDPHE. Corrective measures are implemented as necessary to repair soil covers, control erosion of the reclaimed areas and meet other post-closure requirements established by CDPHE.

10.5 Emergency Response Systems

10.5.1 Operating Procedures and System Controls

A firewater loop, with hydrants at key locations serves as one component of the overall fire protection system. The raw water storage tank or a separate tank dedicated to fire protection feeds the firewater loop. Non-process buildings and the SX Building are equipped with sprinkler systems and all buildings have fire extinguishers in accordance with building codes and county requirements.

An emergency response plan has been prepared for the Facility as part of the licensing effort with CDPHE. Because of potential radiation emissions associated with an emergency, Energy Fuels anticipates that most emergency response actions will be handled by trained employees under the direction of the Facility's Radiation Safety Officer. Energy Fuels developed this response plan in consultation with local law enforcement agencies and fire departments, so that the roles of all involved personnel are clearly defined, potential chemical and radiation risks are quantified and adequate equipment is available to support emergency response efforts.

The trucking companies transporting ore, chemical reagents and fuel to the Facility and yellowcake and vanadium oxide from the Facility to other processing facilities are required under USDOT regulations to have an emergency response plan in place for responding to accidents and cargo spills. As part of its contracting program, Energy Fuels verifies that these plans are in place and offers the support of its emergency response teams to carriers of ore,

yellowcake and other low-level radiation shipments in their emergency management planning. The Energy Fuels response teams have expertise in radiation control and the necessary specialized monitoring equipment that is generally not available to most law enforcement agencies, fire departments, and other first responders.

11.0 References

CH2M HILL Engineers, Inc. (CH2M HILL), 2009. "Basic Engineering Report, Piñon Ridge Project, Colorado." February

Energy Fuels Resources Corporation (Energy Fuels), 2009. "Material Containment Plan for the Piñon Ridge Mill, 16910 Highway 90, Bedrock, CO 81411." September

Golder Associates, Inc. (Golder), 2008. "Evaporation Pond Design Report, Piñon Ridge Project, Montrose County, Colorado." October

Golder Associates, Inc. (Golder), 2008. "Ore Stockpile Pad Design Report, Piñon Ridge Project, Montrose County, Colorado." October

Golder Associates, Inc. (Golder), 2008. "Tailings Cell Design Report, Piñon Ridge Project, Montrose County, Colorado." October

Figures

Certain figures contained in this Facility Operating Plan are based on the original design drawings contained in the Piñon Ridge Project Basic Engineering Report prepared by CH2M HILL Engineers, Inc., dated February 4, 2009 (CH2M HILL 2009). Those figures that are based on the CH2M HILL engineering report, are noted as such, and are not intended to be design drawings. They are provided solely to illustrate the general layout of the process areas discussed in this Facility Operating Plan.

Appendix A – Process Control Philosophy

The source of this appendix is the Piñon Ridge Project Basic Engineering Report prepared by CH2M HILL Engineers, Inc., dated February 4, 2009 (CH2M HILL 2009).

PIÑON RIDGE PROJECT

BASIC ENGINEERING

ENERGY FUELS RESOURCES CORPORATION

PROCESS CONTROL PHILOSOPHY

MM-2400-SP-001

Project No. 365541

Rev. No.	Issue Date	Revision Subject	Discipline Approval	Management Approval	Client Approval
A	04/01/08	Initial Issue	CBB	MDSB	
B	05/19/08	Issued for Review	CBB	MDSB	
C	06/10/08	Issued for Basic Engineering Draft Report	CBB	MDSB	
D	02/04/09	Issued for Basic Engineering Report	CBB	MDSB	

TABLE OF CONTENTS

1.0 GENERAL 1
1.1 Reference Documents 1
1.1.1 Process Flow Diagrams 1
1.1.2 Piping and Instrumentation Diagrams 1
2.0 PROCESS OPERATION 3
3.0 CONTROL SYSTEM ARCHITECTURE 4
3.1 Process Control System (PCS) 4
3.1.1 Instrumentation Ratings 5
3.1.2 Networks 5
3.1.3 Printers 5
3.2 Operator Interface 5
3.3 Data Historian 6
3.4 Closed-circuit Television (CCTV) 6
4.0 CONTROL PHILOSOPHY 6
4.1 Operating Philosophy 6
4.2 Operational Modes 7
4.2.1 Control Source 7
4.2.2 Device Control Modes 7
4.2.3 Interlock Types 7
4.3 Motor Control 8
4.4 Valve Control 8
4.5 Sequences 9
4.6 Control Loops 9
4.7 Alarm Philosophy 9
5.0 FUNCTIONAL DESCRIPTION 10
5.1 Area 110 ROM - Coarse Ore Storage and Reclaim 10
5.2 Area 120 SAG Mill Grinding and Screening 10
5.3 Area 130 Leach Feed 10
5.4 Area 210 Pre-leach 11
5.5 Area 220 Leach Train A 11
5.6 Area 310 CCD Thickeners 11
5.7 Area 320 Tailings Sump and Tailings Pond 12
5.8 Area 410 Uranium Solvent Extraction Feed 12
5.9 Area 420 Uranium Solvent Extraction Train A 12
5.10 Area 430 Uranium Solvent Extraction Train B 14
5.11 Area 440 Uranium Solvent Extraction Loaded Organic 14
5.12 Area 510 Uranium Precipitation 15
5.13 Area 530 Uranium Drying and Packaging 16
5.14 Area 610 Vanadium Oxidation 16
5.15 Area 620 Vanadium Solvent Extraction Train A 16
5.16 Area 620 Vanadium Solvent Extraction Train B 17

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

5.17 Area 640 Vanadium Solvent Extraction Loaded Organic 17
5.18 Area 710 Vanadium Conversion and Precipitation..... 17
5.19 Area 730 Vanadium Filtering, Fusion, and Packaging 18
5.20 Area 800 Reagents..... 18
5.21 Area 910 Water 19
5.22 Area 920 Steam 19

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

1.0 GENERAL

This document describes the control strategy for the Piñon Ridge Project uranium plant. The plant would be located near Bedrock, CO. This document is to be used as a reference with the latest revisions of the mechanical equipment list, process flow diagrams (PFDs) and process and instrumentation diagrams (P&IDs).

1.1 Reference Documents

This document has been developed using information from the following sources:

1.1.1 Process Flow Diagrams

100-PF-001 Area 100 Ore Handling and Grinding

200-PF-001 Area 200 Pre-leach

200-PF-002 Area 200 Leach Train

300-PF-001 Area 300 Counter Current Decantation (CCD) Thickeners

300-PF-002 Area 300 Tailings Area

400-PF-001 Area 400 Uranium Solvent Extraction (SX) – Feed System and Extraction Train A

400-PF-002 Area 400 Uranium SX Extraction Train B, Scrub and Strip

500-PF-001 Area 500 Uranium Precipitation, Drying and Packaging

600-PF-001 Area 600 Vanadium Oxidation and SX – Extraction Train A

600-PF-002 Area 600 Vanadium SX – Extraction Train B, Scrub and Strip

700-PF-001 Area 700 Vanadium Precipitation

700-PF-002 Area 700 Vanadium Drying and Packaging

800-PF-001 Area 800 Sulfuric Acid, Ammonia and Ammonium Sulfate

800-PF-002 Area 800 Sodium Hydroxide and Sodium Carbonate

800-PF-003 Area 800 Flocculant and Organics

800-PF-004 Area 800 Sodium Chlorate and Hydrogen Peroxide

900-PF-001 Area 900 Water Storage

900-PF-002 Area 900 Boilers and Compressors

900-PF-003 Area 900 Fuel Storage

1.1.2 Piping and Instrumentation Diagrams

110-PI-001 Area 110-1 Run of Mine (ROM) – Coarse ore Storage and Reclaim

120-PI-001 Area 120-1 SAG Mill Grinding and Screening

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

130-PI-001	Area 130-1 Pulp Storage
130-PI-002	Area 130-2 Pulp Storage
210-PI-001	Area 210-1 Pre-leach Tanks
210-PI-002	Area 210-2 Pre-leach Thickener and Clarifier
220-PI-001	Area 220-1 Leach Train
220-PI-002	Area 220-2 Leach Train
220-PI-003	Area 220-3 Leach Train
310-PI-001	Area 310-1 CCD Thickeners 1 and 2
310-PI-002	Area 310-2 CCD Thickeners 3 and 4
310-PI-003	Area 310-3 CCD Thickeners 5 and 6
310-PI-004	Area 310-4 CCD Thickeners 7 and 8
310-PI-005	Area 310-5 Flocculant Metering
320-PI-001	Area 320-1 Tailings Sump and Tailings Pond
410-PI-001	Area 410-1 Uranium SX Polishing Filters Feed System
410-PI-002	Area 410-2 Uranium Polishing Filters
410-PI-003	Area 410-3 Polishing Filter Precoat and Body Feed System
420-PI-001	Area 420-1 Uranium SX Feed Tank and Raffinate Tank
420-PI-002	Area 420-2 Uranium SX Extraction Train A
420-PI-003	Area 420-3 Uranium SX Extraction Train A
420-PI-004	Area 420-4 Crud Handling System
430-PI-001	Area 430-1 Uranium SX Extraction Train B
430-PI-002	Area 430-2 Uranium SX Extraction Train B
440-PI-001	Area 440-1 Uranium SX Loaded Organic and Barren Organic Tanks
440-PI-002	Area 440-2 Uranium SX Scrubber and Stripper
510-PI-001	Area 510-1 Uranium Precipitation Feed Tank and Thickener
510-PI-002	Area 510-2 Uranium Precipitation Tanks 2, 3 and 4
510-PI-003	Area 510-3 Uranium Precipitation Tanks 5 and 6
530-PI-001	Area 530-1 Uranium Drying and Packaging
530-PI-002	Area 530-2 Yellowcake Packaging
610-PI-001	Area 610-1 Vanadium Oxidation

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

610-PI-002	Area 610-2 Vanadium Oxidation
610-PI-003	Area 610-3 Vanadium Polishing Filter and SX Feed Tank
620-PI-001	Area 620-1 Vanadium SX Extraction Train A
620-PI-002	Area 620-2 Vanadium SX Extraction Train A
630-PI-001	Area 630-1 Vanadium SX Extraction Train B
630-PI-002	Area 630-2 Vanadium SX Extraction Train B
640-PI-001	Area 640-1 Vanadium SX Loaded Organic and Barren Organic Tanks
640-PI-002	Area 640-2 Vanadium SX Scrub, Strip and Regeneration
710-PI-001	Area 710-1 Vanadium Conversion
710-PI-002	Area 710-2 Vanadium Precipitation
730-PI-001	Area 730-1 Vanadium Filtering and Drying
730-PI-002	Area 730-2 Vanadium Fusion
730-PI-003	Area 730-3 Vanadium Packaging and Dust Scrubber
810-PI-001	Area 810-1 Reagents Sulfuric Acid
820-PI-001	Area 820-1 Ammonium Sulfate Storage
820-PI-002	Area 820-2 Ammonia Storage and Vaporizer
830-PI-001	Area 830-1 Sodium Hydroxide Storage and Dilution Tank
840-PI-001	Area 840-1 Sodium Carbonate Storage and Make-Up
850-PI-001	Area 850-1 Flocculant Mix and Supply System
860-PI-001	Area 860-1 Kerosene Storage and Organic Make-Up
870-PI-001	Area 870-1 Sodium Chlorate Make-Up and Storage
870-PI-002	Area 870-2 Hydrogen Peroxide Storage
910-PI-001	Area 910-1 Raw Water Storage Tank with Fire Water
910-PI-002	Area 910-2 Process Water Tanks
910-PI-003	Area 910-3 Raw Water and Gland Water Distribution
920-PI-001	Area 920-1 Steam Boilers

2.0 PROCESS OPERATION

The Piñon Ridge Project is designed to treat 1,000 short tons of ore per day and to produce both uranium in the form of the yellow uranyl peroxide ($UO_4 \cdot nH_2O$) referred to as U_3O_8 or yellowcake, and vanadium in the form of vanadium pentoxide (V_2O_5).

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

The ore would be trucked from various pits in the area and stored on a 5 acre stockpile pad. This arrangement is designed to allow toll-milling of ores and optimization of circuit conditions for each ore.

Ore would be ground in a SAG Mill in closed circuit with a vibrating screen. Screen oversize would be returned to the mill and screen undersize passed to the leach circuit.

In the leach circuit, the ore would be mixed with concentrated sulfuric acid and sodium chlorate in a leach train of eight tanks. The uranium and vanadium bearing solutions would be washed from the solids in an 8-stage CCD circuit.

CCD underflow would be pumped to the tailings dam where clear solution would be decanted from the tailings and returned to the plant. The CCD overflow would pass through a pre-leach thickener and clarifier and then to the uranium SX circuit.

The uranium SX feed would be cleaned in one of two polishing filters. Uranium would be recovered from the solution in two parallel solvent extraction circuits. The loaded uranium organic would be stripped to produce a concentrated uranium bearing solution. The uranium would be precipitated as yellowcake (U_3O_8), in the form of uranyl peroxide, filtered, dried and then packed into drums for shipment.

The raffinate from the uranium circuit would pass to the vanadium circuit. The vanadium would be oxidized in a series of six tanks—a three tank adjustment circuit followed by a three tank retention circuit. The vanadium leach liquor would be cleaned in a polishing filter and the vanadium recovered in two parallel solvent extraction circuits. The loaded vanadium organic would be stripped to produce a concentrated vanadium bearing solution. The vanadium would be precipitated, converted, and cast into flakes for packaging and shipment.

The tailings impoundment is designed to consist of a number of tailings cells and evaporation ponds. The areas would be equipped with a leak detection system that would be monitored from the main plant control room.

3.0 CONTROL SYSTEM ARCHITECTURE

The plant would be monitored and controlled from a central control room using a Process Control System (PCS). The PCS would provide automatic control of the circuit, regulatory and supervisory control of the process, configuration of batch processing operations, an operator interface and historical data storage.

3.1 Process Control System (PCS)

The PCS is a complete plant control system. The PCS would be a distributed control network consisting of input/output (I/O), processors, and operator interface. The I/O and processors would be in the main electrical rooms of the plant and therefore the PCS would be divided by process area.

The analog signals would be mostly 4-20 mA with HART protocol and digital I/O would be 24 V DC. Motors and drives would be controlled by intelligent motor control relays and communicate to the Distributed Control System (DCS) through DeviceNet.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

Any vendor packages would be fully integrated into the PCS and would communicate using Modbus protocol. Vendor packages that are part of the main process stream— not just services—would require a hardwired interlock signal from the control system to run. All packages must have an active heartbeat to the control system to monitor communications and take action on a loss of control.

3.1.1 Instrumentation Ratings

The solvent extraction area of the plant would be rated Class 1 Div Group D due to flammable vapor from the solvent. This area will require explosion proof instrumentation and barriers for I/O connections. Intrinsically safe equipment would not be required.

3.1.2 Networks

The PCS would use a dedicated network to connect processors, operator interfaces and servers. The plant would have a network ('plant local area network (LAN)') for general computing needs and the phone system. The connection between the control and plant LAN networks would be controlled by a firewall. The objective would be to maintain the security and integrity of the control network. The exact structure of the firewall would depend on the PCS vendor's recommended architecture.

The firewall would only permit access to the data historian from specific clients on the LAN and for remote access to an engineering station. All other access between the networks would be forbidden. There would be no internet or plant LAN access from the control system computers.

3.1.3 Printers

The control network would include a color laser printer in the central control room for operator graphics and diagnostics. A black and white laser printer would be installed with the engineering station for documentation.

3.2 Operator Interface

The plant would be operated from a central control room equipped with three dual-head operator workstations. These workstations give the operators access to real-time and historical data from the process.

There would also be an engineering station that could be used as an operator workstation but would be primarily intended for programming and maintenance. There would be two additional engineering stations added to the system for commissioning.

The functions available at each workstation would be controlled by password access to four levels of security.

OPERATOR	Visualize and operate all areas of the plant.
SUPERVISOR	All OPERATOR rights plus temporary overriding of process interlocks.
MAINTENANCE	All SUPERVISOR rights plus control configuration, tuning and functions related to field devices and hardware.
ENGINEER	Unrestricted rights to the entire system including system configuration.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

3.3 Data Historian

The data historian would be used by the operators for normal operation of the plant and by the engineering staff for analysis and optimization of plant performance. The historical data would be accessed by client software from computers on the main plant network. A firewall would be configured to only allow traffic between the client software and the historian.

The data historian would be essential for recording and analyzing toll-milling of different ores. The data would be needed for accounting of toll milling batches and optimization of process conditions for different ores. The data will be accessed through an Excel add-in, which would permit the development of any tools and reports required for plant operation.

The data historian should store data based on a user-defined deadband and minimum sampling frequency. The historian must be expandable up to at least 400 GB of compressed historical data and permit archiving of the data to DVD, tape, or equivalent.

The historian client software should have functions for browsing data points, retrieving data interpolated to equal time intervals and summary functions such as average and sum. All data stored in the archive should include the data quality.

3.4 Closed-circuit Television (CCTV)

There would be two CCTV systems: process and security, both would be able to watch images from any camera.

The process cameras would be connected over Ethernet to a central matrix in the main control room. The control room operator would have control of any pan-tilt-zoom (PTZ) functions. The CCTV images will be displayed on dedicated monitors in the control room. CCTV software would permit image tiling and automatic scanning. The CCTV matrix would have a network port to make the images available to the plant LAN or control network if required. It would be possible to add a recording device to the CCTV system with cameras connected to the matrix using fiber from the main plant infrastructure.

The security cameras would be a separate CCTV system with its own matrix and controls in the security offices. The process and security CCTV matrices would be connected over Ethernet to permit the exchange of images.

4.0 CONTROL PHILOSOPHY

The PCS would be used for monitoring and control of the process and for safe operation of the plant as well as the protection of personnel, equipment and the environment. This section defines the philosophy and terminology used to describe the plant operation.

4.1 Operating Philosophy

The overall operating philosophy of the plant would be that the process is sufficiently instrumented to allow automatic operation under normal, stable conditions. However, the plant would not be fully automated so that switching process streams and similar changes would require manual intervention

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

and verification. This means that with the current philosophy, some interlocking of pumps and flows would rely on operator actions in the field without feedback to the control system.

4.2 Operational Modes

The plant would be intended to be operated from the central control room and local control would be provided in the uranium and vanadium packaging areas for their respective systems. The following terms are used to define various types of controls. The mode of a device would be shown on the operator interface. When the device is not in the normal operating mode, this indication would be more noticeable than the normal mode.

4.2.1 Control Source

The control source would be selected from the operator interface.

LOCAL MODE	The device would be operated from controls in the field such as pushbuttons. Local mode would be intended for maintenance functions only and would not be the normal operating mode.
REMOTE MODE	The device would be operated from the control system through the operator interface or by logic in the controller.

For safety, all stop functions would be active in all modes. A device in local could only be started from the field and a device in remote can only be started through the PCS.

All start signals would be conditioned in the PCS regardless of mode to apply appropriate interlocks.

4.2.2 Device Control Modes

MANUAL	The device would be controlled by an operator's manual actions.
AUTOMATIC	The device would be controlled by logic.

A control loop would have the following modes:

MANUAL	The loop output would be entered by the operator.
AUTOMATIC	The loop set point would be entered by the operator and the output calculated by the control loop.
CASCADE	The loop set point would come from the output of another or calculation.

4.2.3 Interlock Types

Interlocks refer to PCS inputs or logic that would be used to control the operation of devices. In general all interlocks must default to a state that would drive the process to a safe state. Any interlocks that are uncertain or have bad quality signals would be assumed to be in the fault state. The system would be intended to make operating with bypassed interlocks inconvenient and noticeable.

HARDWIRED INTERLOCK	A signal wired directly to the motor control relay. Hardwired interlocks may be required by construction codes or for fundamental safety. The states of these values would be reported to the PCS for diagnosis.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

These interlocks could only be bypassed by inserting jumpers in the field which should never be required.

SAFETY INTERLOCK	A PCS input or logic required for the safe operation of a device and equipment protection. These interlocks cannot be bypassed except by changing the control logic.
PROCESS INTERLOCK	A PCS input or logic required for the normal operation of a device in the process. In local mode process interlocks could be bypassed. In the transition to remote mode, all process interlocks would be activated.
PERMISSIVE	A condition that must be true for a device to change state but when the state has changed it would be ignored. Examples would be a mill motor start permissive of no high temperature alarms or a cyclone valve close permissive of at least the minimum number of cyclones still open.

All interlocks, except permissives, would be latched in the control system and require acknowledgement by the operator. Motor controls would only start on a direct start command and would not be set to trigger when an interlock clears or is acknowledged.

4.3 Motor Control

Motors and drives would normally be controlled from the control system over a DeviceNet link to the control system. If the DeviceNet link is not functioning, the drive could only be operated by a manual override from the motor control relay. This structure ensures that all safety and process interlocking would always be in place during normal operation to provide safe operation and equipment protection.

Motor controls would be built to show the operator the status of all interlocks and permissives. The cause of the last trip would be identified in the logic and displayed on the operator interface and would reset each time the motor restarts.

Motors would typically have only four states:

NOT AVAILABLE	No control power or locked out.
NOT READY	Stopped and not ready to start due to interlock or permissive.
READY	Stopped and ready to start.
RUNNING	Motor running.

4.4 Valve Control

Valves would be controlled by the PCS. All valves would be installed and configured with a fail-safe position in the event of PCS, power, or air failure that drives the process to a safe state. Valve controls would use feedback of actual valve position where possible. The operator interface would display the state of any valve interlocks.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

4.5 Sequences

Sequences would be constructed using International Electrotechnical Commission (IEC) 61131-11 compliant Sequential Function Chart (SFC) structures. The sequences would be used where appropriate for frequently repeated series of control actions. All sequences must include feedback for the operator of the current step and status of the sequence. All transitions must be configured with an alternative path in the event of the failure of an action that drives the process to a safe state. Where possible, large sequences should be broken into smaller components that can be activated from a supervisory sequence. For example, if a pump with inlet and outlet valves is part of a sequence, the pump start/stop can be made into a smaller sequence called from the main process sequence.

4.6 Control Loops

Analog control loops must be built to include the following features:

- Output limiting in automatic and optionally in manual mode
- Anti-windup logic
- Parallel proportional-integral-derivative (PID) algorithm
- Output tracking
- Feed-forward inputs
- Process variable filtering
- Controller derivative action on process variable only, not set point
- Set point rate limiting

Cascade loops require the following features:

- Master loop tracking when slaves are not in cascade mode
- Output configurable in the range and units of the slave loop measurement

4.7 Alarm Philosophy

The alarm philosophy would follow the latest Instrument Society of America (ISA) and Engineering Equipment and Materials Users' Association (EEMUA) guidelines on process control system alarms and include the principles of Abnormal Situation Management (ASM). The alarm philosophy must be applied to the design and configuration of all control logic. A well-structured alarm system would save significant time and money during commissioning and operation. The general principles are:

- Alarms would be items requiring an operator action.
- Alarm saturation should be avoided.
- Unnecessary alarms should be inhibited automatically through control logic.
- Alarms would be prioritized using the following structure:
    - PRIORITY 1 Immediate operator action required to prevent injury or loss.
    - PRIORITY 2 Operator action required to correct an abnormal situation.
    - PRIORITY 3 Operator action required to avoid an abnormal situation.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

- PRIORITY 4 Abnormal situation recorded but not annunciated.
- PRIORITY 5 System fault alarms.

5.0 FUNCTIONAL DESCRIPTION

This section describes the operation and process controls that would be applied in each area of the plant.

5.1 Area 110 ROM - Coarse Ore Storage and Reclaim

Ore from the Piñon Ridge mine or trucked in from other sources would be stored on a 5-acre ore pad. Trucks would tip ore over a dump wall where a front-end loader would take the ore to the stockpile or mill feed hopper. Dump lights would be used to tell the truck driver if it is permitted to dump. The lights would be red when equipment is present inside the dump pocket or there is a downstream process restriction. The dump wall would be the boundary of the restricted area so that trucks stay outside this boundary and, as a result, do not require decontamination.

A loader would feed ore into a coarse ore hopper that would feed an apron feeder. The hopper design incorporates a grizzly and a mobile rock breaker that would be used to break up large pieces of ore. The apron feeder would discharge onto the SAG Mill feed conveyor and the apron feeder's speed would be controlled by the SAG Mill feed conveyor weightometer.

5.2 Area 120 SAG Mill Grinding and Screening

Ore would be ground in a fixed speed SAG Mill in closed circuit with two vibrating screens. The screen undersize would be pumped to the leach feed storage tanks.

The SAG Mill usually would be fed at a fixed rate and the SAG Mill bearing pressure and power draw would be monitored. The SAG Mill lubrication system logic would be defined by the mill vendor.

Water would be added to the SAG Mill feed chute in ratio to the feed to the mill to maintain the SAG Mill discharge density at an optimum value to be determined during commissioning (typically in the range of 65–75 percent solids by weight).

The SAG Mill would discharge through a trommel screen. The trommel screen oversize (mill scats) would be directed to a storage hopper that would be emptied periodically. Trommel screen undersize would flow into a sump where water would be added and slurry pumped onto two vibrating screens. The screen feed density and flow would be measured. Process water returned from the uranium and vanadium product filters would be stored in a tank and would be used as sump dilution water and the use of recycled water would be maximized and raw water consumption minimized.

5.3 Area 130 Leach Feed

SAG Mill screen undersize would be pumped, alternately, into the two pulp storage tanks. This way, while one tank is being filled, the other would be used to feed the leach circuit. The leach feed would be sampled and the flow and density measured for metallurgical accounting.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

5.4 Area 210 Pre-leach

Leach feed slurry would be mixed with overflow solution from the CCD circuit to recover fast leaching uranium and vanadium. The slurry would flow through two pre-leach tanks; the solids and solution would be separated in a thickener and clarifier. The solution would be pumped to the uranium polishing filters preceding the uranium solvent extraction circuit and the solids would be pumped to the leach circuit.

The hydrogen concentration (pH) in each pre-leach tank would be monitored. Pre-leach Tank 2 would overflow to the Pre-leach Thickener. Flocculant would be added to control the settling rate of solids indicated by the level of the thickener interface. A local control panel would measure the thickener torque and raise and lower the rakes automatically.

5.5 Area 220 Leach Train

Slow leaching uranium and vanadium would be leached from the ore in a series of eight tanks. Slurry from the Pre-leach Thickener underflow would be pumped into the first or second leach tank and then flow by gravity through the remaining tanks. The leached slurry would be pumped to the CCD circuit to wash the leached uranium and vanadium minerals from the slurry and concentrate the values in the solution.

Steam, sodium chlorate, and concentrated sulfuric acid would be added to the first four leach tanks to carefully control the free acid concentration, oxidation/reduction potential (ORP) and temperature. Steam would be added to the other four tanks to control temperature. The ORP would be measured in the last two leach tanks only. Conductivity would be used to infer free acid concentration in the first three leach tanks and control acid flow. The relationship between conductivity would be determined during initial operation.

5.6 Area 310 CCD Thickeners

The leached slurry would be washed in the CCD circuit for solid/liquid separation and recovery of dissolved uranium and vanadium. The circuit would be comprised of eight thickening stages with a wash ratio of 2.3 tons of wash water per tons of solids feed.

The underflow from each thickener would be pumped to the next stage downstream and the underflow from stage eight pumped to the tailings sump. The overflow from each thickener would be pumped to the feed box of the upstream thickener where it would dilute the feed to the thickener and the flocculant. The overflow from the first CCD thickener would be pumped to the pre-leach tanks.

Tailings return water would be added to the last thickener in an operator defined ratio to the mass flow of solids entering that thickener to ensure the wash ratio is maintained at all times and the loss of soluble product would be minimized.

The mass of the bed in each thickener would be measured to show the operator the distribution of solids around the CCD circuit allowing the operator to detect any uneven distribution of solids and make the necessary corrections.

Flocculant would be added to each thickener according to manual settings and underflow pumps would be controlled by the density of the underflow stream.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

5.7 Area 320 Tailings Sump and Tailings Pond

The underflow of the last CCD thickener would consist of leached solids with practically all product bearing solution washed out of the slurry and would be pumped to the tailings collection box. The slurry would be sampled and flow by gravity into the tailings sump. These tailings would be pumped to tailings impoundment cells. Water would be recovered from the dam by barge pumps and pumped to the plant return water tank.

The cells would be equipped with a leak collection recovery system designed by others.

5.8 Area 410 Uranium Solvent Extraction Feed

The Pre-leach Clarifier overflow would be filtered in one of two polishing filters to remove any remaining entrained solids before passing to solvent extraction for recovery of dissolved uranium and vanadium.

The filter would use diatomaceous earth (DE) to coat the filter media and remove fine solids. Each filter would operate in an automated cycle. The filter media would be contained inside a pressurized vessel that contains the force to push the filtrate through the filter media (called the 'septum').

The filter would be first coated with a defined thickness of DE. The filter feed would be switched to clarifier overflow dosed with DE to ensure a fresh filter media surface at all times. The filter would run in this mode until the pressure drop reaches a maximum value. At this point the feed would be shut off and the DE discharged from the filter and flushed to the area sump pump to be pumped to the tailings collection box.

5.9 Area 420 Uranium Solvent Extraction Train A

Uranium would be extracted from the leach solution in the solvent extraction circuit.

The filtered uranium-bearing ('pregnant') solution from the polishing filters would be stored in a tank. The solution would be contacted with an organic solvent that would selectively extract the uranium compounds from the solution. The barren solution (raffinate) would be pumped to the vanadium circuit and the loaded organic sent to the stripping circuit. There would be two parallel solvent extraction lines. A common crud handling system would be installed to periodically treat batches of solvent and remove solids accumulations.

There would be four stages of solvent extraction. Each stage would consist of a mixer/settler unit where organic and aqueous phases would be contacted in two mixing chambers—the primary and secondary mixers. The organic and aqueous phases would then be allowed to separate in the settler area where they would flow into separate launders.

Barren organic flows counter-currently to the pregnant solution so that the lowest grade pregnant solution would be contacted with the lowest loaded organic, driving the equilibrium shown below to the right and maximizing extraction.

The SX trains would be controlled to keep the correct organic to aqueous ratio ("O:A") in each unit. This would be controlled manually using a valve that would recirculate organic from the discharge launder to the primary mixer. All the control would be rooted in the feed flow of pregnant liquor. This

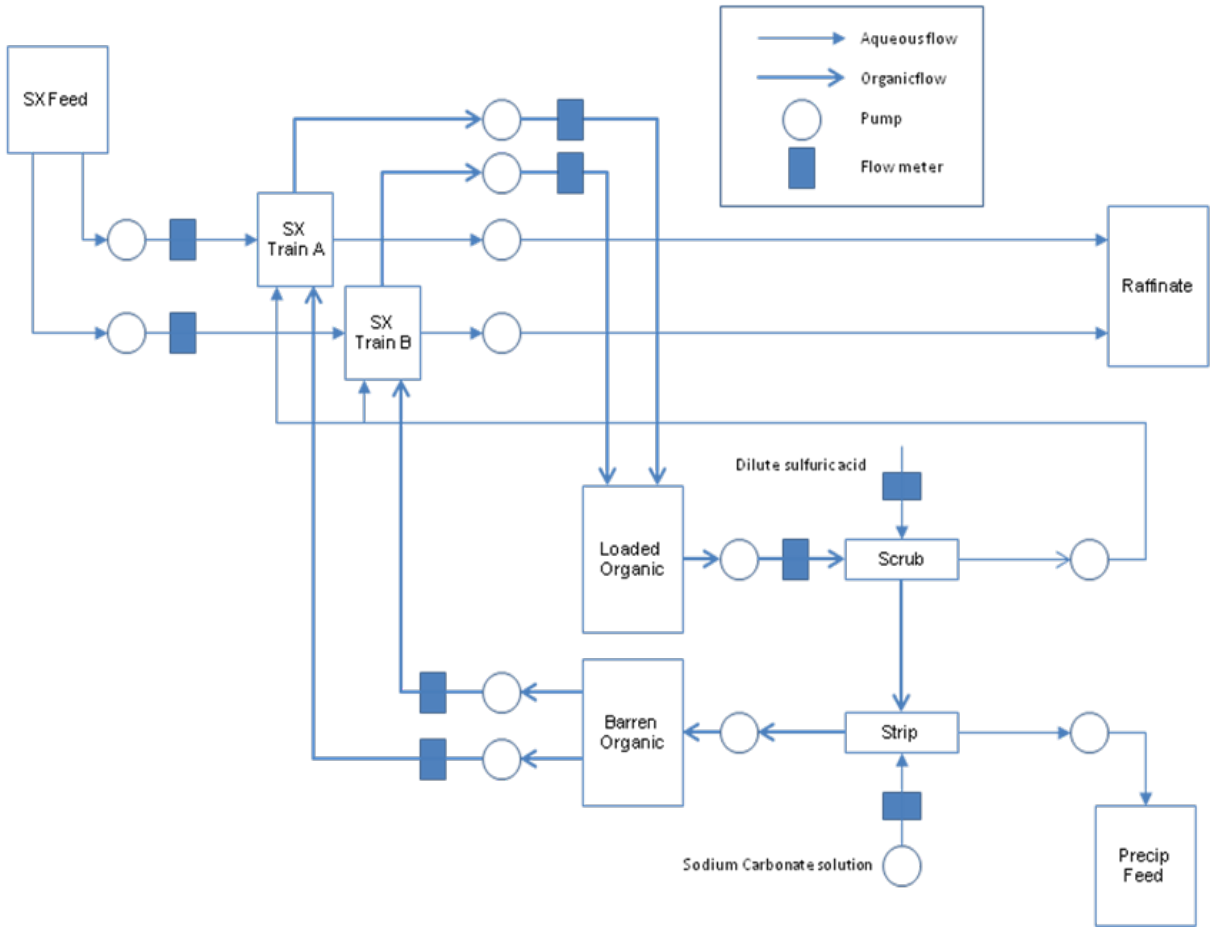
USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

would be controlled to an operator defined set point based on the current and expected production level, uranium loading of the leach solution, and the level in the SX feed tank. The flow rate of barren organic to the extraction circuit would be set in ratio to the leach liquor flow and its loading. The circulation of organic and aqueous through the SX and scrub/strip circuits would be controlled to maintain a steady balance in the circuit.

The Piñon Ridge layout would require that organic and aqueous streams be pumped into and out of each section (Figure 1). The flows in and out must therefore be balanced by controlling the speed of the outlet pumps with the level in the overflow launders.

Figure 1

SOLVENT EXTRACTION CIRCUIT



USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

5.10 Area 430 Uranium Solvent Extraction Train B

The second solvent extraction line would operate in parallel with Train A (Section 5.9) using the same principles of operation.

5.11 Area 440 Uranium Solvent Extraction Loaded Organic

Uranium would be recovered from the organic in the scrub/strip circuit. The organic would be pumped through the scrubber mixer settler to remove impurities and then through the stripper mixer settlers and then back to the barren organic tank.

The loaded organic from both uranium solvent extraction trains would be stored in a tank preceding the scrub/strip mixer settlers. The uranium would be removed from the organic to make a concentrated aqueous solution ("pregnant liquor") by contacting the organic with a carbonate solution at a slightly elevated pH. The barren organic would be returned to the solvent extraction trains. The pregnant liquor would be sent to the uranium precipitation circuit.

The loaded organic would be first scrubbed with dilute sulfuric acid to remove impurities such as iron and silica before stripping. The scrubbing solution would be pumped to the head of the solvent extraction circuit to recover any uranium.

Uranium would then be stripped from the organic. The barren organic would be stored for reuse in the extraction circuit. Careful control of the pH would be essential for effective stripping.

The scrubbing and stripping circuit would be operated to keep the solvent extraction circuit supplied with barren organic without an unnecessary accumulation of loaded organic. The scrub/strip circuit would have a fixed design flow and the amount of loaded organic would depend on how many SX trains are running. The scrub/strip circuit might run intermittently depending on the amount of loaded organic accumulated and amount of barren organic available; this would be dependent on whether one or two extraction trains are running.

Under normal operating conditions, the levels of loaded and barren organic tanks should be stable. Should there be a sustained increase or decrease in levels, the operator would know the stripping flow is not in balance with the solvent extraction flow.

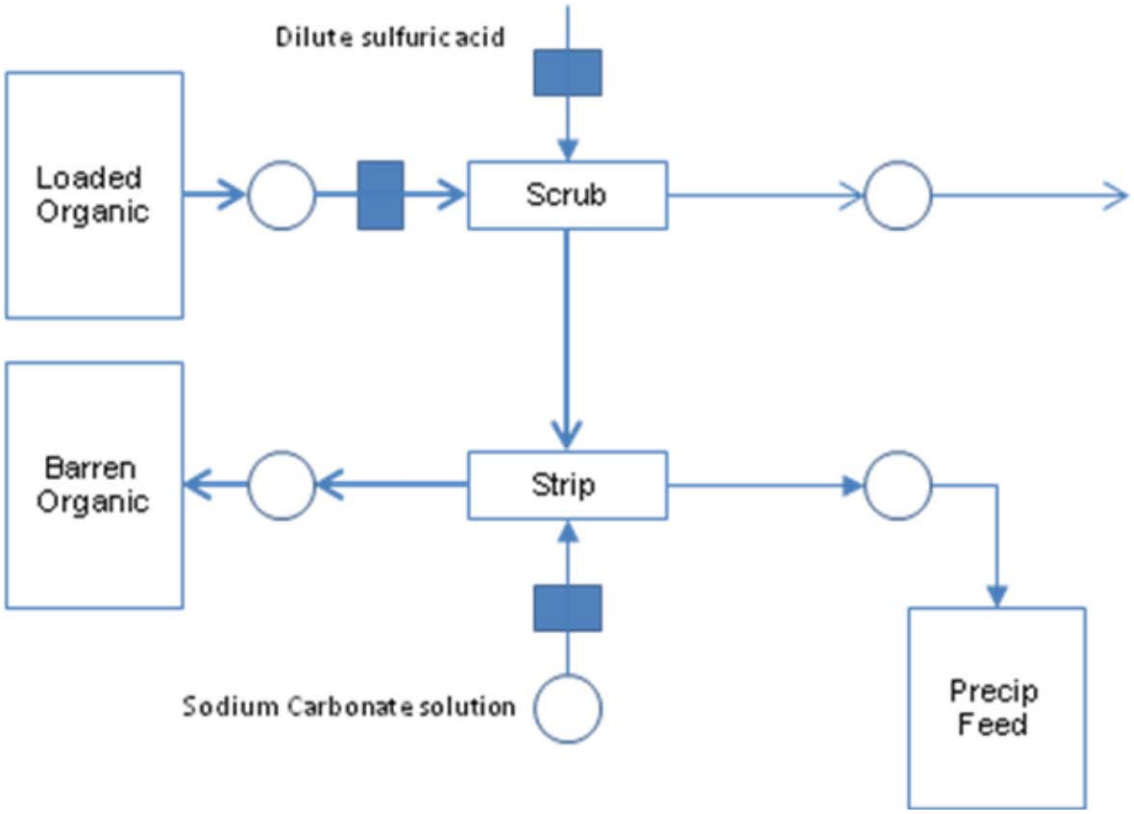
The arrangement of the pumps and flow meters in the circuit is shown in Figure 2. The pumps and mixer speeds would be controlled to keep the mixer/settler interface levels steady and the flows at the design rate. The feed rate of loaded organic to the scrubber would be controlled at an operator defined set point.

The O:A ratio would be controlled in each cell by the recirculation of aqueous from the product launder back to the primary mixer. The speed of the outlet pumps would be controlled by the level in each product launder.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

Figure 2

SCRUB/STRIP CIRCUIT



5.12 Area 510 Uranium Precipitation

Uranium would be precipitated as hydrated uranium peroxide from the pregnant liquor using hydrogen peroxide.

Pregnant liquor from the SX circuit would be pumped through a train of five tanks. Sulfuric acid would be used in the first tank to control the pH and eliminate any sodium carbonate left over from stripping. Hydrogen peroxide would be added into the second tank according to the uranium loading of the pregnant liquor.

Approximately 20 percent of the pregnant liquor flow would be pumped to the third precipitation tank. This flow and sulfuric acid would be used to control the pH around 4.2 for optimum precipitation conditions and filterability of the precipitate.

The uranium peroxide precipitate would be sent to a thickener and the thickener overflow would be pumped to the process water tank.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

5.13 Area 530 Uranium Drying and Packaging

Uranium peroxide precipitate would be recovered on a belt filter and the filtrate sent to the thickener to recover any remaining precipitate. The filter cake would be washed on the filter and then dried. The drying process would drive off water but would not convert the uranium peroxide. The temperature profile along the dryer and speed of the dryer would be set by the operator to achieve optimum product quality. The product ("yellowcake") would then be packed into drums by an automated system for shipment. As the material was being packaged, an automated sampler would take "grab" samples to be assayed.

The mass, content, source, and other production data for each drum would be stored in the PCS historian for accounting and process analysis and the drums labeled with the necessary regulatory and shipping information.

The sealed uranium area would be operated with all handling equipment and transfer points well ventilated to prevent uranium dust. The vent gases would be thoroughly scrubbed and monitored before being vented to the atmosphere.

5.14 Area 610 Vanadium Oxidation

Vanadium would be leached from the ore at the same time as uranium. The vanadium would be oxidized to the pentavalent state using sodium chlorate and ammonia to control pH and ORP so the vanadium could then be selectively recovered by solvent extraction.

Raffinate from the uranium solvent extraction circuit would be pumped into the vanadium oxidation circuit at an operator defined flow rate. The oxidation circuit would consist of five agitated tanks in series followed by a storage tank. The ORP would be measured in all five tanks and would control sodium chlorate addition to the first three tanks. The pH would be measured in the first four tanks and would control ammonia gas injection to those tanks. The temperature would be measured in the first three tanks. The control strategy would take into account the feed flow rate and the interaction between pH, ORP, and temperature to provide optimum conditions for vanadium oxidation.

The vanadium bearing solution would be cleaned in a polishing filter and stored in a tank for SX feed. The temperature of the vanadium oxidation tanks would be monitored to ensure the solution is not too hot for solvent extraction.

5.15 Area 620 Vanadium Solvent Extraction Train A

Vanadium would be selectively extracted from the leach solution in the solvent extraction circuit.

Each vanadium solvent extraction train would consist of five mixer/settlers and a raffinate settler. The pH would be measured in the aqueous discharge of the first four mixer/settlers and controlled by sparging ammonia gas into the aqueous feed. The pH would be controlled in the fifth mixer/settler by adding sulfuric acid. The barren organic returned from the strip circuit would be alkali and must be neutralized before it could be used in extraction.

The feed flow to each SX train would be set by the operator. The flow of barren organic would be controlled in ratio to the leach solution concentration and flow rate.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

Similarly to the uranium SX circuit, the products would be pumped out of the circuit. The levels in the raffinate settler aqueous and organic overflow launders would control the speed of the aqueous and organic pumps respectively.

The vanadium raffinate would be pumped to a storage tank and from there it could be pumped to the polishing filters, evaporation ponds or tailings. The flow to the evaporation pond would be measured for environmental monitoring and reporting.

5.16 Area 620 Vanadium Solvent Extraction Train B

The second vanadium solvent extraction train would be operated in parallel with the first and use the same control philosophy.

5.17 Area 640 Vanadium Solvent Extraction Loaded Organic

Vanadium would be stripped from the loaded organic to produce a sodium decavanadate solution, that would be suitable for recovery of vanadium oxide product.

The loaded organic from solvent extraction would be stored in a tank and pumped through the scrub/strip circuit at an operator defined flow rate. The organic would be first scrubbed with dilute sulfuric acid controlled to a pH of about 2.5 that would remove impurities, particularly dissolved base metals.

The organic would then be contacted with a sodium carbonate strip solution in three stages. An operator defined flow of sodium hydroxide would be injected into the third stage. Sodium carbonate would also be added to the third stage and the flow would be controlled by the pH measured in the first stripping stage. The target pH of the first stage would be about 8.5.

Barren organic would be pumped to a storage tank that could be used in extraction and the striped liquor would be pumped to vanadium conversion.

5.18 Area 710 Vanadium Conversion and Precipitation

Vanadium would be recovered from the strip solution by converting to metavanadate and would be precipitated as ammonium metavanadate.

The strip solution from solvent extraction would be stored in a tank and processed in batches for precipitation. The objective would be to provide the correct chemical and physical conditions for precipitation that would give a product that could be handled easily and with little loss or environmental contamination.

The strip solution would be pumped continuously into the first precipitation tank where steam would be injected to control the temperature at 149°F. Ammonia gas would be injected to neutralize the solution which would convert the decavanadate in the strip solution to metavanadate.

The solution would then be pumped to one of three precipitation tanks where it would be treated in batches. An operator defined quantity of ammonium sulfate solution would be added to each batch and the solution would be allowed to cool. Ammonium metavanadate would crystallize from the solution.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

After the batch processing time is complete, the tank agitator would be stopped and the precipitate would be allowed to settle to the bottom of the tank. The solids would drain onto a belt filter and the solution would be decanted off to the process water tank. A fourth tank would be used to blend a bad batch of precipitate with a good batch to allow for good belt filtration.

The precipitation would be operated as a sequence with time and dosage parameters set by the operator.

5.19 Area 730 Vanadium Filtering, Fusion, and Packaging

The ammonium metavanadate precipitate would be dried and then heated to covert it to vanadium oxide that would be melted and cast to produce flakes that would be packaged for shipment.

Vanadium product filtering and packaging would be primarily a batch operation run manually.

As each batch of vanadium precipitate is finished, the precipitation tank would be drained onto a belt filter running at an operator defined speed. The filtrate would be pumped to the process water tank and the solids conveyed directly into a dryer. The operator would set the speed and temperature profile of the dryer to give a product that could be easily handled in the conversion kiln.

The dried precipitate would be stored in a hopper that would feed a diesel-fired rotary kiln. In the kiln ammonia would be driven off to produce a vanadium oxide product. Kiln temperature would be controlled by the operator to give complete conversion.

The product from the kiln would be melted in a fusion furnace and then poured onto a water cooled casting wheel to produce flakes which would be fed into an automated packaging system. As the material was being packaged, an automated sampler would take “grab” samples to be assayed.

The mass, content, source, and other production data for each drum would be stored in the PCS historian for accounting and process analysis and the drums labeled with the necessary regulatory and shipping information.

The sealed vanadium area would be operated with all handling equipment and transfer points well ventilated to prevent vanadium dust. The vent gases would be thoroughly scrubbed and monitored before being vented to the atmosphere.

5.20 Area 800 Reagents

The reagent area would be comprised of equipment for receiving and preparing reagents for use in the process. The operation would be primarily manual except where the preparation of fresh batches of reagent from a concentrated feed stock could be automated.

Concentrated sulfuric acid would be received by tanker and stored in storage tanks and the acid would be pumped continuously around a header for use in the plant.

Ammonium sulfate would be delivered as a solid. Batches of ammonium sulfate solution would be prepared automatically as needed.

Ammonia liquid would be delivered to the plant by tanker and stored under pressure. The liquid would be pumped into a vaporizer to provide ammonia gas for the plant. The pressure in the plant header would automatically control the vaporizer and its feed pumps.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

Concentrated sodium hydroxide would be added to a storage tank where it would be diluted down to the required concentration for use in the plant.

Sodium carbonate would be delivered to the plant by tanker and put into solution at an operator defined concentration for storage. Batches of dilute sodium carbonate would be prepared automatically as needed.

Flocculant would be prepared by an automated system based on the level in the flocculant storage tank.

Kerosene and organic solvent would be stored in tanks. Fresh solvent would be pumped into the barren organic tanks as required.

Concentrated sodium chlorate would be delivered to the plant by tanker and stored in a stock tank. The solution would be pumped over to a storage tank and diluted to an operator defined concentration for use in the process.

Hydrogen peroxide would be delivered by tanker and stored in a tank for use in the process.

5.21 Area 910 Water

The water system would be designed to consume the minimum amount of fresh water and maximize re-use of process water. Water treatment and storage would be a critical environmental responsibility and would be carefully monitored and controlled.

Raw water would only be used where clean water would be necessary. The water would be stored in a large tank. The top part of the tank would be for raw water storage and the bottom part of the tank for fire water storage that would feed a diesel and a jockey fire water pump.

A water treatment system would be used to treat raw water to produce non-potable water for sinks and showers. Potable water would be supplied from an outside source (vendor).

Process water would be recycled from the tailings dam and used as feed to the CCD circuit. Process water from product belt filters and precipitation would be recycled to the process water tank and used in SAG Mill discharge sump.

5.22 Area 920 Steam

Three automated boiler packages would provide steam for process heating and drying.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

Appendix B – Process Design Criteria

The source of this appendix is the Piñon Ridge Project Basic Engineering Report prepared by CH2M HILL Engineers, Inc., dated February 4, 2009 (CH2M HILL 2009).

PIÑON RIDGE PROJECT

BASIC ENGINEERING

ENERGY FUELS RESOURCES CORPORATION

PROCESS DESIGN CRITERIA

MM-2600-DC-001

Project No. 365541

Rev. No.	Issue Date	Revision Subject	Discipline Approval	Management Approval	Client Approval
A	04/01/08	Initial Issue	CBB	MDSB	
B	05/19/08	Issued for Review	CBB	MDSB	
C	06/10/08	Issued for Approval	CBB	MDSB	
D	10/05/08	Issued for Basic Engineering Draft Report	CBB	MDSB	
E	02/04/09	Issued for Basic Engineering Report	CBB	MDSB	

TABLE OF CONTENTS

1.0 GENERAL 1
1.1 Introduction 1
1.2 Source Codes 1
1.3 Definition of Design Value Terms 1
2.0 PROCESS DESCRIPTION 3
2.1 Introduction 3
2.2 Ore Receiving 3
2.3 Grinding 3
2.4 Pre-Leaching 4
2.5 Leaching 4
2.6 Counter Current Decantation (CCD) 4
2.7 Tailings Disposal 5
2.8 Uranium Recovery 5
2.9 Vanadium Recovery 6
2.10 Reagents Storage & Handling 7
3.0 MEASUREMENT UNITS AND SYMBOLS 8
4.0 SITE DATA 13
4.1 Location 13
4.2 Meteorological Data 13
4.3 Other Site Data 13
5.0 ENVIRONMENTAL CRITERIA 14
5.1 General Applicable Regulations and Standards 14
5.2 Special Considerations/Comments 14
5.3 Effluent, Emission, and Pollution Control Criteria 14
5.3.1 General 14
5.3.2 Air 15
5.3.3 Water 15
5.3.4 Solids 16
5.3.5 Fencing 16
6.0 DESIGN CRITERIA REFERENCE LIST 17
6.1 *Energy Fuels Resource Corporation Uranium Mill Licensing Support Climatological Report Piñon Ridge Mill Site Montrose County, Colorado* Kleinfelder Report, December 2007 17
6.2 *Autogenous and Semi-autogenous Grinding Studies on Blanding, Utah, Operation Ores* CSMRI Report, July 1978. 17
7.0 PRODUCTION SUMMARY 18
7.1 Annual Production Parameters 18
7.1.1 Annual Production 18
7.1.2 Daily Production 18
7.2 Concentrate Grade 18

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

7.3 Recovery 18
7.4 Operating Schedule 18
8.0 CHARACTERISTICS OF PROCESS MATERIALS 19
8.1 Introduction 19
8.2 Mineralogy, Process Raw Materials 19
8.3 Chemical Composition of ROM Ore 19
8.4 Physical Characteristics of ROM Ore 19
9.0 COARSE ORE STORAGE 20
9.1 Operating Time 20
9.2 Equipment 20
9.3 Coarse Ore Stockpile 20
10.0 GRINDING 21
10.1 Operating Time and Grinding Tonnage Rate 21
10.2 Grinding Power Requirements 21
10.2.1 Work Index 21
10.2.2 Mill Power 21
10.3 Equipment 21
10.3.1 Coarse Ore Reclaim Feeders 21
10.3.2 SAG Mill Feed Conveyor 21
10.3.3 SAG Mill 22
10.3.4 SAG Mill Discharge Trommel 22
10.3.5 SAG Mill Discharge Pumps 23
10.3.6 SAG Mill Classifying Screen 23
10.3.7 Pulp Storage Tanks 23
11.0 LEACHING 24
11.1 Pre-leach 24
11.2 Leach 25
12.0 COUNTER CURRENT DECANTATION AND TAILINGS 26
12.1 Counter Current Decantation 26
12.2 Tailings 27
13.0 URANIUM SOLVENT EXTRACTION 28
13.1 Polishing Filters 28
13.1.1 Extraction 28
13.1.2 Scrub 29
13.1.3 Strip 29
13.1.4 Uranium SX pumps 29
14.0 URANIUM PRECIPITATION, DRYING AND PACKAGING 30
14.1 Uranium Precipitation 30
14.2 Uranium Recovery, Drying and Packaging 30
15.0 VANADIUM SOLVENT EXTRACTION 31
15.1 Vanadium Oxidation 31
15.1.1 Extraction 31
15.1.2 Scrub 32

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

15.1.3 Strip 32
15.1.4 Vanadium SX pumps 32
16.0 VANADIUM PRECIPITATION, FUSION AND PACKAGING 33
16.1 Vanadium Precipitation 33
16.2 Vanadium Fusion and Packaging 34
17.0 Reagents 35
17.1 Sulfuric acid (93%) 35
17.2 Anhydrous ammonia 35
17.3 Ammonium sulfate 35
17.4 Sodium hydroxide (50%) 35
17.5 Sodium carbonate (31%) 36
17.6 Flocculant 36
17.7 Kerosene (SX 12) 36
17.8 Amine (Alamine 336) 36
17.9 Isodecanol (Exxal 13) 36
17.10 Sodium chlorate (39%) 37
17.11 Hydrogen peroxide (50%) 37
17.12 Diatomaceous earth 37

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

1.0 GENERAL

1.1 Introduction

The following design criteria are for the engineering, design, and specification of the process requirements for a uranium extraction plant. These criteria encompass the following operations:

- Ore handling and grinding
- Leaching
- Counter current decantation (CCD) and tailings disposal
- Uranium solvent extraction
- Uranium precipitation
- Vanadium oxidation and solvent extraction
- Vanadium precipitation

1.2 Source Codes

The source code letters listed for each criterion refer to the origin of that criterion value. Where an integer is entered as a source code, this code number refers to specific source documents that are referenced in Section 6. In certain cases, two source codes may be referenced. The following letter code designators are used:

Code	Description
A	Criteria provided by Owner
B	Standard industry practice
C	CH2M HILL recommendation
D	Vendor-originated criteria
E	Criteria from process calculations
F	Engineering handbook data
G	Assumed data
H	Criteria provided by technology supplier
K	Metallurgical test results

1.3 Definition of Design Value Terms

The process criteria are listed as Flowsheet **BALANCE** and/or **DESIGN**. The context in which these terms are used is in accordance with the following definitions:

Annual Rate: Flow rate per 350 calendar days.

Operating Days: The number of plant operating days per year is 350 days.

Utilization: A utilization factor of unity represents the capability of, and requirement for, any equipment or facility being on-line for 24 hours per day for all operating days in the year. A utilization of less than unity reflects the combined effect of

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

allowed availability for that facility and the utilization effect from the online time of upstream or downstream equipment, or from other factors.

Flowsheet Balance: The values in the "Flowsheet Balance" column (generally flow rate) that represent the steady-state average rate during the design utilization time per operating day for any facility or equipment. Thus,

Annual Rate = Flowsheet **BALANCE** daily rate

x number of operating days per year

= Flowsheet **BALANCE** hourly rate

x 24 hours (18 hours for the conveying and grinding facilities)

x equipment utilization factor

x number of operating days per year

Where criteria flow values are for time units of less than one hour, they are intended to represent the equivalent of continuous hourly rates in the relationship above.

In accordance with this definition, all Flowsheet **BALANCE** flow rates, together with the respective utilization factors, should be consistent with a single annual mass balance.

Balance throughput of the uranium extraction plant is based on an annual ore treatment of 350,000 short tons of uranium ore.

Design Value: The criterion values in this column provide the instantaneous process criterion values that take account of flows that operate for less than 24 hours during one operating day, or where it is intended that the particular equipment will have an additional capacity to allow for maintenance, catch-up capability, or for variability in process parameters. The **DESIGN** values are intended as attainable continuous rates and do not include any additional design allowance(s), by engineer or vendor, to ensure attainment. The combinations of **DESIGN** values neither relate to the annual productions defined nor integrate to represent a metallurgical balance. The **DESIGN** values are individual rates used for sizing equipment.

The feed conveyor and grinding facilities would operate up to 18 hours per day, 350 days per year, with a design allowance of 60 percent for the conveyor facility. Leaching through solvent extraction to tailings disposal facilities will be designed to operate on a continuous basis 350 days per year, with a design allowance of 8 percent. Pumps will be designed using a design allowance of 20 percent.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

2.0 PROCESS DESCRIPTION

2.1 Introduction

The Piñon Ridge Project is designed to treat 1,000 tons of ore per day and to produce both uranium, in the form of uranyl peroxide ($UO_4 \cdot nH_2O$) which is referred to as yellowcake or U_3O_8, and vanadium in the form of vanadium pentoxide (V_2O_5). If the Piñon Ridge Mill is built according to the design provided in this Basic Engineering Report, then the plant would operate as described in the balance of this report.

The plant is designed to operate either at the nameplate capacity of 1,000 tons per day or at a reduced rate of 500 tons per day. In order to most effectively handle the reduced throughput, certain sections of the plant have been designed with two equal and parallel trains. These sections are the extraction stages of both the uranium and vanadium solvent extraction circuits.

2.2 Ore Receiving

Ore would be delivered to the Piñon Ridge plant site by truck. The trucks would drop the ore over a discharge platform where it would gravitate onto the ore pad. A front-end loader would relocate the ore from the drop zone to the appropriate stockpile area. Fixed dust mitigation water sprays would be provided, both at the upper discharge platform and at the lower drop zone. A mobile tanker would provide water sprays across the ore pad.

Ore feed to the plant would be transported from the stockpiles by means of a front-end loader, or possibly trucks, to a 50 ton subsurface feed hopper with an 12 inch by 12 inch grizzly. The feed hopper would be enclosed on three sides with the fourth side enclosed by heavy duty curtains; the enclosure would be equipped with a bag house for dust control.

The ore would be discharged from the feed hopper by means of a 36 inch wide by approximately 17 foot long apron feeder to a 42 inch wide belt conveyor which would pass the ore over a weightometer and transport it to the vibrating feeder preceding the semi autogenous grinding (SAG) Mill.

2.3 Grinding

Grinding would be accomplished in a 14 foot diameter by 5 foot effective grinding length (EGL) SAG Mill. The mill would be driven through a reducer by a 500 horsepower reversing motor, in closed circuit with two vibrating screens. One scrubber would be provided to minimize the amount of fugitive dust from the grinding circuit with a removal efficiency of 97–99 percent. The grinding circuit would be located in the main mill building. The 0.023 inch (28 Tyler mesh) vibrating screen undersize product, at 50–60 percent solids, would be sampled by a two stage vezin sampler, with interstage sample swirl tank, and then distributed to one of two pulp storage tanks. Each of these storage tanks would be 39 feet in diameter by 39 feet high and equipped with a 125 horsepower agitator.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

2.4 Pre-Leaching

From the pulp storage tanks, the slurry would be pumped to two 21 foot diameter by 24 foot high chlorobutyl rubber lined pre-leach tanks in series. Agitation in these tanks would be provided by 40 hp agitators. Prior to discharge into the tanks, the pulp would be sampled by means of an automatic, vezin sampler for mill head grade analysis. In the pre-leach tanks the pulp would react with pregnant liquor overflow from counter current decantation (CCD) thickener 1. The pre-leach or "acid kill" stage is designed to contact fresh feed ore with the excess acid in the overflow from CCD thickener 1. The addition of this pregnant liquor to the new pulp feed in the pre-leach tanks results in a pre-leach pulp density of 22–25 percent solids.

The pulp from pre-leach tank 2 would report to the 60 foot diameter, epoxy coated, pre-leach thickener. Thickener overflow would gravitate to a 50 foot diameter clarifier. Clarifier overflow would be pumped to the uranium pressure filtration system and, ultimately, would report to the uranium solvent extraction feed tank. Underflow from the pre-leach thickener would be pumped to the first leach tank online (either leach tank 1 or 2.)

2.5 Leaching

The leach train would consist of eight 21 foot diameter by 24 foot high chlorobutyl rubber lined steel tanks. The tanks would also be lined with acid bricks along the bottom and up to the height of the propeller. Each tank would be provided with a 40 horsepower agitator. The tanks are arranged in a cascading and staggered pattern to allow by-passing of individual tanks. The 21 hours of required residence time for leaching would be achieved using all eight tanks. Leaching is designed to be accomplished at approximately 185 ºF. The pulp would be heated by means of live steam sparging. The leach tanks are designed to be covered and a demister system would be provided for fume acid mist extraction from each tank using a scrubber. Sulfuric acid addition, as well as sodium chlorate oxidant addition, would be provided as necessary.

2.6 Counter Current Decantation (CCD)

Leached pulp would be pumped to a series of seven or eight 40 foot diameter, epoxy coated, CCD thickeners. The layout is designed for eight thickeners, but only seven may be constructed. The thickener circuit is located outdoors. Each thickener overflow, with the exception of the overflow from CCD thickener 1, would be pumped to a 4 foot diameter by 6 foot high thickener feed box which would feed the upstream thickener where the flow would be combined with the underflow from the appropriate preceding thickener. The CCD thickener underflows would be pumped by variable speed pumps. Individual flocculant dosing pumps would be provided to supply flocculant to the flocculant dilution box feeding each thickener. The flocculant would be diluted by a bleed stream of the thickener overflow from the subsequent thickener. The diluted flocculant stream would gravitate to a number of addition points in the thickener feed launder. Bypass piping has been designed such that both the thickener underflow and the overflow streams would be able to bypass a thickener.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

2.7 Tailings Disposal

The underflow from CCD thickener 7 or 8, a portion of the vanadium raffinate, and the backwash streams (intermittent flows) from both the uranium and vanadium polishing filters would be combined in a tailings sump of approximately 1,500 gallon capacity and would be pumped to the tailings impoundment area by means of centrifugal pumps. The combined discharge to tailings would pass through a two-stage vezin sampler. The tailings pumps discharge to a pipe line reporting to the tailings pond. The design of the lined tailings pond is by others.

2.8 Uranium Recovery

Overflow from the clarifier in the pre-leach circuit would be further clarified in one of two polishing filters. These filters would be provided with precoat and body feed make up tanks and pumps. The uranium solvent extraction (SX) feed tank would provide buffer storage between the uranium polishing filter and the A and B uranium SX circuits. The pregnant solution would be treated in a series of four stages of extraction mixer settler units. The sizes of the stainless steel settlers would be 19 feet 8 inches long, by 10 feet 5 inches wide, by 3 feet 4 inches deep. The treatment would recover uranium from the pregnant solution by using a tertiary amine extractant in an organic solvent that would flow countercurrent to the clarified solution. In the extraction section, the total mixer residence time in the two mixers would be 3 minutes. A fifth raffinate settler would be provided to reduce the loss of organic into the raffinate solution.

The reactions that would occur in the extraction section are shown below. Barren organic flows counter-currently to the pregnant solution so that the lowest grade pregnant solution would be contacted with the lowest loaded organic, driving the equilibrium shown below to the right and maximizing extraction.

$$[2R_3N]_{org} + H_2SO_4 \Rightarrow [(R_3NH^+)_2SO_4^{2-}]_{org}$$

$$[2(R_3NH^+)_2SO_4^{2-}]_{org} + UO_2(SO_4)_3^{4-} \Rightarrow [(R_3NH^+)_4UO_2(SO_4)_3^{4-}]_{org} + 2SO_4^{2-}$$

The design includes two extraction trains; therefore, buffer storage is designed for the loaded organic solution between the extraction and the scrub and strip stages.

The uranium-bearing organic would be washed in a scrubber mixer-settler with acid and water. The uranium would then be stripped from the solvent in two stripping mixer-settlers with a total of 6 minutes retention in two mixers (3 minutes in each mixer), using a sodium carbonate solution. The mixer-settlers used for washing the loaded organic and for stripping have stainless steel settlers. The sizes of these settlers would be 14 feet 9 inches long, by 7 feet 7 inches wide, by 3 feet 4 inches deep.

Uranium would be stripped from the loaded organic according to the equilibrium shown below.

$$[(R_3NH^+)_4UO_2(SO_4)_3^{4-}]_{org} + 5Na_2CO_3 \Rightarrow [4R_3N]_{org} + Na_4UO_2(CO_3)_3 + 2H_2O + 3CO_2 + 3NaSO_4$$

The uranium would be continuously precipitated from the stripping liquor in five agitated tanks arranged in series. Uranium precipitation tanks 1 and 2 would be 5 feet in diameter by 6 feet high,

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

while uranium precipitation tanks 3, 4, and 5 would be 8 feet in diameter by 8 feet high. The tanks are different in size due to the process requirements and retention times required during the crystal growth process. Precipitation would be caused by the addition of hydrogen peroxide to form yellowcake. The precipitate would then be partially dewatered and washed in a 32 foot diameter thickener. The thickener underflow would be further dewatered on a 15 foot long by 4 foot wide belt filter to produce a filter cake of approximately 35 percent moisture which would be dried in a steam vacuum dryer. The dryer would discharge cake to a holding bin for packaging. The yellowcake would be packed, weighed, and sealed in 55 gallon drums for shipment. One scrubber would be provided to treat the dryer off-gas and fugitive dust, with a removal efficiency of 97–99 percent.

2.9 Vanadium Recovery

When uranium-vanadium ores are treated, the raffinate solution from uranium recovery is prepared for vanadium recovery by oxidizing the vanadium ion species in solution with the addition of sodium chlorate, and reducing the acid concentration slightly by the addition of ammonia. The equation for the oxidization of the vanadium is shown below.

$$30VOSO_4 + 5NaClO_3 + 39H_2O \Rightarrow 3H_6V_{10}O_{28} + 5NaCl + 30H_2SO_4$$

These steps are designed to be accomplished under conditions of continuous flow by the addition of the reagents to a three-tank adjustment circuit, followed by a three-tank retention circuit. Total residence time would be 360 minutes. A polishing filter is included in the design to clarify the feed to the vanadium solvent extraction section.

In a similar fashion to the uranium recovery, the vanadium circuit is designed to extract vanadium into a tertiary amine solvent. The two vanadium extraction trains would each have five stages of extraction followed by an organic recovery settler. The two mixers per stage would have a total retention time of 4 minutes and the sizes of the stainless steel settlers would be 21 feet 4 inches long, by 10 feet 6 inches wide, by 3 feet 4 inches deep.

Vanadium would be extracted from the pregnant solution according to the equilibrium shown below.

$$H_6V_{10}O_{28} + 4[(R_3NH^+)HSO_4^-]_{org} \Rightarrow [(R_3NH^+)_4H_2V_{10}O_{28}^{4-}]_{org} + 4H_2SO_4$$

The vanadium-bearing organic would be scrubbed in a mixer-settler with an acid solution. The vanadium would be stripped from the solvent in three mixer-settler stages with a total retention time of 3.5 minutes in the two mixing stages. The sizes of these settlers would be 14 feet 9 inches long, by 8 feet 2 inches wide, by 3 feet 4 inches deep.

Vanadium would be stripped from the loaded organic according to the equilibrium shown below.

$$[(R_3NH^+)_4H_2V_{10}O_{28}^{4-}]_{org} + 4Na_2CO_3 \Rightarrow 4R_3N + Na_4H_2V_{10}O_{28} + 4NaHCO_3$$

The vanadium specie would be converted to metavanadate and then precipitated from the stripping liquor in three, fiberglass reinforced plastic (FRP) batch precipitation tanks by the addition of ammonium sulfate to precipitate the vanadium as ammonium metavanadate (AMV) (NH_4VO_3). There would be a fourth tank that would act as a storage tank to blend a bad precipitation batch with

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

a normal batch so that they could be advanced to the belt filter. The residence time in precipitation is designed to be 48 hours. The AMV would be dewatered on an 8 foot wide by 30 foot long belt filter, dried in a steam vacuum dryer, and deammoniated in an indirect-fired kiln. The V_2O_5 discharging from the kiln would be melted in a 10 foot long by 5 foot outer diameter direct fired furnace. The furnace would discharge to a casting water wheel where the V_2O_5 melt would be solidified into a fused black-flake product. The revolving casting water wheel would be nominally 12 feet in outer diameter and comprised of eight water cooled 1 foot wide sections fabricated of mild steel. The unit would be fitted with a roller-breaker to reduce the flake to an appropriate size for shipment. A simple scraper would continuously remove the broken flake product from the wheel into a bin for packaging. The black-flake would be packed, weighed, and sealed for shipment in labeled 55 gallon drums.

There would be two scrubbers in this area: one servicing the steam dryer and rotary kiln and the other one servicing the furnace, casting water wheel, and the packaging system. Both scrubbers would have removal efficiencies of 97–99 percent.

2.10 Reagents Storage & Handling

Reagents, to be provided by a supplier, would be delivered via truck and would be offloaded by pump, air, or forklift as necessary according to the supplier's recommendations. The truck offloading area would be bermed and sloped to a sump for containment. A safety shower would be located in the offloading area. Throughout the plant, reagents would be stored close to where they would be used. All storage areas would be bermed for containment and would include a safety shower. Unless otherwise mentioned, reagent storage is designed for 2 weeks.

Sulfuric acid, 93 percent by weight, would be piped on a ring main. The line size has been determined by a maximum fluid velocity of 1 foot per second to prevent corrosion.

Ammonium sulfate would be stored in a silo and added to a solution tank via weigh hopper and conveyor.

Sodium hydroxide would be delivered in 275 gallon totes and diluted to 8 percent by weight. The totes would be stored in a heated room and the dilution tank would be heated and insulated. All piping would be heat traced.

Sodium carbonate crystals would be offloaded using a water eductor to create a 31 percent, by weight, solution. The solution would then be diluted and stored as a 15 percent, by weight, solution. Available storage time would be 1 week.

Flocculant would be delivered in super-sacks that would be stored in a dry area. The dry flocculant would be blown into the wet area to minimize globule formation of the flocculant.

Amine (Alamine 336) would be delivered in 275 gallon totes.

Isodecanol (Exxal 13) would be delivered in 55 gallon drums.

Sodium chlorate would be delivered and stored as a 50 percent, by weight, solution and then diluted and stored as a 39 percent, by weight, solution in FRP tanks. Both tanks would be heated and insulated; all piping would be heat traced.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

Hydrogen peroxide would be offloaded using a stainless steel centrifugal pump and would be stored in a stainless steel tank. Available storage time would be 7 weeks.

Diatomaceous earth would be delivered in bulk bags.

3.0 MEASUREMENT UNITS AND SYMBOLS

The US Customary System (USCS) of measurement used in this CH2M HILL design criteria is generally in accordance with the ANSI/IEEE Standard 260, IEEE Standard Letter Symbols for Units of Measurement.

A period is used as the decimal marker. The reference conditions for gas volume are 60°F and 29.92 in. mercury, corresponding with a molar (ideal) gas volume of 379.4 ft^3/(lb•mol). This is shown as standard cubic feet or abbreviated to "scf."

The exception to the use of US Customary units is the measurement of solution concentration which is given in grams per liter (gpl).

Base Units: (dimensionally independent)

Measured Attribute	Unit	Symbol
length	foot	ft
mass	pound	lb
time	second	s
electric current	ampere	A
thermodynamic temperature	degree Rankine	°R
amount of substance	mole[1]	mol
luminous intensity	Candela[1]	cd

Other Base Units Used:

Measured Attribute	Unit	Symbol	Formula
length	inch	in.	1/12 ft
	yard	yd	3 ft
mass	grain	gr	1/7 000 lb
	ounce (avoirdupois)	oz	0.06250 lb
	ounce (troy)	tr. oz	0.06857 lb
	ton (short)	t	2,000 lb

[1] Indicates equivalence with International System of Units (SI) modernized metric system. SI prefixes are not used except with terms that are common to the SI system.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

Measured Attribute	Unit	Symbol	Formula
	gram	g	0.0022046 lb
temperature	degree Fahrenheit	°F	°R – 459.67
time	minute	min	60 s
	hour	h	60 min
	day	d	24 h
	year (calendar)	y	365 d
volume (liquid)	gallon (us)	gal	231 in^3
	liter	l	0.2642 gal

Selected Derived Units:

Note: The ASTM permitted form Wh is used rather than W h.

frequency (periodic)	hertz(1)	Hz	1/s
force	pound-force	lbf	lbf
pressure, stress	pound-force per square foot	lbf/ft^2	lbf/ft^2
energy, work, heat quantity	British thermal unit	Btu	0.2931 Wh
power, electrical	watt(1)	W	V × A
	kilowatt(1)	kW	W × 103
	megawatt(1)	MW	W × 106
	kilovolt ampere	kVA	V × A × 103
	megavolt ampere	MVA	V × A × 106
quantity of electricity	coulomb(1)	C	A × s
electric potential, emf	volt(1)	V	W/A
electric capacitance	farad(1)	F	C/V
electric resistance	ohm(1)	Ω	V/A
electric conductance	siemens(1)	S	A/V
magnetic flux	weber(1)	Wb	V·s
magnetic flux density	tesla(1)	T	Wb/m^2
inductance	henry(1)	H	Wb/A
Fahrenheit temperature	degree Fahrenheit	°F	°R – 459.15
plane angle	radian(1)	rad	dimensionless
solid angle	steradian(1)	sr	dimensionless
luminous flux	lumen(1)	lm	cd·sr
illuminance	lux(1)	lx	lm/m^2
activity (of a radionuclide)	becquerel(1)	Bq	1/s
absorbed dose	gray(1)	Gy	J/kg
dose equivalent	sievert(1)	Sv	J/kg

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

Selected Common Units of USCS:

Measured Attribute	Unit	Symbol
acceleration	feet per second squared	ft/s^2
angular acceleration	radian per second squared	rad/s^2
angular velocity	radian per second	rad/s
electric flux density	coulomb per square foot	C/ft^2
energy	foot-pound force	ft·lbf
energy (electrical)	kilowatt-hour(1)	kWh
heat flux density	Btu per square foot	Btu/ft^2
luminance	candela per square foot	cd/ft^2
loudness of sound	decibel(1)	dB

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

Measured Attribute	Unit	Symbol
molar energy	Btu per mole	Btu/mol
molar heat capacity	Btu per mole degree Rankine	Btu/(mol·°R)
specific heat capacity	Btu per pound degree Fahrenheit	Btu/(lb·°F)
thermal conductivity	Btu ft per hour area degree Fahrenheit	Btu·ft/(h·ft^2·°F)

Abbreviations of Other Terms:

Term	Abbreviation
alternating current	ac
atmosphere	atm
barrel	bbl
boiling point	bp
chlorofluorocarbon	CFC
cosine	cos
cotangent	cot
diameter	dia
diameter, inside	i.dia
diameter, outside	o.dia
direct current	dc
electromotive force	emf
fiberglass reinforced plastic	FRP
gallon	gal
gallon per minute	gpm
gram per liter	gpl
height	H
horsepower	hp
induced draft	ID
length	L
maximum	maxm
mile per hour	mph
minimum	minm
mole percent	mol %
molecular mass (weight)	mol wt
number	no.
particles ≤ 10 micrometers	PM_{10}
parts per billion	ppb
parts per million	ppm
parts per million by volume	ppmv
parts per million by mass (weight)	ppmw
power factor	PF

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

Term	Abbreviation
pressure, absolute	psia
pressure, gage	psig
radio frequency	RF
revolutions per minute	rpm
revolutions per second	rps
root mean square	rms
sine	sin
specific gravity	S.G.
specific heat	Sp.Ht.
tangent	tan
temperature	temp
tons per day (short)	tpd
tons per hour	tph
tons per year	tpy
ultra high frequency	UHF
very high frequency	VHF
volume	vol
volume percent	vol %
weight (mass)	wt
weight (mass) percent	wt %
width	W

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

4.0 SITE DATA

4.1 Location

The Piñon Ridge project site is located approximately 8 miles southeast of Bedrock, in Colorado.

4.2 Meteorological Data

The following abbreviated meteorological data apply for the purpose of this specification.

	Units	Value	Code
Mean barometric pressure	in. Hg	24.4	A
Ambient air temperature			
Average Daily Maximum	°F	67.2	A: 6.1
Average Daily Minimum	°F	38.4	A: 6.1
Daily Minimum (Design)	°F	-20	C
Wind velocity			
Maximum gust (Design)	mph	70	A
Prevailing direction		West	A: 6.1
Precipitation			
Rainfall, average	in./y	7.68	A: 6.1
Rainfall, maximum for 24 hour period	in.	4.43	A
Snowfall	in./y	negligible	A: 6.1

4.3 Other Site Data

Elevation above mean sea level	ft	5,600	A

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

5.0 ENVIRONMENTAL CRITERIA

5.1 General Applicable Regulations and Standards

The Piñon Ridge project would conform to applicable federal, state, and local environmental laws, regulations, and permit conditions, as furnished by the Energy Fuels Resources Corporation (EFR).

These environmental criteria would require updating as an environmental impact report, the related environmental permits, zoning/land use permits, and public health laws with their attendant regulations, permit conditions, and other constraints become established. It would be the ultimate responsibility of the EFR to identify these project requirements and determine the completeness of the environmental criteria.

5.2 Special Considerations/Comments

The ore pads, tailings cells, and evaporation ponds are designed by Golder Associates Inc. and become an integral part of the overall project water balance and water handling/treatment planning for the construction, operation, and closure phases of the project.

5.3 Effluent, Emission, and Pollution Control Criteria

5.3.1 General

The environmental criteria section will be organized by media (e.g., water, air, solids). The intent of these criteria is to set forth the design requirements in the engineering and construction terms rather than reciting the regulatory language.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

5.3.2 Air

	Units	Balance	Design	Code
Opacity for fugitive particulate sources	%		TBD	B
Opacity of particulate point sources for materials handling and processes controlled by baghouse or scrubber	%		TBD	B
Emissions limits	mg/Nm^3 (dry basis)	40	TBD	B
Dust in enclosed spaces (e.g., reclaim tunnels)				
Total dust	mg/m^3		30/silica[2] + 2 TBD	B
Respirable dust	mg/m^3		10/silica[2] + 2 TBD	B

Particulate point source PM_{10} emissions would not exceed 50 mg/sdm^3.
Storage tanks for hydrocarbons with vapor pressure in excess of 1.5 psia would be reviewed for possible vapor recovery requirements; e.g., fitted with organic vapor recovery cartridges. No vapor recovery would be furnished for storage tanks for hydrocarbons with vapor pressures less than 1.5 psia.
Fire protection extinguishing agents would be free of ozone-depleting CFCs (e.g., halon).

5.3.3 Water

	Units	Value	Code
Plant discharge for all precipitation events up to 100 year, 24 hour storm		Zero	B

[2] silica = quartz silica (SiO_3) in ore expressed as a percentage

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

Waste Water

Washdown water would drain to sumps and would be returned to process or discharged to the tailings pond	B
Analytical laboratory sinks would drain through lime chip neutralization and would be discharged to the tailings pond	G
Sanitary sewage would be piped to leach fields	A

5.3.4 Solids

Domestic

Recyclable and non-recyclable trash would be, decontaminated, stored in dumpsters, and transferred off site	A
Non-decontaminated trash would be transported and deposited in an active tailings cell	A

Process

Wastes would be segregated for recycle or recovery	G
Nonrecyclable/nonrecoverable waste would be disposed in a permitted onsite facility	G
Equipment or materials (including hydraulic systems and transformers) containing PCBs would not be used	B
Designated hazardous wastes would be transported offsite to an approved disposal facility after decontamination	G
Spent oils and solvents from the maintenance facilities would be stored in containers for recycling	G

5.3.5 Fencing

A 6 foot high chain link fence would surround the entire licensed property. The fence would have three-strand barbed wire on top and the buried depth for burrowing animal protection would be 2 feet. Separate fencing would be provided around the main substation. Game fencing would surround the Piñon Ridge property.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

6.0 DESIGN CRITERIA REFERENCE LIST

6.1 *Energy Fuels Resource Corporation Uranium Mill Licensing Support Climatological Report Piñon Ridge Mill Site Montrose County, Colorado* Kleinfelder Report, December 2007

6.2 *Autogenous and Semi-autogenous Grinding Studies on Blanding, Utah, Operation Ores* CSMRI Report, July 1978.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

7.0 PRODUCTION SUMMARY

7.1 Annual Production Parameters

7.1.1 Annual Production

	Units	Balance	Design	Code
Plant feed, ore (dry basis)	tpy	350,000		A
Uranium concentrate (U_3O_8)	tpy	840		E
Vanadium concentrate (V_2O_5)	tpy	2,646		E
Final tailings	tpy	365,690		E

7.1.2 Daily Production

Plant feed, ore (dry basis)	tpd	1,000	1,080	A
Uranium concentrate (U_3O_8)	tpd	2.4		E
Vanadium concentrate (V_2O_5)	tpd	7.6		E
Final tailings	tpd	1,046.4		E

7.2 Concentrate Grade

Uranium (U_3O_8)	%	98.2	98.2	E
Vanadium (V_2O_5)	%	100.0	100.0	E

7.3 Recovery

Uranium	%	96	96	A
Vanadium	%	85	85	A

7.4 Operating Schedule

Operating days per year	d	350	350	A
Operating hours per day	h	24	24	A
Plant availability	%	95	95	C

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

8.0 CHARACTERISTICS OF PROCESS MATERIALS

8.1 Introduction

The two groups of economic minerals in the ores to be treated by the Piñon Ridge plant are uranium minerals and vanadium minerals. The predominant uranium mineral is pitchblende. The predominant vanadium minerals are montrosite and vanadium chlorite.

8.2 Mineralogy, Process Raw Materials

	Code
Principal rock and mineral types – sandstone: quartz and calcite	A

8.3 Chemical Composition of ROM Ore

	Units	Balance	Design	Code
Uranium content (U_3O_8), average	%	0.2	0.2	A
Vanadium content (V_2O_5), average	%	0.8	0.8	A

8.4 Physical Characteristics of ROM Ore

Maximum ROM ore size	in.		12	A
Shape			blocky	A
Moisture content	%	5	5	A
ROM bulk density, dry				
For weight purposes	lb/ft^3		100	A
For volume purposes	lb/ft^3		100	A
ROM bulk density, wet				
For weight purposes	lb/ft^3		105	A
Ore hardness			medium	A

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

9.0 COARSE ORE STORAGE

9.1 Operating Time

	Units	Balance	Design	Code
Feed	tpy	350,000	350,000	A
Operating days per year	d		350	A
Operating days per week	d		7	A
Operating shifts per day	shift		2	A

9.2 Equipment

Haul truck	h		16.5	A
Front end loader	h		16.5	A
Rock breaker (mobile)	h		intermittent	B

9.3 Coarse Ore Stockpile

Live capacity inside license boundary	acres		5+1	A
Angle of repose				
For volume	degree		40.0	A
For area	degree		34.0	A
Drawdown angle	degree		37.0	G

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

10.0 GRINDING

10.1 Operating Time and Grinding Tonnage Rate

	Units	Balance	Design	Code
Operating days per year	d		350	A
Operating days per week	d		7	A
Operating shifts per day	shift		2	A
Operating hours per day	h		16.5	A
Availability	%		95	A
Operating hours (350 x 16.5 x 0.95)	h		5,486	E
Feed rate	tph	63.8	70	E

10.2 Grinding Power Requirements

10.2.1 Work Index

SAG Mill	kWh/t	7.4	7.4	K: 6.2

10.2.2 Mill Power

Specific power				
SAG Mill	kWh/t	3.78	3.78	K: 6.2
Installed power per line				
SAG Mill	hp		500	D

10.3 Equipment

10.3.1 Coarse Ore Reclaim Feeders

Apron Feeder	no.		1	A
Drive	type		adjustable speed	B
Design capacity, each	tph	63.8	100	C

10.3.2 SAG Mill Feed Conveyor

Design capacity	tph	63.8	100	C

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

10.3.3 SAG Mill

	Units	Balance	Design	Code
Mill	no.		1	A
Size of mill				
Diameter, inside shell x length, EGL	ft		14 x 5	A
New feed rate	tph	63.8	70	E
Design circulation load				
Percentage of new feed	%	100	100	A
Rate	tph	63.8	70	E
Total feed to SAG Mill	tph	127.6	140	E
Discharge density	% solids	66	70	B
Installed power	hp		500	D
SAG Mill critical speed	%		TBD	D
Loading, by volume	%		TBD	D
Discharge	type		slotted grate	B
Grate aperture	in.	0.75	TBD	D
Size of ball, diameter	in.		3 or 4	B
Ball charge, by volume				
Nominal	%	8	15	C
Ball consumption	lb/t		0.4	G
New feed size, 100% passing	in.	12	12	A

10.3.4 SAG Mill Discharge Trommel

Feed rate to trommel	tph	127.6	137.8	E
Percent solids in feed	wt %	74	75	B
Oversize	tph	0.2	0.22	B
Solids	wt %	80	80	B
Undersize	tph	127.4	137.6	E
Solids	wt %	74	75	E
Trommel opening				
Aperture shape			slotted	B
Aperture	inch		0.75	B
Material			polyurethane	B
Wash water to trommel	gpm	1	2	B

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

10.3.5 SAG Mill Discharge Pumps

	Units	Balance	Design	Code
Pump	no.		2 (1 operating + 1 uninstalled standby)	A
	Type		Cetrifugal Metal	B
Flow rate	gpm	449	485	E
Pulp density	% solids	66	71	E
Specific gravity of pulp	S.G.	1.76	1.85	E
Drive				
Speed			adjustable	C
Control			sump level	B

10.3.6 SAG Mill Classifying Screen

Screen	no.		2	D
Screen size	ft		15.7 L x 4.8 W	D
Screen aperture	mesh		28	A
Screen feed (slurry)	gpm	449	485	E
Screen wash water	gpm	13	14	E
Screen oversize				
Solids	tph	62.9	70	E
Flow rate	gpm	154	166	E
Percent solids	wt %	80.5	85	G
Screen undersize				
Solids	tph	62.9	70	E
Flow rate	gpm	308	333	E
Percent solids	wt %	54	58	E
Product size, P80	mesh		48	A

10.3.7 Pulp Storage Tanks

Holding tanks	no.		2	A
Material			Rubber lined carbon steel	
Tank volume total (ea.)	gal		348,486	C
Tank volume live (ea.)	gal		214,526	C
Tank diameter	ft		39	C
Tank height	ft		39	C
Tank agitator	hp		125	D
Feed rate	tph	62.9	70	E
Storage time (ea.)	h	11.6*	10.7*	E
		*Based on balance flowrate	*Based on design flowrate	

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

11.0 LEACHING

11.1 Pre-leach

	Units	Balance	Design	Code
Pre-Leach Tank				
Number required	no.		2	A
Type			Vigorous Agitation	A
Material			Rubber lined (Chlorobutyl) carbon steel with acid bricks	A
Retention time per tank	h		1.5	A
Tank volume (ea.)	gal		62,187	C
Tank diameter	ft		21	C
Tank height	ft		24	C
Tank agitator	hp		40	D
Feed rate, solids	tph	42	45.4	A
Temperature	ºF	106	175	E&C
Percent solids	wt %	23	25	E
Thickener				
Number required	no.		1	A
Type			High capacity	C
Diameter	ft		60	A
Specific capacity			TBD	E
Material			Epoxy coated carbon steel	C
Solids feed rate	tph	43.2	46.6	E
Solids specific gravity	S.G.		2.7	E
Slurry feed rate	gpm	575	621	E
Feed temperature	ºF	105	150	E
Thickener unit area	ft^2/(tpd)		2.83	E
Flocculant			TBD	D
Flocculant dosage	lb/t	0.2	0.25	G
Flocculant concentration	wt %		0.5	B
Feed pulp solids	wt %	24	26	E
Underflow pulp solids	wt %	54	58	A
Underflow pumps				
Type			Peristaltic	C
Flow rate	gpm	200	216	E
Overflow solids	ppm	200	100-200	G

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

	Units	Balance	Design	Code
Clarifier				
Number required		no.	1	A
Type		Clarifier/ Thickener	B	
Diameter		ft	50	A
Material			Epoxy coated carbon steel	C
Solids feed rate	tph	0.03	0.05	E
Solids specific gravity	S.G.		2.7	E
Slurry flowrate	gpm	505	545	E
Feed temperature	ºF	106	150	E
Underflow solids	wt %	20	20	G
Overflow solids	ppm	50	50	G

11.2 Leach

Leach tank				
Number required	no.		8	C
Type			Vigorous agitation	A
Material			Rubber lined (Chlorobutyl) carbon steel with acid bricks	A
Tank volume (ea.)	gal		62,187	E
Tank diameter	ft		21	C
Tank height	ft		24	C
Tank agitator	hp		40	D
Retention time (total)	h		21	A
Feed rate	tph	43	47	E
Operating temperature	ºF	185	190	A
Steam addition	lb/h	10,000	11,000	E
Percent solids	wt %	54	50	E
Sulfuric acid supply	lb/t	340	400	A
Sulfuric acid feed, maintain free acid	gpl	80	100	A
	gpm	16	18	E
Oxidant consumption	lb/t	4.7	10	E
U_3O_8 extraction	% of total		96.4	A
V_2O_5 extraction	% of total		85.4	A

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

12.0 COUNTER CURRENT DECANTATION AND TAILINGS

12.1 Counter Current Decantation

	Units	Balance	Design	Code
Thickener				
Number required	no.		7 or 8	A
Number in design	no.		8	A
Diameter	ft		40	A
Material			Epoxy coated carbon steel	A
Solids feed rate	tph	43	47	E
Solids specific gravity	S.G.	2.7	2.7	E
Slurry feed rate	gpm	218	235	E
Thickener unit area	ft^2/(tpd)		1.25	E
Flocculant			TBD	D
Flocculant addition rate	lb/t	0.8	0.9	A
CCD thickener 1	lb/t	0.20		C
CCD thickener 2	lb/t	0.15		C
CCD thickener 3	lb/t	0.13		C
CCD thickener 4	lb/t	0.10		C
CCD thickener 5	lb/t	0.08		C
CCD thickener 6	lb/t	0.06		C
CCD thickener 7	lb/t	0.04		C
CCD thickener 8	lb/t	0.03		C
Flocculant concentration	wt %		0.5	B
Feed pulp solids	wt %	49.7	53	E
Underflow pulp solids	wt %	50	50	B
Thickener underflow pumps				
Type			Peristaltic	C
Number required	no.		8	A
Flow rate	gpm	226	253	E
Percent solids	wt%	50	50	B
Slurry specific gravity	S.G.	1.56	1.6	E
CCD Thickener 1 overflow	gpm	377	407	E
Overflow specific gravity	S.G.	1.1	1.1	G
Overflow solids	ppm	200	100-200	G
Overflow temperature				
CCD thickener 1	ºF	117	150	E
CCD thickener 8	ºF	67	150	E
Thickener overflow pumps				
Number required	no.		8	C
Flow rate	gpm	375	456	E
Type			Centrifugal	C
Material			rubber lined	C

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

12.2 Tailings

	Units	Balance	Design	Code
Total plant tailings	tph	43.6	50	E
Flow rates	gpm	503	543	E
Pulp specific gravity	S.G.	1.28	1.35	E
Solids	%	27	30	E
Temperature	ºF	88	105	E
pH	pH	1.8 – 2	2.0	E
Iron Sulfate concentration	gpl $Fe_2(SO_4)_3$	38		E
Barge pump*	no.		2	A
*The barge pump from tailings cell B would be used as the standby pump for the mill startup				
Flow rate	gpm	375	450	E

The design of the tailings cells and evaporation ponds is by Golder Associates Inc.

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

13.0 URANIUM SOLVENT EXTRACTION

13.1 Polishing Filters

	Units	Balance	Design	Code
Number required	no.		2	A
Filter feed	gpm	378	408	E
Filter feed solids	ppm	50	100	G
Filter discharge solids	ppm		5	C
Filter feed surge capacity	gal		30,000	C

13.1.1 Extraction

SX Aqueous feed surge capacity	gal		79,433	C
Number of extraction mixer/settler trains	no.		2	C
Number of extraction mixer/settlers per train	no.		4	A
Aqueous feed rate per train	gpm	189	204	E
Recycle flow, organic	gpm	129	139	E
Barren organic surge capacity	gal		64,302	C
Tank material			FRP	C
Loaded organic surge capacity	gal		64,302	C
Tank material			FRP	C
Organic feed rate per train	gpm	80	86	E
Continuous phase	type		Organic	B
Mixer organic to aqueous ratio			1.1/1	A
Number of mixers per settler	no.		2	D
Mixer retention time (total)	min		3	A
Settler area	gpm/ft^2		2.5	C
Material			316L SS	D
Organic composition				
Amine	vol%		1 vol% per gpl U_3O_8 in feed	C
Isodecanol	vol%		3	C
Kerosene	vol%		remainder	C

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

13.1.2 Scrub

	Units	Balance	Design	Code
Number of scrub mixer/settlers	no.		1	A
Aqueous advance rate	gpm	1	1-10	E
Organic feed rate	gpm	160	165	E
Recycle flow, aqueous	gpm	31	21-31	E
Mixer organic to aqueous ratio			5/1	A
Mixer retention time (total)	min		1.5	A
Number of mixers per settler	no.		2	D
Settler area	gpm/ ft^2		2.5	C
Material			316L SS	D
Aqueous scrub composition				
Sulfuric Acid	wt%	93	93	C
	gpm	.001	.01	E
Raw water	gpm	1	1-10	E
pH of mixture		pH	1.5	E

13.1.3 Strip

Number of strip mixer/settlers	no.		2	A
Aqueous advance rate	gpm	3.9	5	E
Recycle flow, aqueous	gpm	60	65	E
Organic feed rate	gpm	159	165	E
Mixer organic to aqueous ratio			2.5/1	A
Mixer retention time (total)	min	3	3	A
Number of mixers per settler	no.		2	D
Settler area	gpm/ft^2		2.5	C
Material			316L SS	D
Aqueous strip composition				
Sodium Carbonate	wt%	15	15	C

13.1.4 Uranium SX pumps

Barren organic pump				
Flow rate	gpm	80	96	E
Material			316L SS	C
Raffinate pump				
Flow rate	gpm	379	456	E
Material			316L SS	C
Type			Centrifugal	C

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

14.0 URANIUM PRECIPITATION, DRYING AND PACKAGING

14.1 Uranium Precipitation

	Units	Balance	Design	Code
Pregnant strip surge capacity	gal		3,760	C
Pregnant strip flow rate	gpm	3.9	5	E
Dilution water	gpm	14.6	15.8	E
Precipitation operating temperature	ºF	84-88	100	E
Precipitation Tank				
Number required	no.		5	C
Type			Vigorous Agitation	
Material			Steel, Chlorobutyl rubber lined	C
Tanks 2 – 3 size	gal		881	C
Retention time	h		0.5	C
Tanks 4 – 6 size	gal		3,008	C
Retention time	h		1.9	C
Sulfuric Acid required	gpm	0.4	0.6	E
Hydrogen Peroxide required	gpm	0.1	0.12	E

14.2 Uranium Recovery, Drying and Packaging

Thickener type			High capacity	C
Number required	no.		1	C
Size (diameter)	ft		32	C
Material			Steel, Rubber lined	C
Thickener unit area	ft^2/(tpd)		23.7	E
Solids feed rate	lb/h	398	432	E
Flocculant addition rate	lb/t	.005	.01	G
Belt filter				
Number required	no.		1	C
Type			Vacuum	
Size	ft		15.25 L x 4.3 W	D
Solids feed rate	lb/h	398	432	E
Feed percent solids	wt%	60	60	C
Steam vacuum dryer				
Type			Hollow screw	A
Temperature, max	ºF		300	B
Dryer feed rate	lb/h	200	216	E
Feed percent solids	wt%	75	60	E
Packaged Uranium 55 gal drums	no./day		7	E
Weight of drum	lb		700	C

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

15.0 VANADIUM SOLVENT EXTRACTION

15.1 Vanadium Oxidation

	Units	Balance	Design	Code
Vanadium Oxidation tanks				
Number required	no.		6	A
Tanks 1 – 3 size	gal		7,109	C
Agitator (1-3)	hp		3	G
Tanks 4 – 6 size	gal		73,578	C
Agitator (4-5)	hp		15	G
Bottom			cone (160^{o})	G
Material			FRP	A
Sodium chlorate addition	gpm	3.1	3.5	E
Anhydrous ammonia (vaporized)	lb/h	273	300	E

15.1.1 Extraction

SX Aqueous feed surge capacity	gal		79,438	C
Number of extraction mixer/settler trains	no.		2	C
Number of extraction mixer/settlers per train	no.		5	A
Aqueous feed rate per train	gpm	191	206	E
Recycle flow, organic	gpm	132	143	E
Barren organic surge capacity	gal		64,302	C
Tank material			FRP	C
Loaded organic surge capacity	gal		64,302	C
Tank material			FRP	C
Organic feed rate	gpm	79	85	E
Mixer organic to aqueous ratio			1.1/1	A
Mixer retention time (total)	min		4	A
Number of mixers per settler	no.		2	D
Settler area factor	gpm/ft^2		2.5	C
Material			316L SS	D
Organic composition				
Amine	vol%		3	C
Isodecanol	vol%		2.5	C
Kerosene	vol%		remainder	C
Anhydrous ammonia per train	lb/h	40	45	E
Sulfuric acid	gpm	0.25	0.3	E

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

15.1.2 Scrub

	Units	Balance	Design	Code
Number of scrub mixer/settlers	no.		1	A
Aqueous advance rate	gpm	1	1-10	E
Recycle flow, aqueous	gpm	31	21-31	E
Organic feed rate	gpm	159	172	E
Mixer organic to aqueous ratio			5/1	A
Mixer retention time (total)	min		2	A
Number of mixers per settler	no.		2	D
Settler area factor	gpm/ft^2		2.5	C
Material			316L SS	D
Aqueous scrub composition				
Sulfuric Acid	wt%	93	93	C
	gpm	0.001	0.01	E
Raw water	gpm	1	1-10	E
pH of mixture		pH	1.5	E

15.1.3 Strip

Number of strip mixer/settlers	no.		3	A
Aqueous advance rate	gpm	7	10	E
Recycle flow, aqueous	gpm	73	79	E
Organic feed rate	gpm	159	172	E
Mixer organic to aqueous ratio			2/1	A
Mixer retention time (total)	min		3.5	A
Number of mixers per settler	no.		2	D
Settler area	gpm/ft^2		2.5	C
Material			316L SS	D
Aqueous strip composition				
Sodium Carbonate	wt%	15	15	C
	gpm	4.7	5	E

15.1.4 Vanadium SX pumps

Barren organic pump				
Flow rate	gpm	79	96	E
Material			316L SS	C
Type			Centrifugal	C
Vanadium raffinate return pump				
Flow rate	gpm	277	332	E
Material			316L SS	C
Type			Centrifugal	C
Vanadium raffinate pump				
Flow rate	gpm	107	130	E
Material			316L SS	C
Type			Centrifugal	C

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

16.0 VANADIUM PRECIPITATION, FUSION AND PACKAGING

16.1 Vanadium Precipitation

	Units	Balance	Design	Code
Feed tank capacity	gal		4,511	C
Material			FRP	A
Precipitation tank 1 (conversion)				
Type			Mild agitation	A
Material			FRP	A
Tank volume	gal		3,760	C
Anhydrous ammonia	lb/h	119	129	E
Steam	lb/h	60	65	E
Temperature	ºF		150	E
Precipitation tanks (2 – 4)				
Type			Mild agitation	A
Material			FRP	A
Tank volume (ea.)	gal		9,991	C
Bottom			Cone (120^{o})	A
Ammonium sulfate	lb/t	41.6	45	E
Precipitation tank 5				
Type			Mild agitation	A
Use			Mixing batches	
Material			FRP	A
Tank volume	gal		9,991	C
Bottom			Cone (120^{o})	A

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

16.2 Vanadium Fusion and Packaging

	Units	Balance	Design	Code
Belt filter				
Number required	no.		1	A
Type			Vacuum	A
Size	ft		30 L x 8 W	C
Solids feed rate	lb/h	805	869	E
Feed percent solids	wt%	40	40	E
Steam vacuum dryer				
Type			Hollow screw	C
Temperature, max	ºF		300	B
Solids feed rate	lb/h	805	869	E
Feed percent solids	wt%	75	60	E
Rotary kiln (de-ammoniator)				
Type			Indirect fired	C
Temperature, max	ºF		800	B
Solids feed rate	lb/h	808	990	E
Feed percent solids	wt%	97	95	E
Retention time	h		1	C
Fusion furnace (melting furnace)				
Type				
Temperature, max	ºF		1,300	B
Retention time	h		2	C
Casting water wheel				
Capacity	lb/h	630	650	E
Packaged Vanadium 55 gal drums	no./day		21	E
Net weight	lb		700	C

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

17.0 Reagents

17.1 Sulfuric acid (93%)

	Units	Balance	Design	Code
Consumption	lb/t	400	470	E
Storage duration	weeks		2	A
Storage capacity (total)	t		2,960	E
Storage tank size	gal		128,963	C
Number	no.		3	C
Material			Steel	C

17.2 Anhydrous ammonia

Consumption	lb/t	11.6	12.5	E
Storage duration	weeks		2	A
Storage capacity (total)	gal		24,000	E
Storage tank size	gal		12,000	C
Storage type			Horizontal	C
Number	no.		2	C
Material			Steel	C

17.3 Ammonium sulfate

Consumption	lb/t	41.6	45	E
Storage duration	weeks		2	A
Storage capacity (total)	t		350	E
Storage tank (hopper) size	ft^3		6,280	C
Number	no.		1	C
Material			Steel	C
Solution tank	gal		11,845	C
Number	no.		1	C
Material			Steel	C

17.4 Sodium hydroxide (50%)

Consumption	gal/t	0.09	0.1	E
Storage duration	weeks		2	A
Storage capacity (total)	gal		1,375	E
Storage type			275 gal totes	C
Number	no.		5	C
Dilute storage tank	gal		4,512	C
Number	no.		1	C
Material			Steel	C

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

17.5 Sodium carbonate (31%)

	Units	Balance	Design	Code
Consumption	lb/t	16.5	17.8	E
Storage duration	weeks		1	C
Storage tank size	gal		26,438	C
Number	no.		1	C
Material			Steel	C
Dilute storage tank	gal		15,228	C
Number	no.		1	C
Material			Steel	C

17.6 Flocculant

Consumption	lb/t	1.0	1.1	E
Storage duration	weeks		2	A
Storage capacity (total)	lb		16,500	E
Storage type			1,650 lb supersacks	C
Number	no.		10	C

17.7 Kerosene (SX 12)

Consumption	gal/t	0.55	0.6	E
Storage duration	weeks		2	A
Storage tank size	gal		38,069	C
Number	no.		1	C
Material			Steel	C

17.8 Amine (Alamine 336)

Consumption	lb/t	0.15	0.17	E
Storage duration	weeks		2	A
Storage capacity (total)	gal		550	E
Storage type			275 gal totes	C
Number	no.		2	C

17.9 Isodecanol (Exxal 13)

Consumption	lb/t	0.04	0.043	E
Storage duration	weeks		2	A
Storage capacity (total)	gal		220	E
Storage type			55 gal drums	C
Number	no.		4	C

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

17.10 Sodium chlorate (39%)

	Units	Balance	Design	Code
Consumption	lb/t	45.1	48.7	E
Storage duration	weeks		2.5	C
Storage tank size	gal		98,139	C
Number	no.		1	C
Material			FRP	C
Mix tank	gal		18,425	C
Number	no.		1	C
Material			FRP	C

17.11 Hydrogen peroxide (50%)

Consumption	lb/t	1.37	1.48	E
Storage duration	weeks		7	C
Storage tank size	gal		7,138	C
Number	no.		1	C
Material			316 SS	C

17.12 Diatomaceous earth

Consumption	lb/t	0.1	0.11	E
Storage duration	weeks		2	A
Storage capacity (total)	lb		14,160	E
Storage type			bulk bags	C
Number	no.		15	C

USE OF THIS REPORT IS SUBJECT TO THE RESTRICTIONS SET FORTH IN THE IMPORTANT NOTICE ON THE TITLE PAGE OF THIS REPORT.

Appendix C – Transport Vehicle Radiation Screening and Decontamination Plan

Introduction

Transport vehicles leaving the Piñon Ridge Mill Facility (the "Facility") are subject to the requirements of Part 49 of the Code of Federal Regulations ("49 CFR") and Nuclear Regulatory Commission ("NRC") Regulatory Guide 1.86 ("Reg Guide 1.86"). This screening and decontamination plan includes procedures necessary to release transport vehicles that are leaving the Facility site following delivery of low specific activity I ("LSA-I") material. Procedure No. RH-100 in the Energy Fuels Radiological Health & Safety Plan provides the scanning and shipping requirements for shipments of LSA-I materials leaving the site, which include yellowcake and contaminated materials shipments. Transport vehicles used exclusively for hauling of LSA-I material (including uranium ore, wastewater treatment residues and loaded ion-exchange resin) will undergo radiation screening prior to leaving the Facility site. Transport vehicles that require release for unrestricted use, service, or repair will undergo decontamination and a more stringent radiation survey than those transport vehicles that will be used solely to transport LSA-I material (i.e. exclusive use). The screening and decontamination requirements are outlined below.

Vehicles Used Solely for Purposes of Transporting LSA-I Material to the Facility

Transport vehicles used solely for transporting LSA-I material to the Facility must be labeled "FOR RADIOACTIVE MATERIALS USE ONLY" with three-inch high, stenciled letters located in a conspicuous place on both sides of the exterior of the transport vehicle. Additionally, these vehicles must be kept closed (e.g., via a tarpaulin) at all times other than during loading and unloading activities (49 CFR 177.843(b)).

Radiation surveys will be conducted on transport vehicles prior to allowing them to leave the restricted area. Vehicles that unload from the ore dumping platform (i.e. vehicles that do not enter the restricted area) will be scanned following initial delivery to the Facility, following a delivery in which the material source (mine) changes from previous deliveries, and at least annually thereafter. Radiation testing of transport vehicles will also be available at any time for vehicles that need to be released without restrictions. The gamma exposure rate from the typical uranium ore grade of 0.25-0.30 percent uranium oxide ("U_3O_8") for Colorado Plateau uranium ores is one mrem/hr, which is substantially less than the radiation limits for exclusive use vehicles (see Table C-1, Radiation Limits for Exclusive Use Transport Vehicles). As a result, the radiation survey requirements for exclusive use transport vehicles are expected to be satisfied in all cases.

Vehicles that unload from the ore dumping platform do not enter the Mill License Boundary (restricted area) and do not require decontamination unless they fail to pass a radiation survey. All transport vehicles that need to dump directly on the ore pad will be washed at the truck wash facility prior to undergoing a radiation survey. The radiation survey will consist of measuring radiation in the cab, on the external surface of the vehicle, and at one meter away from the exterior of the vehicle. The applicable radiation limits for vehicles used solely for transportation of LSA-I material are shown in Table C-1 below.

Table C-1
Radiation Limits for Exclusive Use Transport Vehicles

In cab	At exterior surface	Transport Index (1)	3 meters from exterior surface	Regulatory Reference
2 mrem/hr	---	---	---	49 CFR 173.441(b)(4)
---	200 mrem/hr	10	---	49 CFR 173.427(a)(5) and 49 CFR 173.441(a)
---	---	---	1,000 mrem/hr	49 FR 173.427(a)(1)

(1) The Transport Index is unitless and equal to the average mrem/hr measurement taken one meter from the exterior surface of the conveyance.

All radiation measurements will be conducted in accordance with Energy Fuels' standard operating procedures (Procedure No. RH-121) found in the Radiation Health & Safety Plan. These surveys will be recorded and kept on file. At a minimum, the radiation survey will consist of:

1. at least one measurement taken in the cab of the transport vehicle;
2. various measurements taken on the exterior surface of the transport vehicle; and
3. various measurements taken one meter from the exterior of the transport vehicle for the Transport Index (multiple measurements will be averaged).

Measurements do not need to be taken three meters from the exterior (per 49 CFR 173.427(a)(1)) because radiation limits at the surface and at one meter are more stringent than the limit at three meters.

Transport Vehicles that will be Released for Unrestricted Use

Unless the transportation contractor advises mill staff otherwise, mill staff will assume that each transport vehicle released from the Facility site will be returning solely for transporting LSA-I material from the mine to the Facility and does not require release for unrestricted use. The transportation contractor will advise mill staff prior to sending any vehicle in for repairs, servicing, or alternate use so that mill staff can ensure that the vehicle is decontaminated, surveyed, and released for unrestricted use. No transport vehicle that has carried LSA-I material may be used for non-radioactive materials transport or sent in for servicing or repair unless it has been released for unrestricted use by mill staff. This plan provides procedures for performing decontamination and radiation surveys required for transport vehicles released to unrestricted use. For a more detailed outline of the following decontamination and radiation survey procedures, refer to the Radiological Health & Safety Plan.

The transport vehicles to be released for unrestricted use will be decontaminated prior to radiation surveys as outlined below. Following decontamination, the vehicle will undergo a more stringent radiation survey than is performed for exclusive use vehicles. A vehicle may not be returned to service (i.e., released from the Facility for unrestricted use) until the following requirements are met.

1. The radiation dose rate at every accessible surface (including the interior of the bed) is 0.5 mrem/hr or less (49 CFR 177.843(a));

2. The radiation dose rate at one centimeter from every accessible surface is 0.2 mrad/hr on average and 1.0 mrad/hr maximum or less (NRC Policy Guidance FC 83-23);

3. The removable (non-fixed) radioactive surface contamination is not greater than 22 dpm α/cm^2, averaged over 300 cm^2 per sample on external surfaces (49 CFR 173.443(a)); and

4. Surface contamination is at or below the Reg Guide 1.86 acceptable surface contamination levels in Table C-2, NRC Regulatory Guide 1.86 Acceptable Surface Contamination Levels.

Table C-2
NRC Regulatory Guide 1.86 Acceptable Surface Contamination Levels

Nuclide(1)	Average(2)	Maximum(3)	Removable(4)
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Beta-gamma emitters	5,000 dpm β-γ/100 cm^2	15,000 dpm β-γ/100 cm^2	1,000 dpm β-γ/100 cm^2

(1) Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

(2) Measurements of average contamination should not be averaged over more than one square meter.

(3) The maximum contamination level applies to an area of not more than 100 cm^2.

(4) The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with a dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe.

Reg Guide 1.86 establishes acceptable surface contamination levels for unrestricted release of components from a nuclear reactor. These levels will be adhered to for any transport vehicles being released from the Facility for unrestricted use.

Radiation measurements will be conducted in accordance with Energy Fuels' standard operating procedures (Procedure No. RH-121) found in the Radiation Health & Safety Plan. These surveys will be recorded and kept on file. At a minimum, the radiation survey will consist of measurements taken on:

1. The interior and exterior of the trailer;
2. One tire;
3. The driver-side door handle;
4. The driver's seat;
5. The floor inside of the vehicle; and
6. Any dirty or suspect areas.

After a vehicle has been decontaminated and passed the radiation survey for unrestricted release in accordance with this Section, the vehicle markings indicating "FOR RADIOACTIVE MATERIALS USE ONLY" will be removed or painted over.

Transport Vehicle Decontamination

Transport vehicles being released for unrestricted use and vehicles that have entered the Mill License Boundary area (i.e. have dumped directly on the ore pad) will be decontaminated prior

to a radiation survey. Additionally, any transport vehicles that do not pass an initial radiation survey or require decontamination for any other reason will be decontaminated.

Decontamination of transport vehicles will consist of pressure-washing at the truck wash facility, located immediately northeast of the ore pad. The truck wash is a partially enclosed and fully automated touch-less system consisting of a platform constructed of heavy-duty angle iron with high-pressure water sprays mounted both below and on the sides. The high-pressure sprays remove dirt or mud and requires between one and two minutes to wash a truck. A handheld, high-pressure hose is also available to selectively wash portions of the vehicle where residual ore and mud may have collected.

Appendix D – Laboratory Facilities and Plans

This appendix, including the supporting exhibits, was prepared from information developed and provided by R and D Enterprises, Inc.

Introduction

The onsite laboratory facilities at the Energy Fuels Resources Corporation ("Energy Fuels") Piñon Ridge Mill Facility consist of an ore processing area, a metallurgical laboratory, and an analytical laboratory. The radiation safety laboratory is located in the same general area as these other laboratory facilities and is described in the Operational Monitoring Plan prepared for the Piñon Ridge Mill Facility. The laboratory procedural plans addressing quality assurance, quality control and chemical hygiene are included as exhibits to this appendix, following this narrative description of the laboratory facilities and analytical methods.

Sample Receiving and Preparation Area

Sampling of ores and pulps in the uranium mill process is an important step towards controlling and evaluating the mill performance. Sampler installations are designed to follow the requirements of good sampling practice, particularly in the sampling of slurry and solids streams where particle size and density segregation can cause material errors.

Three types of samples are taken. These include individual samples taken for purposes of direct control, shift and daily composited samples taken for later study and analyses, and special grab samples taken for some specific purpose. Important sampling points in the mill process, for purposes other than direct control, include the ore feed (either before or after grinding), tailings, and uranium and vanadium concentrates.

Located in the Change House and Laboratory Building (Area 900), the Sample Preparation Laboratory contains the necessary drying, bucking and grinding equipment required to prepare raw or slurried ores for analysis. One or more large ore drying ovens and a variety of ore sizing apparatus are located in the enclosed area. Ore sizing equipment may include primary and secondary crushers (jaw or roll), cone and ring grinders and plate pulverizers. Stationary riffle samplers and mechanical blenders are used to ensure representative sampling.

Dust is controlled in the sample preparation area by enclosing all crushing, grinding and splitting operations in hoods utilizing dust collection systems. Effluent from the dust collection system is directed to an appropriately sized baghouse with collected residue redirected to the mill process.

Illustration 1, Typical Flowsheet for Uranium Ore Sampling, illustrates the process for sampling uranium ore for moisture content and chemical analysis.

Metallurgical Laboratory

The metallurgical laboratory is located near the sample preparation area and has the primary function of providing ore amenability testing of ore feeds and optimizing mill circuit performance. Potential, specific areas of investigation are discussed below.

The complex characteristics of an ore, which combine to determine its reaction to processing, are usually termed "amenability." Amenability is evaluated by standard bench leaching tests, the results of which are compared against "normal" ore in terms of reagent requirements for uranium extraction. These data are then used to establish proper conditions for treating the ore in the mill or for determining blending ratios with other ores, and thus amenability tests may be considered as a method of pre-process control. Chemical analyses of feed ores for such

constituents as Calcium, Carbonate/bicarbonate, Vanadium, Molybdenum, sulfides, and others also aid in this planning, and requires coordination with the analytical laboratory.

Additionally, the metallurgical laboratory investigates alternatives and improvements in Ore Leaching, Liquid-Solid Separation, Solvent Extraction, Precipitation and Product Handling. Major equipment items could include drying ovens, grinding and ore blending equipment, muffle furnaces, and pilot scale equipment for specific circuit testing. Adequate ventilation is provided for any activity generating dust or chemical fumes.

Analytical Laboratory

The analytical laboratory is located in the Change House and Laboratory Building (Area 900) adjacent to the sample preparation and metallurgical laboratory. The primary function of the analytical laboratory is to support the mill processes, coordinate and cooperate with the efforts of the metallurgical laboratory, and provide accurate data on mill solutions and final product purity. The laboratory is comprised of three areas; the primary laboratory, the instrument laboratory containing the inductively coupled argon plasma ("ICP") spectrometer, and the X-ray fluorescence ("XRF") laboratory.

Analytical Methods

Analytical requirements in a uranium mill tend to be many and varied. This situation results from routine process requirements and from the periodic analyses of a variety of chemical constituents for which maximum limits may be stated in product purchase specifications.

Uranium analyses are obtained by volumetric (yellowcake product), colorimetric, ICP spectroscopy techniques, and X-ray fluorescence depending on the type of sample and the accuracy required.

X-ray fluorescence methods of uranium analyses are used in both control and routine laboratory procedures with available equipment being suitable to the direct analysis of either solutions or solids. X-ray fluorescence instruments are capable of quantitative analyses for elements from atomic number 23 (sodium) through 92 (uranium) without major modification, provided that suitable calibration curves are prepared or internal standards are used.

Elements other than uranium are determined by volumetric, gravimetric, and colorimetric methods and instrumentally by XRF and ICP spectroscopy. The latter is applicable to the determination of most elements of interest in mill products and concentrates, and is rapid and accurate in routine work. Other specialized information may require analyses of organic solutions and ion exchange media for loading and for fouling or poisoning, determinations of water hardness, etc.

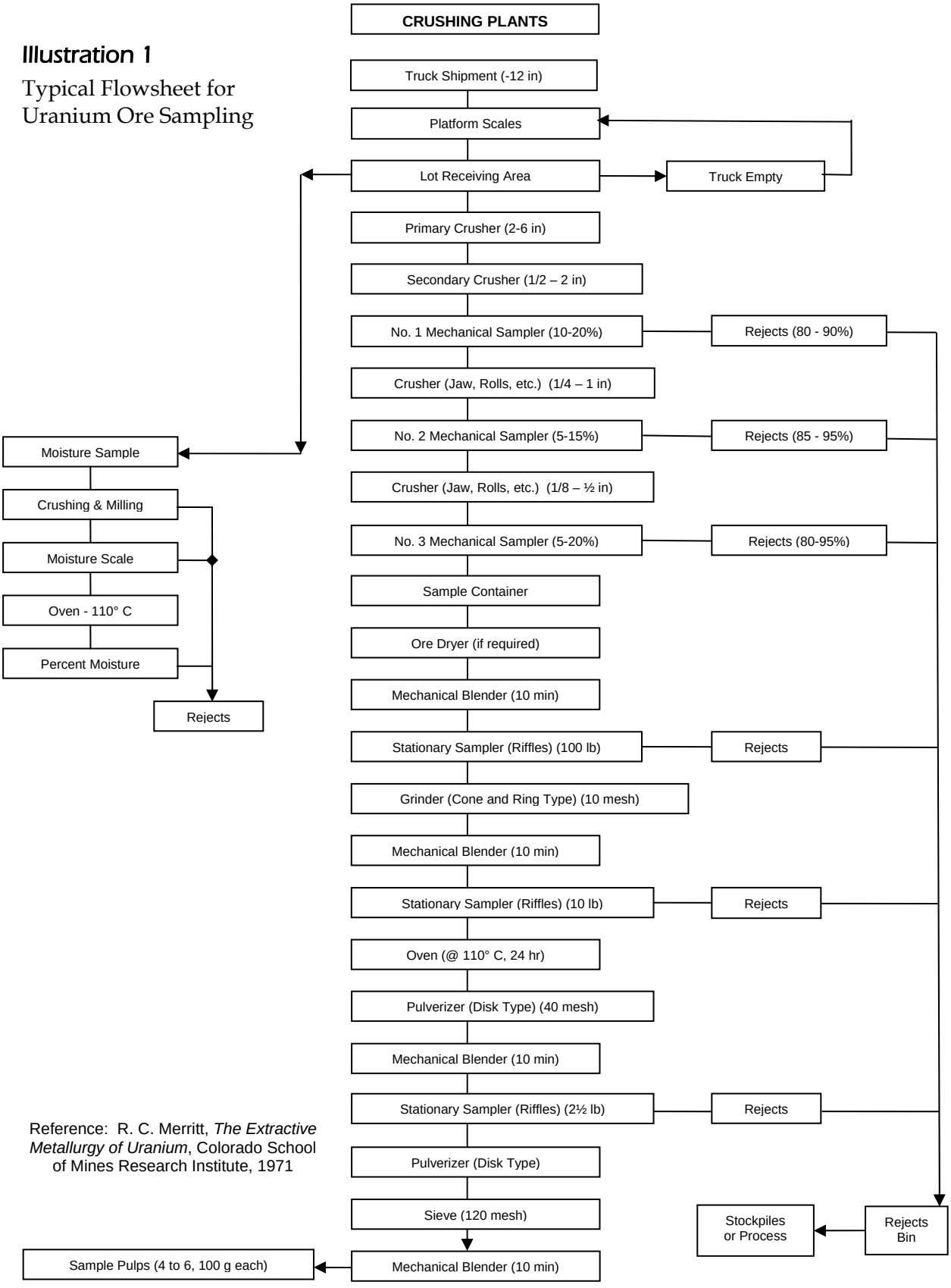
Major equipment items could include laboratory drying ovens, perchloric acid capable hoods with large hot plates, pH/mv meters, turbidimeters, ICP Optical Emission Spectrometer, X-ray Fluorescence Spectrometer, conductivity bridges, electronic analytical balances, auto titration equipment, organic carbon analyzers, and the glassware, disposables, chemicals and safety supplies to support the facility.

The primary function of the analytical laboratory is to support and account for mill activities and circuits and to assist the metallurgical laboratory in process development and improvement. The mill laboratory will have the capability to analyze environmental levels of

constituents in surface and groundwater, however compliance samples required under the operating license will be performed by a certified independent offsite analytical facility.

Illustration 1

Typical Flowsheet for
Uranium Ore Sampling



Reference: R. C. Merritt, *The Extractive Metallurgy of Uranium*, Colorado School of Mines Research Institute, 1971

Laboratory Safety

The Chief Chemist is responsible for providing written Standard Operating Procedures ("SOPs") relevant to the health and safety for laboratory activities directed in the laboratory involving hazardous chemicals. Laboratory personnel are strongly encouraged to offer suggestions for improving the SOPS with respect to worker health and safety.

The minimum elements required in an SOP are:

- Document Heading;
- Process or Experiment Description;
- Risk Assessment;
- Safety Equipment Required;
- Designated Area;
- Step-by-Step Operating Procedure;
- Special Handling Procedures and Storage Requirements;
- Decontamination;
- Emergency Procedures;
- Waste Disposal;
- Training Requirements; and
- Approval Required.

Laboratory Safety Basics

1. KNOW THE HAZARDS OF THE CHEMICALS YOU ARE WORKING WITH! Consult the Material Safety Data Sheets ("MSDS") or other appropriate references prior to using a chemical with which you are unfamiliar.
2. Minimize exposure to all chemicals regardless of toxicity or their familiarity. Most laboratory chemicals have not been fully characterized with respect to toxicity; as such, it is prudent to implement procedures that will minimize the likelihood of exposure. Skin contact should always be avoided. Avoid inhalation of chemicals; never "sniff" to test chemicals.
3. Wear appropriate personal protective equipment ("PPE") at all times.
4. Minimize chemical exposure through consistent and proper use of laboratory fume hoods.
5. Communicate with others in the building when working alone in the laboratory and let others know when you arrive and leave. Avoid working alone in the laboratory when performing high-risk operations.
6. Use cautious judgment when leaving unattended operations:
   - Post signs to communicate appropriate warnings and precautions;
   - Anticipate potential equipment and facility failures; and
   - Provide containment for release of hazardous chemicals.

7. Assume that unknown materials are toxic, and that a mixture is more toxic than its most toxic component.
8. Know the location and proper use of emergency equipment, such as safety showers, fire extinguishers and fire alarms.
9. Do not use mouth suction for pipetting or siphoning.
10. Label all chemical containers with the identity of the contents (avoid abbreviations/ acronyms); hazard warning and chemical concentration information should also be included.
11. Use appropriate safety carriers (secondary containment) when transporting chemicals inside or outside of the building.
12. Keep work area clean and uncluttered; clean work area on completion of task or at the end of the day.
13. Consuming food and beverages, applying cosmetics, using smokeless tobacco or smoking in laboratories or chemical storage areas is not permitted since this practice increases the likelihood of chemical exposure by ingestion (smoking also increases the risk of fire).
14. Do not store food or beverages in laboratories (including refrigerators and cold rooms) or chemical storage areas.
15. Wash your hands frequently to minimize chemical exposure through ingestion and direct contact with the skin. Remove gloves when leaving the laboratory, so as not to contaminate doorknobs, etc.
16. Always wash your hands before eating, drinking or applying cosmetics.
17. Because most controlled temperature rooms (i.e. cold/warm rooms) lack mechanical exhaust (100 percent re-circulated air), storage and use of toxic substances, flammable solvents, corrosive acids, asphyxiates (such as nitrogen and carbon dioxide), and open flames (e.g. Bunsen Burners) are strictly forbidden.

Laboratory Specific Rules

These rules are to be observed along with the general safety rules. Additionally, you must know and observe the safe operating rules for each area in which you work.

1. Safety glasses with side shields must be worn at all times when working in any area of the laboratory or bucking room (contacts are not allowed).
2. Safety shoes must be worn at all times.
3. Laboratory coats and PPE will be worn as conditions warrant.
4. Glass jugs must be carried in safety containers.
5. Fume exhaust hoods will be checked for performance with results documented on a semi-annual basis or more frequently if a noticeable change in operating performance is observed. Additionally, a daily wash down record of the fume hoods will be kept.

6. Fume exhaust hoods must be turned on when any work is being done under them or when the hot plate is being utilized.
7. Dust exhaust hoods must be turned on at any time dry samples are being prepared. Dust respirators must be worn while dry samples are being prepared. The use of compressed air will be kept to a minimum.
8. Eating, drinking and chewing are permitted only in designated areas in the laboratory (i.e., break room).
9. Safety showers, eyewash stations, first aid kits and fire extinguishers are located throughout the laboratory. Become familiar with the locations.
10. MSDS on all chemicals used in the laboratory are available for review in the laboratory office.
11. If you have any questions on the use of chemicals or laboratory procedures, contact your supervisor.
12. Personal hygiene and good housekeeping must be observed in the laboratory at all times.
13. Oxidizing agents and reducing agents will not be stored in the same area in the stock room.
14. Perchloric acid in use in the laboratory will be stored in a manner to prevent spillage.
15. Strong acids will be stored separately.
16. Perchloric acid in excess of that which is in use in the laboratory will be stored in a secure enclosure approved by the Health and Safety Department.
17. Chemical spills will be cleaned up immediately and people in the area warned to stay clear.
18. All broken glass will be disposed of in a separate container from normal laboratory wastes.
19. Hydrofluoric acid is used only under an operating fume exhaust hood. Burn jelly is available in the first aid cabinet for emergency use. In cases of hydrofluoric acid burns, seek medical attention immediately.
20. Oxygen, acetylene and other specialty gases shall be kept chained in the safety racks at all times.
21. Portable steps are used whenever any climbing is done. At no time is it permissible to climb on a stool or a chair to reach a high shelf, valve, or other equipment.
22. Strong acids will be diluted by pouring the acid slowly into the volume of water required.
23. All dispensing burettes and reagent bottles shall be clearly and correctly labeled.
24. Compliance with all other general plant safety rules is required.

Exhibit 1 to Appendix D

Laboratory Quality Assurance Plan

LABORATORY QUALITY ASSURANCE PLAN

PIÑON RIDGE MILL FACILITY

MONTROSE COUNTY, COLORADO



ENERGY FUELS RESOURCES CORPORATION

44 Union Boulevard, Suite 600

Lakewood, Colorado 80228

October 2009

1.0 Introduction 1
2.0 Quality Control Program 2
3.0 Quality Assessment Program 5
4.0 Laboratory Facilities 7
5.0 Personnel Requirements and Laboratory Organization 7
6.0 Sampling Procedures 8
7.0 Sample Handling 9
8.0 Instrument Operation and Calibration 10
9.0 Records and Reporting 11
10.0 General Laboratory Practices 15
11.0 Quality Control Monitoring 17
12.0 Corrective Action 19
13.0 Preventative Maintenance 20
14.0 References 21
15.0 Glossary of Terms 22

1.0 Introduction

The onsite laboratory facilities at the Energy Fuels Resources Corporation (Energy Fuels) Piñon Ridge Mill Facility provide chemical, industrial hygiene, and environmental analytical services to support the conventional recovery of uranium and vanadium. Analytical services include analysis of aqueous solutions and ores for inorganic constituents and uranium product purity.

The Quality Control Program establishes acceptable performance criteria for all routine analytical procedures being performed by laboratory personnel. The Quality Control Assessment program provides a formal system for evaluating the quality of data being generated and reported. The Energy Fuels Safety and Chemical Hygiene Plan provides the direction to perform health and safety monitoring of all laboratory and facility personnel. These, in addition to the experience and expertise of the analysts, provide a comprehensive Quality Assurance Program.

The procedures discussed or referenced in this manual describe the day-to-day laboratory practices and adhere to Good Laboratory Practices (GLPs). Where possible, Energy Fuels uses EPA, AOAC, ASTM, APHA, NIOSH, OSHA, or published analytical methods and follows the procedures with strict adherence to described protocol and recommended QA/QC parameters. Vital parts of the Quality Assurance Program, quality control and quality assessment programs, are outlined in Sections 2.0 and 3.0 of this manual.

To generate data that will meet project specific requirements, it is necessary to define the type of decisions that will be made and identify the intended use of the data. Data Quality Objectives (DQOs) are an integrated set of specifications that define data quality requirements and the intended use of the data. Project-specific DQOs must be established for both field and lab operations. Through the DQO process, appropriate reporting limits, analyses methods, target analytes, method quality control samples, sample security requirements, quality control acceptance ranges, corrective action procedures, and reporting formats and reporting levels can be specified.

Certain types of requests may not be suitable to standardized analytical methods. These custom requests are handled individually with laboratory management and staff scientists. Attention to documentation of the analytical procedure and use of suitable QC parameters is maintained according to good scientific discipline and Good Laboratory Practice guidelines.

In the event that Energy Fuels is dependent on the service of an outside laboratory for analyses not available through the site facility, staff will be notified that the work will be subcontracted to a qualified outside laboratory (See Subcontracting Policy - Section 7.5).

2.0 Quality Control Program

2.1 Objective

It is the policy of the management of Energy Fuels to produce laboratory data that is scientifically valid, meets method specifications, satisfies regulatory requirements, and accomplishes the data quality objectives of Energy Fuels. The method, regulatory, and Energy Fuels requirements are incorporated into the Quality Assurance Program, which is outlined within this Quality Manual. Energy Fuels is proactive in the commitment to continuously improve the effectiveness of QA and Management Systems. Energy Fuels applies appropriate corporate resources to set objectives, provide training opportunities, and monitor the quality performance of the staff. Energy Fuels also provides facilities and equipment adequate and appropriate to those objectives.

The purpose of the Quality Assurance Program is to ensure that the analytical services provided by Energy Fuels are of the highest quality, and each analytical result produced meets or exceeds Energy Fuels requirements and expectations. The quality systems in the program consist of the policies and procedures, and all referenced documents, described in this Quality Assurance Manual. All Energy Fuels personnel are expected to implement and follow the policies contained within the Quality Assurance Program Manual.

The Quality Control program insures that results of analyses are within established accuracy and precision limits required by the referenced method or Standard Operating Procedure (SOP). The Quality Control Program requires that the following points be met for each applicable analytical method:

Performance of any analytical method requires that the proper equipment and instrumentation are available. The procedure for operation of an analytical instrument is described in the equipment manufacturers operating manual, and may also be supplemented with a specific Standard Operating Procedure (SOP) for the instrument and/or the method.

Each SOP covers operation of the instrument including the sequence of operations involved in instrument start-up, calibrating, analyzing, and shutting down. SOPs include recommended preventative maintenance, and/or a list of parameters used to identify other types of maintenance. The SOP also outlines any special safety precautions for operation of the instrument.

SOPs of well-detailed EPA, ASTM, NIOSH, APHA, OSHA, or published procedures include, as appropriate, a list of any method specific items or variances, a list of QC parameters and their recommended performance ranges, recommended or example analytical sequences, specific or unique safety information, method performance requirements, method references, and a signed signature page. Detailed SOPs are prepared for those procedures that do not have published methods.

The initial test method evaluation for chemical analyses involves Method Detection Limit (MDL) studies, confirmation of the Limit of Quantitation (LOQ)/Practical Quantitation Limit (PQL), an evaluation of method performance (using four or more replicates of reference quality control reference samples), evaluation of the selectivity of the method, and any additional method-specific requirements.

Energy Fuels demonstrates that laboratory staff is qualified and capable of performing the method. Analysts are assigned duties based on their skills and experience. Training records are maintained for all analysts.

It is the responsibility of the analyst to become thoroughly familiar with the methodology and instrument operation before performing the analysis. It is the responsibility of the person providing training to monitor all laboratory results generated for a reasonable time. The amount of time necessary may vary depending on the method and the experience of the analyst. At a minimum, the analyst's performance is monitored until the analyst demonstrates the ability to generate results of acceptable accuracy and precision, according to the method.

All analysts are required to demonstrate and maintain a record of proof of competency by routinely analyzing quality control samples appropriate to the analytical procedures they perform. Competency in analyzing these control samples is documented in analysts' training files. For those analyses where external performance evaluation samples are not routinely analyzed, competency is documented by including the results of routine analyses of method specific quality control samples (prepared by laboratory staff) and/or a verifying statement of procedural review by a supervisor.

Each analytical method is subjected to quality control monitoring. The purpose is to demonstrate that results generated meet acceptable accuracy and precision criteria for the method. Precision and bias are determined for standard and non-standard methods. Precision and bias are determined for standard methods through control charting of quality control data from quality control samples. Precision and bias using non-standard, modified standard or laboratory-developed methods are compared to the criteria established by Energy Fuels (when requested), the method, or the laboratory.

Quality control requirements are outlined in the methods and Energy Fuels, at a minimum, follows the guidelines specified in the methods used. Additional QC requirements are also added as appropriate. Statistical method performance is periodically evaluated against method requirements using control charts.

Quality control monitoring to measure accuracy for each method generally requires that a percentage of all samples analyzed be fortified (spiked) with a known concentration of target analytes tested by the method. Percent recovery is calculated. This provides a means for

monitoring method accuracy and evaluating sample matrix effects. Blank spike samples replace matrix spike samples for certain methods, or when there is insufficient sample for a matrix spike analyses. Historical, routine, batch QC sample performance can be used to estimate the precision and accuracy of the method.

Quality control monitoring to measure precision for each method requires replicate samples be prepared and analyzed when appropriate. Actual requirements are outlined in the specific SOP. When replicate samples or matrix spike duplicates are analyzed, relative percent difference is calculated and used to monitor precision of the method. In instances where there are no specific method requirements, it is the policy of the laboratory to analyze a percentage of all samples in duplicate. Duplicate test results must be within the control limits established for each analysis type. Acceptance limits generally follow specifications listed in the method. Matrix spike duplicates replace sample duplicates for most methods.

When not defined in the method, and as appropriate, method blanks and instrument blanks are analyzed. Method blanks are used to verify that contamination from laboratory reagents and glassware is not present in the analytical sample processing. Generally, the method blank must be less than the reporting limit, or 10 times less than the concentration amount in the sample, for the analytical parameter being tested.

Calibration standards are analyzed and calibration curves are developed for all applicable methods. For additional information on instrument calibration, see Section 8.0 of this QA manual.

The initial calibration is continuously monitored by analyzing a continuing calibration standard periodically during the analytical run and at the end of each new set of samples, depending on the method and instrumentation. Results must be within an established range as described by the method SOP. Initial calibrations are verified against a standard from a second source.

Performance evaluation samples and further quality control check samples may be required for various methods. Refer to Section 3.0 of this QA manual for further details.

2.2 Maintenance of Performance Records

All quality control monitoring is recorded and documented. Quality control data is recorded in laboratory notebooks, electronic summary files, and/or analyses sheets. QC data can also be maintained in quality control forms, graphs, or charts. It is the responsibility of the analyst to see that all results are recorded in a timely manner.

All quality control data is filed and available for inspection and assessment by analysts, supervisors, management, and quality control personnel.



3.0 Quality Assessment Program

3.1 Purpose

The function of the Quality Assessment Program is to provide formal evaluation of the quality of data being generated and reported by the laboratory. External and internal quality control measures are used in this assessment. These measures include performance evaluation samples, laboratory quality control check samples, and routine internal and external audits on methodology and documentation procedures.

3.2 Performance Evaluation (PE) Samples

PE samples are supplied by an outside entity and contain known amounts of constituents. The laboratory does not have access to the known values of the samples. Only the PE provider has knowledge of constituent levels prior to the formal publishing of the test results.

These samples are received on a routine basis, with results sent to the providing entity for evaluation. Acceptable results are those that fall within a defined range as determined by the supplier. These study results are available for review upon request.

Blind Quality Control Check Samples are samples submitted as regular lab samples and are processed through the system in the same manner as any other sample. The analysts do not know the true value when performing the analyses. Method performance reports are returned to the analysts and maintained in method performance files.

3.3 Quality Control Check Samples

Quality Control Check Samples are performance evaluation samples used for routine method performance monitoring. As appropriate, analytical procedures include the analysis of a quality control sample with every sample batch analyzed. The materials are obtained from a commercial source, when available, or they may be prepared in-house. Acceptable results are within a defined range based on certified ranges, or against statistically determined control limits, method-defined criteria, or Energy Fuels defined Data Quality Objectives. Routinely used methods not subjected to PE sample monitoring are evaluated with Quality Control Check Samples as appropriate.

QC samples are processed through the system in the same manner as any other sample; except the analyst is aware of the source, concentration, and acceptance ranges of target analytes and calculates analyte recoveries to evaluate method performance in real time.

3.4 Quality Control Audits

Quality Control Audits consist of internal and external laboratory analyses inspections designed to monitor adherence to Quality Systems and quality control requirements. These audits check

general laboratory operations, overall Quality Systems, adherence to QA program requirements, sample tracking procedures, sample holding times, storage requirements, adherence to procedures during analysis, calculations, completion of required quality control samples within the group surrounding the sample, and proper record-keeping.

Internal quality control audits are conducted or coordinated by the Quality Assurance Officer at least annually. Energy Fuels conducts internal inspections on a regular basis to monitor adherence to quality control requirements. Results of formal audits are given to management with possible recommendations for corrective action in the event any discrepancies are found. As necessary, a follow-up review is conducted to determine that identified problems have been addressed. Annually, the overall Quality Systems of the laboratory are reviewed and a summary report is prepared.

The Chief Chemist and Quality Assurance Officer will conduct an annual review of the Quality System, including policies, procedures and environmental testing activities. This is done to ensure the QA systems continuing suitability and effectiveness, as well as give the opportunity to introduce necessary changes or improvements. The review shall take into account at a minimum the following:

- The suitability of policies and procedures;
- Reports from managerial and supervisory personnel;
- The outcome of recent internal audits;
- Corrective and preventative actions;
- Assessments by external bodies;
- The results of inter-laboratory comparisons or proficiency tests;
- Changes in the volume and type of work;
- Staff feedback;
- Complaints; and
- Other relevant factors, such as quality control activities, resources and staff training.

The findings from annual reviews and the actions that arise from these findings shall be recorded. The Chief Chemist shall ensure that those actions are carried out within an appropriate, pre-determined timescale.

4.0 Laboratory Facilities

The laboratory space includes adequate bench top and floor space to accommodate periods of peak workloads. Working space includes sufficient bench top area for processing samples; storage space for reagents, chemicals, glassware, bench and portable equipment items; floor space for stationary equipment; and adequate associated area for cleaning glassware. The laboratory contains at least 15 linear feet of usable bench space per analyst and at least 150 to 200 square feet per person. Laboratory departments are organized and the facilities are designed for specific laboratory operations in order to protect the safety of analysts and to minimize potential sources of contamination between and within department areas.

The laboratory is appropriately ventilated and illuminated, relatively free of dust and drafts, and is not subject to excessive temperature changes. As required, laboratory areas are temperature and humidity controlled. A light intensity of 100-foot candles is present at all working surfaces. Ample cabinets, drawers and shelves are available for storage and protection of glassware. Exhaust and particulate filtering hoods are available as needed for use during preparation, extraction, and analysis of samples. Air quality monitoring is conducted routinely to ensure a safe working environment. The laboratory has provisions for the disposal of chemical and radioactive wastes.

5.0 Personnel Requirements and Laboratory Organization

5.1 Personnel Requirements

Energy Fuels maintains experienced staff and management. Below is a summary of the primary roles, responsibilities and qualifications for designated positions. Laboratory experience can be substituted for academic requirements. Specific titles of employees are at the discretion of the Laboratory Manager.

Chief Chemist

The Chief Chemist is required to have education equivalent to a Bachelor of Science degree (site-specific requirements) in Chemistry or a related science. Five years (site-specific requirements) of relevant laboratory experience is required.

The Chief Chemist is responsible for all operations, analysis scheduling, equipment acquisition, as well as compliance with all employment, safety, environmental, and appropriate regulations. The Chief Chemist may delegate daily activities of these work aspects to appropriate personnel. The Chief Chemist reports directly to the General Mill Foreman.

Laboratory Technicians

Laboratory Technicians are required to have a High School Diploma or equivalent.

Laboratory Technicians perform the following duties: collection and preservation of samples, preparation of samples and reagents, analysis and preliminary data input, as well as various other tests. Laboratory Technicians are responsible for ensuring compliance with all laboratory policies and ensure that the analyses conducted under their work scope are compliant with all appropriate standards.

6.0 Sampling Procedures

Members of the staff are acquainted with proper sample collection and handling procedures and will advise those who need help in this area.

When the laboratory has been assigned the responsibility of sample collection, there is strict adherence to correct sampling protocols, initiation of chain-of-custody, sampling documentation, complete sample identification, and prompt transfer of sample(s) to the laboratory.

The laboratory provides proper sample containers and preservatives as specified for the procedure. Instructions for sampling, sample labeling, sample preservation, and sample packaging/shipping are also provided upon request. Sample container type, sample volume, preservation requirements, and maximum holding times, are detailed for each analyte.

When any sample is shipped by common carrier or sent through the United States Mail, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements as described in the Office of Hazardous Materials, Material Transportation Bureau, and Department of Transportation has determined the Federal Hazardous Materials Regulations do not apply to the following:

- Hydrochloric Acid - (HCl) in water solutions of 0.04 % by weight or less (pH of 1.96 or greater).
- Nitric Acid - (HNO3) in water solutions of 0.15 % by weight or less (pH of 1.62 or greater).
- Sulfuric Acid - (H2SO4) in water solutions of 0.35% by weight or less (pH of 1.15 or greater).
- Sodium Hydroxide - (NaOH) in water solutions of 0.080% by weight or less (pH of 12.30 or less).

It is required that all samples be analyzed within the prescribed holding times. Holding times are the maximum times allowed between sampling and analysis for results to still be considered valid. Samples should be delivered to the laboratory as soon as possible following collection to assure



that holding times can be met. Samples are analyzed as soon as possible after sample receipt. When maximum holding times cannot be met, re-sampling may be required/requested. Samples may be held for longer periods only if the monitoring laboratory has data on file to show that the specific types of samples under study are stable for the longer time or if a variance is allowed.

7.0 Sample Handling

The laboratory utilizes a sample tracking policy. Upon receipt, the security of the samples is maintained by the implementation of the laboratory access and security policies.

7.1 Sample Receipt

All samples arriving at the laboratory are logged into the Laboratory Information Management System (LIMS). Each sample container is given a unique laboratory sample number. Samples requiring preservation are checked to determine if the staff performed preservation. If requested, staff will preserve or filter samples as appropriate. Samples that degrade quickly or cannot be opened (such as aqueous samples for gasses) are not preserved at the time of sample login. If samples are improperly preserved, or the maximum holding times are exceeded upon arrival at the laboratory, the collector is notified and re-sampling is requested.

Samples are stored in accordance with method specifications in designated laboratory areas.

During sample login, all sample information such as sample description, analyses requested, special requirements, etc. are entered into the computer database of the Laboratory Information Management System (LIMS). Requested analyses parameters and special requirements are communicated to the analysts via their LIMS work lists. Project-specific requirements are maintained in the LIMS for any samples received from a special project. This process ensures that individual requirements are maintained.

7.2 Chain-of-Custody (COC)

Routine COC policy is maintained at the laboratory level through the laboratory access and security policies.

7.3 Sample Tracking

Samples are tracked through the analytical process by the LIMS. Completed analyses, which have been approved by the appropriate supervisor as valid data, are noted on the sample status screen. When all analyses are completed, the data sheets are sent to reporting for generation. The completed report is sent through data validation and finally to the appropriate department.

7.4 Sample Disposal

Samples will be disposed of in accordance with site Policies and Procedures.

The disposal of all laboratory wastes will be performed in accordance with all local, state, and federal and mill permit regulations that apply to such activities. Each method SOP addresses waste minimization and management specific to the method procedure.

7.5 Subcontracting Policy

The laboratory utilizes third party laboratory facilities to provide comprehensive analytical services. This occurs when the site laboratory cannot perform the analytical request outside of the laboratory's capabilities. Upon completion of the analyses, the third party laboratory(s) report the sample results, and their quality assurance package, to the Chief Chemist.

Third party laboratories will be required to maintain and provide current certifications.

The outside laboratory reports the results to Energy Fuels and these results become part of the final report. Any external or internal subcontracted analyses that require NELAC or other accreditation will be performed by a laboratory accredited for those parameters. All final reports indicate where the analyses were performed.

8.0 Instrument Operation and Calibration

Laboratory instruments and equipment are operated and calibrated according to the manufacturer's instructions and according to the requirements of the method being used. Exact calibration procedures are outlined in the appropriate SOP. For most instruments, a calibration curve composed of three to five standards covering the concentration range of the samples is prepared. The acceptance criteria for the calibration curves are listed in the individual methods. Unless otherwise specified in the method, at least one of the standards is at or below the practical quantitation limit (PQL) of the method. Calibration standards are routinely compared against second source calibration standards to verify accuracy. These second source standard results must fall within an established range, as described by the SOP, to be accepted. Whenever possible, the laboratory uses calibration standards prepared from certified stock standards. Initial instrument calibration curves are verified and routinely monitored by running a continuing calibration standard every 10 to 20 samples, and at the end of every analytical sequence, depending on the analysis method and instrumentation. High-level samples, which produce an analytical response outside the calibrated range of the instrument, are diluted or reduced in mass and re-analyzed until a response within the calibrated range is obtained.

System cleanliness is verified through the analysis of reagent/instrument blanks prior to analysis, between highly contaminated samples, and at regular intervals during the analysis. Samples are only quantitated within the limits of the response of the standards.

Use of measuring equipment and reagents (glassware, water, chemical reagents, and industrial gases) conform to Good Laboratory Practice guidelines. Good Laboratory Practices (GLPs) are laboratory guidelines, which were established by the Food and Drug Administration and published in the Federal Register (21 CFR, part 58) in the mid 1980's The GLP guidelines were adopted by the Environmental Protection Agency. SOPs are developed in accordance with GLP and NELAC guidelines. Laboratory volumetric glassware conforms to National Institute of Standards and Technology (NIST) Class A or B standards. All mechanical pipettors are calibrated monthly. Laboratory balances are annually serviced and calibrated by certified technicians. Routine calibration checks of all balances are performed. Laboratory drying ovens, incubators, freezers, refrigerators, and water bath temperatures are recorded at frequencies as described in the specific SOP. Laboratory pure water is generated by commercial water purification systems and is monitored and documented in accordance with ASTM grade II water specifications. The routine analyses of laboratory blanks are used to verify laboratory water quality and the suitability of sampling containers. Laboratory stock and working standards are derived from commercially available primary standards whenever possible. Standards preparation notebooks document the source, purity, content, concentration, preparation date, and technician. All calibrations standards are documented in the analytical sequence such that they are uniquely identifiable and traceable to stock standards and their source.

Standard Operating Procedures (SOPs) detail the sequence of operations involved in instrument startup, calibration, analyzing, shutting down, and routine maintenance. Suggestions for corrective action are included with the SOPs and parameters are identified which dictate certain types of maintenance. Instrument and method detection limits are performed at the method required frequency or whenever there is a significant change in instrumentation. Acceptable instrument response/performance criteria are based upon the manufacturers or the analytical method specifications. SOPs exist for all major pieces of analytical equipment/methods. Instrument maintenance logbooks are used to document instrument maintenance and repairs.

All instrumental run sequences are documented. Laboratory analysts record and document all instrumental runs in Laboratory Instrument Logbooks or computer files. Instrument Logbooks and/or dated computer files record instrument performance data, analytical sequences, instrument maintenance, calibration standards data, and any other additional information pertinent to operation of the instrument.

9.0 Records and Reporting

9.1 Document Management

Energy Fuels manages three types of documents: 1) controlled, 2) approved, and 3) obsolete.

A CONTROLLED document is one that is uniquely identified, issued, tracked, and kept current as part of the Quality System. Controlled documents may be internal documents or external documents. All controlled documents are written and reviewed by personnel technically competent to perform that procedure and approved for use by the Chief Chemist as well as the Quality Assurance Officer.

APPROVED documents have been reviewed, signed and dated by the Chief Chemist.

OBSOLETE documents are documents that have been superseded by more recent versions. Obsolete documents are retained for legal use or historical knowledge preservation. Old or archived SOPs are available for review using the laboratories electronic document system. OBSOLETE document records are maintained for at least ten years.

Documents are reviewed on an annual basis to ensure their contents are suitable and in compliance with the current quality systems requirements, and accurately describe current operations. The Quality Assurance Officer and the Chief Chemist maintain a master list of controlled documents (which include title, author, date of issue, revision identification and signatures of the issuing authority).

9.2 Laboratory Notebooks

Several different types of Laboratory Notebooks are maintained at the Energy Fuels Laboratory. These include, but are not limited to, the following:

- Method/Parameter Notebooks;
- Project Notebooks;
- Instrument/Equipment Use and Maintenance Notebooks;
- Standard Preparation Notebooks;
- Safety Notebook;
- Balance Calibration Notebooks;
- Pipette Calibration Notebooks; and
- General Notebooks.

The general purpose of maintaining each of these Laboratory Notebooks is to record the details that may be important in repeating a procedure, interpreting data, or documenting certain operations. Entries in the notebook may include data such as standard and sample weights, pH measurements, instrument operating parameters, preparation of calibration curves, analytical run sequences, calculations, recording of instrument operating parameters, sample condition, etc. The lab technician's notebook is particularly important in documenting analyses that deviate in

any way from routine or standard practices. It can also be an important training record. All pertinent data is to be recorded directly in the notebook. Some notebooks or data records are maintained in electronic files. Electronic data records are duplicated using hardcopy and/or alternate electronic backup techniques such as magnetic tape.

It is the responsibility of each lab technician to maintain a laboratory notebook according to Good Laboratory Practices (GLP) Guidelines. All laboratory notebooks are assigned unique logbook control number. Laboratory notebooks will remain the responsibility of the Energy Fuels staff member to whom they are assigned until, or unless, they are formally transferred to another staff member, until they are completely filled and returned to the Chief Chemist for archiving, or until the staff member resigns and returns them as a part of the checkout process. Staff members other than the individual to whom the Laboratory notebook is issued to may make entries in the notebook as long as those entries are consistent with the intended use of the notebook, and such entries are initialed. Laboratory notebooks are the responsibility of each staff member using the notebook. Supervisors review and approve all Laboratory notebook formats.

9.3 Records

The laboratory keeps records of chemical analyses, including all quality control records, for a minimum of 10 years.

9.4 Data Reduction

Data reduction refers to the process of converting raw data to reportable units.

Wherever possible, the instrument is calibrated to read out directly in the units reported. In this case, the value is recorded directly into a laboratory notebook, logbook, bench sheet, or electronic file and presented for review by supervision.

In cases such as titration, gravimetric measurements, or other techniques that require calculation prior to reporting, raw data is recorded in the appropriate laboratory notebook or electronic file, or on the appropriate laboratory form. The calculations specified in the method are used to determine the reported value. That value is also entered into the laboratory notebook or bench sheet, and on the draft of the report. Most of the calculations are computerized to reduce the chance of arithmetic or transcription errors.

Wherever possible, electronic data results are transmitted throughout the laboratory via the LIMS computer network. This process is intended to minimize manual data transcriptions within the laboratory. Additional advantages include the opportunity for rapid comprehensive data validation by supervisors, and more rapid data reporting.

9.5 Validation

Data validation includes the procedures used to ensure that the reported values are consistent with the raw data, calculated values, sample type, sample history, and other analyses parameters requested.

The data recorded on the draft report is validated with several steps. The lab technician who submits the report checks all the values reported for omissions and accuracy. Elements of this review also evaluate all instrument and method QC results. Automated data management programs are designed with an interactive step allowing data review by the analyst. Results to be reported are approved by the lab technician.

The reported result and associated QC data is reviewed by the Chief Chemist. The Chief Chemist reviews the suitability of the data according to project and method performance specifications. Analyses results for each requested parameter are evaluated against other requested parameters, project specifications, other samples within the set, historical files associated with the project/, and any other information provided with the sample. The Chief Chemist initials all validated sample results.

Internal and external laboratory audits review selected sets of data to ensure that the analysis results are correct and accurate, analytical methods are appropriate, documentation and record keeping procedures complete, and that overall objectives of the Quality Assurance Program are adhered to. At least annually, an in-depth monitoring of data integrity is performed per analytical method.

All automated programs used to process and report data are verified using hand-calculated results. Whenever a modification is performed to a program, re-verification of overall software function is performed.

One step of the Quality Control process involves data outlier detection; data that falls outside of established limits. This is performed at four different stages of the data reduction process. After sample analysis is complete, the data is placed in a draft report. If an outlier is observed, the lab technician must take action to investigate and/or correct the cause. Actions to correct these causes may include, but are not limited to, inspection of the instrumentation, checking calibrations, checking sample numbers or dilutions, rerunning samples or calibrations. After the lab technician reviews the data, the Chief Chemist reviews the draft reports. Once the Chief Chemist approves the data, he or she generates a report in LIMS. At this stage of the process, LIMS flags any QC data that is outside of the established limits for a given parameter. When reviewing the data, the Chief Chemist can see this flagged data and take appropriate actions to validate any data outliers. The Chief Chemist, or his designate, then performs the final review of the data and checks for data outliers. If a data outlier is discovered in the final review, corrective



actions are taken to correct the cause of the outlier, which may include some or all of the actions described in the first review step.

9.6 Reporting

Various levels of data reporting are available. All analyses results, regardless of the level of reporting used, have record keeping procedures which allow a complete "data validation package" to be produced. Note that a comprehensive "data validation package" is most easily generated at the time of sample analyses.

The final copy of a completed report is scanned and maintained as a graphics file. The electronic file of the report meets reporting requirements. An electronic copy of this file is available.

10.0 General Laboratory Practices

10.1 Chemicals and Reagents

When available and appropriate, chemicals used in the laboratory are analytical reagent grade (AR) chemicals purchased from reliable suppliers. Reagents are prepared, standardized, and made fresh as mandated by the method, their stability, and according to Good Laboratory Practices.

Normalized standards are checked regularly against independently prepared reference materials.

All standards and reagents are dated when received, opened, or prepared, and each are labeled with expiration dates when applicable.

Reagents are checked for discoloration or signs of degradation and are discarded if these are observed.

Certified primary standards are obtained from commercial sources when available. Standards used for calibration are verified against second source standards. Secondary and working standards are accurately prepared in volumetric flasks, or other calibrated glassware, from primary standards and stored in appropriate containers.

Titrants, standards, and other solutions used for analytical purposes frequently must be standardized upon preparation with certified or traceable standards. Method SOPs specify if standardization is necessary. The date and analyst's initials must be recorded on the container whenever re- standardized and records are maintained in a laboratory notebook.

Individual SOPs may also provide additional details for reagent requirements.

10.2 Reagent Interference

To determine the extent of reagent interference, method blanks are analyzed prior to sample analysis whenever appropriate.

If any interference cannot be eliminated, the magnitude of the interference is considered when calculating the concentration of the specific constituent in the sample, but only when permitted within the method being used.

If reagents, materials, or solvents contain substances that interfere with a particular determination, they are replaced.

Individual method SOPs may also provide additional requirements for handling reagent interferences.

10.3 Glassware Preparation

All glassware used for inorganic analyses is washed in warm detergent solution and thoroughly rinsed in tap water. Glassware is then rinsed well three times with ASTM Type II water. This cleaning procedure is sufficient for many analytical needs, but individual SOPs detail additional procedures when necessary.

Disposable, sterilized glassware/plastic ware is preferred for many procedures in the laboratory. The cleanliness and suitability of disposable glassware/plastic ware is continuously evaluated for each test with the routine analyses of method blanks.

All volumetric glassware used in precise measurements of volume is class A or laboratory calibrated.

10.4 Laboratory Pure Water

ASTM Type II water is used in the laboratory for dilution, preparation of reagent solutions and final rinsing of glassware.

Water quality is monitored for acceptability in the procedure in which it is used. Specific details are listed in the appropriate SOPs.

10.5 Employee Training

New lab employees and contract personnel are given an initial general orientation and tour of the laboratory facilities. Personnel are shown the locations of safety equipment such as safety showers, eyewash fountains, fire extinguishers, and first aid supplies. Personal protective equipment such as lab coats, disposable gloves, and safety glasses (if applicable) are issued at this time.

Safety considerations are a vital part of the training process. All hazards associated with the performance of a procedure or with the operation of an instrument are to be understood by the trainee before training can be considered complete. General laboratory safety procedures are a part of the new and current employee training. Specific safety procedures are outlined in SOPs and in instrument Operator's Manuals. Training in use of protective clothing, eye protection,

ventilation, and general safety are provided to each employee. Each employee is required to read the laboratory Safety and Chemical Hygiene Plan.

All new and existing lab employees must demonstrate capability prior to performing an analytical procedure independently (See Section 2.0). Method performance on Quality Control Samples is used to document employee training and work quality. Employees are required to read this Quality Assurance Plan and all appropriate SOPs. Employees also are required to sign, for all applicable SOPs, a Record of Acknowledgement Form that states they have read and understood the SOP. All Record of Acknowledgement forms for all SOPs are kept with the current SOP as an attachment.

10.6 Data Integrity

In order to ensure data integrity, the laboratory performs in-depth periodic monitoring of data integrity through internal and external audits.

10.7 Standard Operating Procedures

All routine laboratory operations and procedures are documented in Standard Operating Procedures (SOPs). SOPs are written to provide a reference that specifically defines requirements for routine procedures so that consistent, safe, and efficient laboratory operations are possible. For analytical methods, SOPs provide information on the details of the analyses that are not specified in a published analytical method. For routine procedures other than analytical methods, SOPs define the steps required in accomplishing a given task. All SOPs are reviewed periodically to assure that they reflect any changes in laboratory operations.

10.8 Confidentiality

Each employee has the responsibility to maintain confidentiality in all matters pertaining to samples submitted, and Information obtained during employment with this laboratory regarding the specific business of this laboratory shall at no time be revealed to any outside sources without permission from Energy Fuels of the data.

11.0 Quality Control Monitoring

11.1 Routine Monitoring

Temperatures of incubators, water baths, refrigerators, and ovens are checked and recorded according to a prescribed schedule.

All pH meters are calibrated against reference standards. Calibrations are noted in laboratory notebooks.

Conductivity of the ASTM Type II water is monitored.

Reagents are dated and initialed at the time of receipt; reagents are not used after recommended shelf life is exceeded.

Balances are checked against NIST traceable ASTM Type I weights and are calibrated and serviced by certified technicians annually.

SOPs are reviewed periodically for accuracy.

Laboratory Notebooks are reviewed for correctness and accuracy by the Chief Chemist

Performance Evaluation Samples are analyzed as required (See Section 3.0 of this QA Manual). Quality Control Check Samples are analyzed with each analytical batch.

Internal and External audits are performed as specified or requested (See Section 3.0 of this QA Manual for additional discussion).

Additional monitoring requirements may also be specified in individual SOPs.

11.2 Instruments/Methods

Calibration is performed as required by the analytical method or SOP (See Section 8.0 of this QA Manual).

Depending on method requirements, the standard curve is verified with a known second source reference sample. The reference sample results must fall within the appropriate target range for the calibration to be accepted.

In most cases, the calibration is checked by running a continuing calibration standard. The verification standard results must fall within an established range as described by the SOP.

All laboratory instruments are subjected to preventive maintenance schedules. Preventive maintenance schedules are specified in instrument maintenance logbooks.

As appropriate, instrument and/or method detection limits are determined annually, or more frequently if changes in instrument performance are noted or per method requirements.

Precision and accuracy requirements for each method are specified in the SOPs. General guidelines are given below.

Each sample analyses batch will contain QC samples to measure the accuracy of the method. Each QC sample result is monitored to be within QC specifications of the method. Results of blank spiked sample analysis must be within the established control limits. Quality Control Limits are specified in the SOPs and meet recommended QC limits as described in the referenced method.



Each sample analyses batch will contain QC samples to measure the precision of the method. (See Section 2.0 for discussion on duplicate sample analyses.) Criteria for duplicate sample acceptance are found in the SOP and are generally taken from the referenced method.

Each sample analyses batch will contain QC samples to measure the performance of the method on the sample matrix. These are typically identified as a matrix spike analyses and are often done in duplicate to assess method precision. Typically, the sample is fortified with a known amount of target analyte and spike recoveries are calculated. Results outside of method QC guidance are flagged. Quality control limits and appropriate corrective actions steps are specified in the method SOP.

As appropriate, the performances of QC samples' results are evaluated with Quality Control Charts. Suitability of existing QC limits is evaluated and possibly adjusted, but not to exceed method specification.

12.0 Corrective Action

When the quality control checks indicate that an analysis is not within the established control limits, corrective action is needed. This section gives general guidelines for corrective action. Corrective actions for each method or instrument are detailed in individual SOPs. Records are maintained of non- conformances requiring corrective action to show that the root cause(s) was investigated, and includes the results of the investigation.

Method QC samples that fail to fall within QC control limits may be analyzed again to verify if a problem exists. Matrix spike or matrix spike duplicate QC samples may not be re-analyzed if the performance can be attributed to matrix effects; data results are then reported and flagged. If the repeat analysis is not within control limits, the particular instrument or procedure is checked according to the specific protocols outlined in the method or according to the instrument manufacturer's guidelines. Once results are within control limits, analysis of all samples that were analyzed while the procedure was out of control are repeated, i.e., all analyses are repeated back to the previous acceptable control sample. If the analyst is unable to achieve acceptable results after following the corrective action guidelines detailed in the SOP, supervision is consulted. If necessary, the appropriate service personnel are contacted if the problem is determined to be due to instrument error, and cannot be resolved. It is also possible that the result is due to statistical variation of the results based on the tolerable error rate that has been determined for the analysis (usually 0.05). In certain cases, where control limits are exceeded, it is possible that problems cannot be corrected to satisfy QC criteria. This could be due to problems such as matrix interference, instrument problems, lack of sufficient sample, missed holding times, high blank contamination, etc. If all possible solutions available to correct the problem are examined and the

sample results are still considered valid, qualifying comments are attached to the sample report describing the non-compliance to QC and probable cause.

In the event that a QC audit or other informational review shows an analysis report to be incorrect, incomplete, or adversely compromised, a written corrected report and explanation is submitted. The report will clearly be identified as a revised report. As appropriate, an explanation submitted to the should give a detailed review of the problem and document any unapproved deviations from the regulations, standard operating procedures, or project specific scope of work that may have caused it. The explanation shall include, but not be limited to, the following components:

- What actions have been taken regarding the affected data set(s), Identification of the cause; and
- Corrective action(s) taken to prevent future occurrence.

In the event that a QC check fails, the lab technician will follow the procedures outlined in the QA/QC summary of the SOP. The analyst will document the steps taken to resolve the QC problem in the logbook for the instrument or method were the QC check failed.

Quality Control Checks for each method or instrument may vary. The Laboratory follows the QC checks set by each governing method. Due to the wide variations between methods, specifics are listed within each SOP for the given method. Please reference the SOP for specific QC checks for the given method. The QC checks may include; ICV, MB, CCV, CCB, LCS, LCDS, MS, MSD or others specific to that method.

12.1 Penalty for Improper, Unethical or Illegal Actions

Employees are expected to work in an ethical, proper, and legal manner. They are expected to perform laboratory analyses according to the cited method(s) and in conjunction with the SOP and the Quality Assurance Plan.

The penalty for improper, unethical, or illegal actions performed by an employee will be determined on a case-by-case basis. It will be set, in part, by the severity of the offense. A first time, minor offense may simply require instruction about the expectations of the company. A subsequent, willful, or more serious incident may require anything from supervisor reprimand to termination of employment. The supervisory staff and the Chief Chemist will determine the penalty. Consideration of such elements as employee experience, training, attitude, and the seriousness of the problem will be used to set the penalty.

13.0 Preventative Maintenance

Preventive maintenance is performed on laboratory equipment according to the manufacturer's guidelines and our experience in its operation.

14.0 References

ASTM Annual Book of Standards, Part 31 (water), American Society for Testing and Materials.

Handbook for Analytical Quality Control in Water and Wastewater Laboratories, Environmental Protection Agency.

Manual for the Certification of Laboratories Analyzing Drinking Water, 5th Ed., EPA 815-R-05-004, 2005.

Methods for Chemical Analysis of Water and Wastes Environmental Protection Agency, 600/4-79-020.

Methods for the Determination of Metals in Environmental Samples – Supplement I, EPA/600/R-94- 111, May 1994.

Methods for the Determination of Inorganic Substances in Environmental Samples, EPA/600/R-93-100, August 1993.

National Environmental Laboratory Accreditation Conference, Quality Systems, July 1, 1999.

NELAC Chapter 5: Quality System Standard, 2003 or most current version approved by Florida DOH NELAC Accreditation program.

Standard Methods for the Examination of Water and Wastewater; 20th Edition, APHA, 1998.

Environmental Protection Agency, Final Update III and IIIB, 1997 and 2005.

15.0 Glossary of Terms

Accuracy - The degree of agreement between an observed value and an accepted reference value.

Analyst - The designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.

Analytical Sample - Any solution or media introduced into an instrument on which an analysis is performed, excluding instrument calibration, initial calibration verification, initial calibration blank, continuing calibration verification, and continuing calibration blank.

Audit or Assessment - A systematic evaluation to determine the conformance to quantitative specifications of some operational function or activity.

Batch - Environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one to twenty environmental samples of the same matrix, meeting the criteria above. An analytical batch is composed of prepared environmental samples, extracts, digestates, or concentrates, which are analyzed together as a group and in a similar time frame.

Blank (BLK) - A sample of clean water that accompanies the samples through different aspects of sample and/or sample preparation. It is used to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value. There are various types of blanks: equipment blank, field blank, instrument blank, method blank, and reagent blank.

Blank Spike - See Laboratory Fortified Blank.

Blind QC Check Samples - Samples whose analyte concentrations are not known to the analyst. That the sample is a QC check sample may or may not be known to the analyst.

Calibration - The set of operations that establish, under specified conditions, the relationship between values indicated by the measuring instrument and the corresponding known value of the property being measured.

Calibration Blank - A volume of reagent water fortified with the same matrix as the calibration standards, but without the analytes, internal standards, or surrogate analytes.

Calibration Check Standard - See Check Standard.

Calibration Curve - The graphical relationship between the known values and the instrument responses for a series of calibration standards.

Calibration Standard - A solution of known concentration used in the calibration of an analytical instrument.

Chain of Custody Form - A record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes; the number and types of containers; the mode of collection; collector; time of collection; preservation; and required analyses.

Check Standard - A material of known composition that is analyzed concurrently with test samples to evaluate a measurement process.

Clean Water Act - Public Law PL 92-500. Found at 40 CFR 100-140 and 400-470. The act regulates the discharge of pollutants into surface waters.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) - The enabling legislation (42 USC 9601 - 9675 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 USC 9601 et seq.), to eliminate the health and environmental threats posed by hazardous waste sites.

Continuing Calibration Blank (CCB) – See Check Standard.

Continuing Calibration Standard - See Check Standard.

Continuing Calibration Verification (CCV) - See Check Standard.

Control Limits - A range within which specified measurement results must fall to be compliant. Control Standard - See Check Standard.

Corrective Action - An action taken to eliminate the causes of an existing nonconformity, defect, or other undesirable situation in order to prevent recurrence.

Data Quality Objectives (DQO) - An integrated set of specifications that define data quality requirements and the intended use of the data.

Demonstration of Capability (DOC) - A procedure to establish the ability of the analyst to generate acceptable and accurate data.

Detectability – For radiochemical analyses, detectability as a Lower Limit Detection (LLD) or Minimum Detection Concentration (MDC), is assessed based on the requirements of 40 CFR 141.27 and is a sample-specific determination. The equation is specific for each method and noted in the method SOP.

Detection Limit - See Practical Quantitation Limit and Method Detection Limit. Reporting of detection in radiochemistry is based on specific formulas identified in individual procedures.

Single activity point standards are used for efficiency calibration. When required, multiple energy emitters are used for energy calibration.

Document Control - The act of ensuring that documents and revisions are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and controlled to ensure use of the correct document version at the location where the prescribed activity is performed.

Duplicate (DUP) - A second aliquot of a sample that is treated the same as the original sample to determine the precision of the method.

Duplicate Sample - See Duplicate.

Fortified Sample - See Sample Matrix Spike.

Holding Times (Maximum Allowable Holding Times) - The maximum time that samples may be held prior to analysis and still be considered valid or not comprised.

Initial Calibration Verification (ICV) - A sample of known concentration, from a source other than that of the calibration standards, analyzed following calibration to demonstrate validity of the calibration.

Instrument Blank - See Calibration Blank.

Internal Standard – A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method.

Laboratory Control Sample (LCS) – A sample with a known concentration prepared and/or analyzed as a measure of accuracy for the method.

Laboratory Fortified Blank (LFB) – An aliquot of reagent water to which known quantities of specific compounds are added and which is analyzed as a measure of method recovery.

Limit of Detection (LOD) - For chemical analyses, the LOD is an estimate of the minimum amount of a substance that an analytical process can reliably detect. An LOD is analyte and matrix specific and may be laboratory-dependent.

Limit of Quantitation (LOQ) – For chemical analyses, the LOQ is an estimate of the minimum amount of a substance that can be reported with a specified degree of confidence. An LOQ is an evaluation of precision and bias.

LIMS - Laboratory Information Management System.

Laboratory Inter-comparison Sample - A performance evaluation sample analyzed by numerous laboratories. Acceptance criteria are often based statistically on the analysis results.

Matrix – The substrate of a test sample.

Matrix Spike (MS) – An aliquot of a sample to which known quantities of specific compounds are added, and which is carried through the entire analytical process to determine the effect of the matrix on the method's recovery efficiency.

Matrix Spike Duplicate (MSD) – A second aliquot of a sample to which known quantities of specific compounds are added, and which is carried through the entire analytical process to determine the effect of the matrix on the method's recovery efficiency.

Method Blank (MBLK) - A clean sample processed simultaneously with, and under the same conditions as, samples containing an analyte of interest through all steps of the analytical procedure.

Method Validation - The confirmation by examination and the provision of objective evidence that the particular requirements for a specific intended use are fulfilled (NELAC 2003) (MARLAP 2004 for radiochemical methods).

Maximum Contaminant Level (MCL) – Regulatory action levels for a contaminant of concern.

Method Detection Limit (MDL) - A measure of the precision of an analytical method determined according to the procedure given in 40 CFR Part 136 Appendix B.

NELAC - National Environmental Laboratory Accreditation Conference. NELAP - National Environmental Laboratory Accreditation Program.

NPDES - National Pollutant Discharge Elimination System - A discharge permit system authorized under the Clean Water Act.

Performance Evaluation (PE) Sample - A sample with a composition unknown to the analyst that is provided to test whether the analyst/laboratory can produce analytical results with specified limits.

Practical Quantitation Limit (PQL) – The lowest concentration or amount of the target analyte that can be identified, measured and reported with confidence that the analyte concentration is not a false positive value.

Precision - The degree to which a set of observations or measurements of the same property conform to themselves.

Preservation - Refrigeration and/or reagents added at the time of sample collection to maintain the chemical and/or biological integrity of the sample.

Proficiency Testing (PT) Sample - A sample with a composition unknown to the analyst that is provided to test whether the analyst/laboratory can produce analytical results with specified limits.

Quality Assurance – An integrated system of activities planning, quality control, quality assessment, reporting and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence.

Quality Assurance Project Plan (QAPP) - A formal document describing the detailed quality control procedures pertaining to a specific project. For environmental clean-up projects, this is typically produced by an engineering firm with references to include a laboratory's Quality Assurance Program Manual.

Quality Control – The overall system of technical activities whose purpose is to measure and control the quality of a product or service so that it meets the needs of users.

Quality Control Sample – A sample used to assess the performance of all, or a portion, of the measurement system.

Replicate – An additional aliquot of a sample that is treated the same as the original sample to determine the precision of the method.

Reporting Limit (RL) – Also known as the Practical Quantitation Limit (PQL). The lowest level of reportable concentration for the method and the analyte.

Resource Conservation and Recovery Act (RCRA) - The enabling legislation under 42 USC 321 et seq. (1976) that gives EPA the authority to control hazardous waste.

Safe Drinking Water Act (SDWA) - The enabling legislation, 42 USC 300f et seq. (1974), which requires the USEPA to protect the quality of drinking water in the U.S. by setting maximum allowable contaminant levels, monitoring, and enforcing violations.

Sample (SAMP) - A portion of material to be analyzed. Spiked Sample - See Matrix Spike.

Standardization - See Calibration.

Standard Operating Procedure - A written document, which details the method of an operation, analysis or action whose techniques and procedures are thoroughly prescribed and which is accepted as the method for performing certain routine or repetitive tasks.

Traceability – The property of a result of a measurement whereby it can be related to appropriate standards.

Trip Blank - One type of Field Blank. An aliquot of analyte-free water or solvent transported to the field in a sealed container and returned to the laboratory with the sample containers.

Exhibit 2 to Appendix D

Laboratory Quality Assurance / Quality Control Plan

LABORATORY QUALITY ASSURANCE / QUALITY CONTROL PLAN

PIÑON RIDGE MILL FACILITY

MONTROSE COUNTY, COLORADO

ENERGY FUELS RESOURCES CORPORATION

44 Union Boulevard, Suite 600

Lakewood, Colorado 80228

October 2009

1.0 Objective 1
2.0 Personnel Requirements 1
3.0 Quality Assurance Program 2
4.0 Quality Assessment Program 4

1.0 Objective

To produce laboratory data that is scientifically valid, meets method specifications, satisfies regulatory requirements, and accomplishes the data quality objectives of the project. Those method, regulatory, and project requirements are incorporated into this Quality Assurance/Quality Control (QA/QC) Plan. Appropriate corporate resources will be applied to set objectives, provide training opportunities, and monitor the quality performance of the staff. Adequate and appropriate facilities and equipment will be available to achieve those objectives.

Laboratory staff will be qualified and capable of performing the methods assigned to them. Analysts are assigned duties based on their skills and experience. Training records and curricula vitae of supervisory and senior analysts will be maintained as well as training records for all analysts and technicians.

2.0 Personnel Requirements

2.1 Chief Chemist

The Laboratory Director is required to have education equivalent to a Bachelor of Science degree in Chemistry or a related science. Five years of relevant laboratory experience is required.

2.2 Quality Assurance Officer

The Quality Assurance Officer is required to have a bachelor degree in a science or engineering field. Five years of relevant laboratory experience is required.

2.3 Analysts/Laboratory Technician II

Analysts are required to have education equivalent to a Bachelor of Science degree in Chemistry or related science, or a High School diploma and three years experience as an analyst in training. A minimum of six months of on-the-job training, under direct supervision of qualified analyst in the measurements being considered for certification is also required. After six months, and on a continuing basis thereafter, the analyst must demonstrate acceptable skills through the successful participation in the analysis of applicable performance evaluation and quality control samples.

2.4 Laboratory Technician

Laboratory Technicians is are required to have a High School Diploma or equivalent. Laboratory Technicians work under the supervision of the primary analyst performing general laboratory test.

Laboratory Technicians prepare samples, make up reagents, load sequences, and perform various other tests under the supervision of the primary analyst.

3.0 Quality Assurance Program

3.1 Purpose

The purpose of the Quality Assurance Program is to ensure that the analytical services provided are of the highest quality, and each analytical result produced meets or exceeds the project requirements and expectations. The quality systems in the program consist of the policies and procedures, and all referenced documents, described in this QA/QC Plan. The QA/QC Plan also functions to maintain the laboratory's compliance with USEPA and State Agency regulations. All employees are expected to implement and follow the policies contained within the QA/QC Plan.

The QA/QC Plan ensures that results of analyses are within established accuracy and precision limits required by the referenced method or Standard Operating Procedure (SOP). The QA/QC Program requires that the points listed below be met for each applicable analytical method.

3.2 Demonstration of Laboratory Capability

Performance of any analytical method requires that the proper equipment and instrumentation are available. The procedure for operation of an analytical instrument is described in the equipment manufacturers operating manual, and may also be supplemented with a specific Standard Operating Procedure (SOP) for the instrument and/or the method.

Each SOP covers operation of the instrument including the sequence of operations involved in instrument start-up, calibrating, analyzing, and shutting down. SOPs include recommended preventative maintenance and/or a list of parameters used to identify other types of maintenance. The SOP also outlines any special safety precautions for operation of the instrument.

SOPs of well detailed EPA, ASTM, NIOSH, APHA, OSHA, or published procedures include, as appropriate, a list of any method specific items or variances, a list of QA/QC parameters and their recommended performance ranges, recommended or example analytical sequences, specific or unique safety information, method references, and a signed signature page. Detailed SOPs are prepared for those procedures that do not have published methods.

3.3 Demonstration of Analyst's Ability to Generate Data of Acceptable Accuracy and Precision

Analysts are assigned duties based on their skills and experience. Training records are maintained for all analysts. Curricula vitae of supervisory and senior analysts are described in the QA/QC Plan.

It is the responsibility of the analyst to become thoroughly familiar with the methodology and instrument operation before performing the analysis. It is the responsibility of the person providing training to monitor all laboratory results generated for a reasonable time. The amount of time necessary may vary depending on the method and the experience of the analyst. As a minimum, the analyst's performance is to be monitored until the analyst demonstrates the ability to generate results of acceptable accuracy and precision according to the method.

All analysts are required to demonstrate and maintain a record of proof of competency by routinely analyzing quality control samples appropriate to the analytical procedures they perform. Competency in analyzing these control samples is documented in analysts' training files. For those analyses where external performance evaluation samples are not routinely analyzed, competency is documented by including the results of routine analyses of internal method quality control samples and/or a verifying statement of procedural review by a supervisor.

3.4 Analysis of Quality Control Samples

Each analytical method is subjected to quality control monitoring. The purpose is to demonstrate that results generated meet acceptable accuracy and precision criteria for the method. Quality control requirements are outlined in the methods. Additional QC requirements are also added as appropriate. Statistical method performance is periodically evaluated against method requirements using control charts.

Quality control monitoring to measure accuracy for each method generally requires that five to ten percent of all samples analyzed be fortified (spiked) with a known concentration of target analytes tested by the method. Percent recovery is calculated. This provides a means for monitoring method accuracy and evaluating sample matrix effects. Where appropriate, surrogates are included in the method to monitor method performance on each individual sample. Blank spike samples replace matrix spike samples for certain methods, or when there is insufficient sample for a matrix spike analyses. Historical routine batch QC sample performance can be used to estimate the precision and accuracy of the method.

Quality control monitoring to measure precision for each method requires replicate samples be prepared and analyzed when possible. Actual requirements are outlined in the specific SOP.

When replicate samples or matrix spike duplicates are analyzed, relative percent difference is calculated and used to monitor precision of the method. In instances where there are no specific method requirements, it is the policy of this laboratory to analyze five to ten percent of all samples in duplicate. Duplicate test results must be within the control limits established for each analysis type. Acceptance limits generally follow specifications listed in the method. Matrix spike duplicates replace sample duplicates for most methods.

When not defined in the method, and as appropriate, method blanks and instrument blanks are analyzed. Method blanks are used to verify that contamination from laboratory reagents and glassware is not present. Generally, the method blank must be one half or less than the reporting limit for the analytical parameter being tested. When not defined in the method, and as appropriate, method spikes (blank spikes) are analyzed.

Calibration standards are analyzed and calibration curves developed for all applicable methods. The initial calibration is continuously monitored by analyzing a continuing calibration standard within a specified time frequency, and at the end of each new set of samples, depending on the method and instrumentation. Results must be within an established range as described by the method SOP. As appropriate, initial calibrations are verified against a standard from a second source.

Performance evaluation samples and further quality control check samples may be required for various methods.

3.5 Maintenance of Performance Records

All quality control monitoring is recorded and documented. Quality control data is recorded in laboratory notebooks, electronic summary files, and/or analyses sheets. QC data can also be maintained in quality control forms, graphs, or charts. It is the responsibility of the analyst to see that all results are recorded in a timely manner. All quality control data is filed and available for inspection and assessment by analysts, supervisors, management, and quality control personnel.

4.0 Quality Assessment Program

4.1 Purpose

The function of the Quality Assessment Program is to provide formal evaluation of the quality of data being generated and reported by the laboratory. External and internal quality control measures are used in this assessment. These measures include performance evaluation samples, laboratory quality control check samples, and routine internal and external audits on methodology and documentation procedures.

4.2 Performance Evaluation (PE) Samples

PE samples are supplied by an outside entity and contain known amounts of constituents. The laboratory does not have access to known values of the samples. Only the PE provider has knowledge of constituent levels prior to the formal publishing of the test results.

These samples are received on a routine basis, with results sent to the providing entity for evaluation. Acceptable results are those that fall within a defined range as determined by the supplier. These study results are available for review upon request. External PE samples are received on a semiannual basis, with results sent to the reference supplier for evaluation. Acceptable results are those that fall within a defined range as determined by the vendor/EPA/NELAP based on multi-laboratory study results. Results are sent by the provider to USEPA and other certifying agencies as requested.

Performance evaluation samples for Radon Proficiency testing certification are from the National Environmental Health Association (NEHA), an EPA approved commercial Radon testing certification association. Radon sampling canisters are submitted to NEHA for known levels of radon exposure. Acceptable results are those that fall within a defined ranged based on multi-laboratory study results.

Blind Quality Control Check Samples are samples submitted as regular lab samples and are processed through the system in the same manner as any other sample. The analysts do not know the true value when performing the analyses. Method performance reports are returned to the analysts and maintained in method performance files.

Laboratory Inter-comparison Samples are samples containing known/unknown quantities of analytes that are split and analyzed by more than one laboratory. These samples are routinely analyzed and results are kept on file.

4.3 Quality Control Check Samples

Quality Control Check Samples are performance evaluation samples used for routine method performance monitoring. As appropriate, analytical procedures include the analysis of a quality control sample with every sample batch analyzed. The materials are obtained from a commercial source when available, or they may be prepared in-house. Acceptable results are within a defined range based on certified ranges, or, against statistically determined control limits. Routinely used methods not subjected to PE sample monitoring are evaluated with Quality Control Check Samples as appropriate.

Exhibit 3 to Appendix D

Laboratory Chemical Hygiene Plan

LABORATORY CHEMICAL HYGIENE PLAN

PIÑON RIDGE MILL FACILITY

MONTROSE COUNTY, COLORADO



ENERGY FUELS RESOURCES CORPORATION

44 Union Boulevard, Suite 600

Lakewood, Colorado 80228

October 2009

1.0 Introduction 1
2.0 General Principles 1
3.0 Definitions 1
4.0 Exposure Reporting 2
5.0 Responsibilities 3
6.0 Laboratory Hazards 4
7.0 Chemical Storage 5
8.0 Safe Laboratory Practices 5
9.0 Transportation of Hazardous Substances 5
10.0 Personal Protection 6
11.0 Avoidance of Routine Exposure 6
12.0 Vigilance 7
13.0 Chemical Procurement 7
14.0 Stockroom and Storerooms 7
15.0 Environmental Monitoring 8
16.0 Housekeeping, Maintenance, and Inspection 8
17.0 Medical Program 8
18.0 Protective Equipment 8
19.0 Record Keeping 9
20.0 Signs and Labels 9
21.0 Performance of Safety Devices 9
22.0 Training 10
23.0 Safety Inspections 11

1.0 Introduction

This Laboratory Chemical Hygiene Plan (CHP) is a generic CHP to be used in conjunction with the Energy Fuels Resources Corporation (Energy Fuels) Piñon Ridge Mill Facility general safety and radiation protection programs. In general, the CHP is a key mechanism to ensure the protection and safety of the environment, laboratory personnel and all other Energy Fuels employees. This CHP complies with the safety requirements mandated by OSHA under 29 CFR 1910.1450 (Laboratory Standard).

2.0 General Principles

- The goal of this CHP is to maintain the Permissible Exposure Limits (PEL) or the Threshold Limit Values (TLV) of all chemicals in the designated laboratory areas.
- All lab personnel must not underestimate the exposure risk associated with all chemicals involved in this project regardless of the quantity.
- All chemical operations must utilize existing properly functioning and adequate engineering controls devices (fume hoods, glove boxes).
- Lab personnel will be required to wear adequate personal protective equipment.
- A process Standard Operating Procedure (SOP) covering all procedures and all phases of the laboratory operation will be reviewed by the Chief Chemist and the Safety Officer.

3.0 Definitions

Material Safety Data Sheets (MSDS)
Compilation of information required under the OSHA Communication Standard on the identity of hazardous chemicals, health, and physical hazards, exposure limits, and precautions. These are supplied by the chemical manufacturers. It must be requested for each ordered chemical. It must be kept in or near the laboratory.

Odor Threshold
Concentration at which a chemical can be detected by smell. Warning Properties (e.g., odor). Note: some chemicals, such as vinyl chloride, have poor warning properties.

Threshold Limit Value (TLV)
This is the concentration to which an employee can be exposed during an 8-hour workday without adverse effect as determined by the American Conference of Governmental Industrial Hygienists (ACGIH).

Permissible Exposure Limit (PEL)
This is a concentration to which a employee can be exposed during a time weighed average (TWA) of eight hours or an action level (AL) or short term exposure limit (STEL) not exceeding 15 minutes as established by OSHA.

Employee
Anyone on the payroll of Energy Fuels.

Workplace Exposure to Chemicals
Personal exposure must be avoided through the use of engineering controls and personal protective clothing.

Regulated Areas
Laboratory area where chemicals will be stored and reacted, handled, or used and in which concentrations could exceed 1 ppm.

Hazardous Operation
Procedure or operation capable of releasing liquid or gaseous compounds with concentrations above the exposure limit. Employees performing these functions must wear respiratory and dermal protective equipment.

Medical Consultation
Consultation between a licensed physician and the employee for a medical evaluation related to a significant hazardous exposure to chemical compounds and other chemicals at the discretion of the safety officer.

4.0 Exposure Reporting

Every employee must report all evidence of possible chemical exposure to the Energy Fuels safety officer and Chief Chemist. This is not limited to:

- Direct skin and eye contact.
- Noticeable odors.
- Manifestation of health hazard symptoms such as headache, nausea, coughing, eye or skin irritation, dizziness, loss of motor dexterity.

Effects of Acute (Short-Term) Exposure to Chemicals:

- Inhalation.
- Skin contact.
- Eye contact.

Effects of Chronic (Long-Term) Exposure to Chemicals:

- Risk of cancer, and other diseases and medical conditions.

Initial and Periodic Monitoring

The safety officer shall recommend the initial monitoring of all lab employees directly involved in the process or project and, depending on the background of the employee and the nature of their project, including periodic monitoring also.

Physician Information

If any signs or symptoms of exposure are experienced, the information will be provided to a physician recommended by Energy Fuels. Upon examination, the physician will provide a written opinion including test results and recommendations for future medical follow-ups. The safety officer will authorize medical consultation in non-emergency cases. The Chief Chemist and safety officer will complement this section with specifications on procedures, equipment safeguarding, personal protective equipment, and research practices that are capable of protecting technicians and nearby personnel as part of the SOP.

5.0 Responsibilities

Laboratory safety and chemical hygiene are the responsibility of all employees. While the safety officer manages or implements the CHP, the Chief Chemist has the primary responsibility for laboratory safety. He/she must ensure that the technicians meet the requirements of the CHP and adhere to the SOP guidelines. Additional responsibilities include:

Mill General Foreman

The Mill General Foreman has ultimate responsibility for chemical hygiene and laboratory safety by providing the needed support for the plan and reports to the Mine Manager.

Safety Officer

The Safety Officer will work with other Energy Fuels staff members to develop and implement the CHP policies and practices, monitor the procurement, use, and disposal of laboratory chemicals, maintain proper audits, assist the department to know the current legal requirements regarding chemicals, and seek ways to improve the CHP.

Chief Chemist

The Chief Chemist has the overall responsibility of the CHP in the laboratory. He/she will ensure that employees involved in the laboratory operations know and follow the CHP rules. He/she will provide regular safety and housekeeping inspections, determine the level of required protective equipment, and ensure adequate general safety in the laboratory area.

Laboratory Technicians
Lab technicians are responsible for following guidelines and safety procedures included in the CHP and developing good personal chemical hygiene habits. They must fully know and understand the SOP and the MSDS information.

6.0 Laboratory Hazards

It is the responsibility of each person to become familiar with the hazards and safety precautions appropriate for this laboratory operation. Many of the techniques, instruments, or materials used in the labs are potentially hazardous and require specialized knowledge before safe work is possible.

The Energy Fuels laboratories have a large number of potential hazards, including:

- toxic, poisonous, flammable materials, reproductive toxins and selected carcinogens;
- high vacuum techniques and handling of glass;
- corrosive chemicals;
- high pressures;
- strong light;
- electrical instruments with high voltages;
- radioactive materials;
- X-ray equipment; and
- reactive metals and compounds.

Measures to avoid laboratory hazards include:

- no laboratory should contain more than the amount of flammable solvents approved by the appropriate authority;
- all equipments and tools should be used only with commonly adopted safety guards;
- any compressed gas cylinders must be properly secured and sufficient personal protection provided at all times;
- all general electrical equipment will be grounded and in proper working condition;
- know the safety operating procedure (SOP) for each activity and review it before performing the procedure; and

- chemical acquisition must be done through the Purchasing Department to ensure that proper Energy Fuels procedures are followed.

7.0 Chemical Storage

- All containers of chemicals must be labeled to show the chemical, owner, and the date of purchase. The shelf life of all chemicals must be respected. A limit of flammable liquids will be established for the laboratory. Larger volumes of chemicals should be kept in the chemical storage room of the mill.
- Shelves holding chemicals should have a raised edge to prevent bottles from falling, where applicable.
- Incompatible chemicals must be segregated from each other during storage.
- Flammable Chemicals must be stored in appropriately labeled cabinets.
- Refrigerators used to store chemicals must be “explosion proof”.
- When in doubt as to the proper procedure for disposal of any material, contact the Chief Chemist or safety officer.

8.0 Safe Laboratory Practices

Because very few laboratory chemicals are harmless, it is prudent to minimize all chemical exposures in the laboratory. Avoidance of skin contact and breathing is the primary rule. Even for substances with no known adverse effect, exposure risk must not be underestimated. A major factor in preventing exposure is through adequate ventilation and proper use of hoods. Hoods are to be used as a standard practice and not as the exception. Regulations require that everyone in the area be notified of all hazards.

The Chief Chemist has the primary responsibility for observing correct procedures. New lab employees should be trained and reminded of the hazards involved in their work area, and the degree of caution one needs to observe. This warning should be in written form, with a copy submitted to the safety officer.

9.0 Transportation of Hazardous Substances

Energy Fuels has available approved carriers and carts for transporting materials and gas cylinders. Safety glasses with side shields, or face shields, must be worn when handling, filling or transporting acids or other corrosive materials.

10.0 Personal Protection

- Goggles: Must have covered vents and should be worn whenever handling chemicals. Safety glasses alone may not be enough in some cases.
- Clothing: No shorts. No sandals. Legs and feet are to be fully covered.
- Contact Lenses: Should be approved by the safety officer and your personal physician.
- Safety Glasses: Must have side shields.
- Gloves: Wear appropriate gloves based on chemical and physical substance.
- Respiratory Protection: Coordinate with the safety officer.
- Lab Coat: Must be suitable and disposed (or properly and safely cleaned) when badly contaminated.
- Accidence and Spills: REPORT ALL ACCIDENTS AND INCIDENTS, AND DOCUMENT ALL OCCURRENCES.
- Eye Contact: Wash promptly with water for 15 minutes. Seek medical attention afterwards.
- Skin Contact: Wash thoroughly affected area and remove all contaminated clothing. Seek medical attention afterwards.
- Spills: Use proper protective clothing and disposal methods to clean all spills.

11.0 Avoidance of Routine Exposure

- Do not smell or taste chemicals.
- Inspect lab coats and gloves before using them.
- Open toxic or noxious chemicals ONLY in the hood.
- Do not store or consume beverages and food in areas, refrigerators, or utensils used for chemicals.
- Avoid eating, gum chewing, smoking, or applying cosmetics in the presence of chemicals.
- Do not use your mouth to open samples or start siphons.
- Wash your exposed skin area before leaving the laboratory.

- Practice good housekeeping and personal hygiene.
- Separate paper trash from broken glassware.

12.0 Vigilance

- Seek information about potential hazards through MSDS.
- Do not handle dangerous chemicals alone.
- Do not leave operations unattended.
- Seek permission before working late in the lab.
- Store a minimum amount of Flammables in the lab.
- Keep toxic or noxious chemicals in the hood.
- Store Flammables in fire cabinets.
- Use proper waste disposal methods.
- Properly label all containers.

13.0 Chemical Procurement

- Chemicals are ordered through the Energy Fuels Purchasing Department.
- No container should be received without a proper label.
- When ordering chemicals, request MSDS from the manufacturer.
- Be familiar with information on proper handing before using any substance.
- Maintain a desk copy of MSDS of in- lab chemicals.

14.0 Stockroom and Storerooms

- Stored Chemicals should be examined annually for replacement, container integrity, and probable deterioration.
- Do not use storerooms or stockrooms to package chemicals.
- Practice adequate chemical segregation during storage.
- Periodic inventories should be conducted to discard aged chemicals. Store small amounts only. Do not hoard chemicals.

- Place container inside a bucket during transport. Use a cart if possible.
- Drums containing Flammables must be grounded.
- Post a copy of the NFPA fire protection for laboratories in each lab.

15.0 Environmental Monitoring

Airborne concentrations of selected chemicals will be monitored in the laboratory at the discretion of the safety officer. Personal badges will be used when be used if necessary.

16.0 Housekeeping, Maintenance, and Inspection

- Floors should be cleaned regularly.
- Conduct chemical hygiene inspections periodically.
- Eyewash kits must be inspected weekly.
- Safety equipment should be in good working order.
- Do not block hallways, exits, and other passageways.
- Emergency equipment must have free access.

17.0 Medical Program

- Proper medical surveillance will be carried out as recommended by the safety officer.
- Each employee potentially exposed to a potentially hazardous chemical may be examined by a licensed physician.
- The initial examination will cover a general physical with a focus on kidneys, liver, spleen, skin, connective tissues, and pulmonary functions.
- The employee medical history in reference to alcohol intake, hepatitis, exposure to hepatotoxins, and past blood transfusions will be reviewed.
- The physician will issue a statement of each employee's ability to work with a particular chemical or suite of chemicals.

18.0 Protective Equipment

- All laboratories have fire extinguishers, safety showers, eyewash kits, fire blankets, and hoods.

- Safety goggles and gloves are issued to all laboratory workers.
- Respiratory protection equipment is stored in adjacent cabinets. This includes SCBA's, spill containment, and respirators. PROPER TRAINING is required prior to using any of these devices.

19.0 Record Keeping

- All incidents in laboratories must be reported to the safety officer. A permanent record of all incidents must be maintained.
- Monitoring and medical records will have the employee's name, social security, date of examination, test, and test results.
- A copy will be given to the employee.
- Records will be kept for at least 30 years of the course of the employee's employment plus 20 years whichever is longer.
- Employees must be notified within 10 days after testing of their sampling results and of the steps taken to reduce exposure.
- A permanent record of all laboratory safety training must be maintained.

20.0 Signs and Labels

- Emergency response and notification signs are posted in buildings and in some cases inside the laboratory.
- Information on MSDS location is also posted.
- All chemicals must and will carry labels.
- Location signs for eyewash and safety showers are in every laboratory.
- Signs for chemicals will be posted.

21.0 Performance of Safety Devices

- Laboratory fume hoods are inspected once a year. They must comply with the 100 fpm (feet per minute) face velocity and pass the required smoke test. The sash must be positioned at the required height and not be obstructed by equipment or other apparatus. Hoods will not be used as storage devices. Vigilance must be exercised with regard to



good housekeeping for effective operation of the hood, as well as for general safety purposes.

- Emergency eyewash equipment and safety showers shall be tested monthly for proper performance.
- Respirators will only be issued by the safety officer or RSO after successful completion of respiratory training.
- Selection, procurement and maintenance of glasses, goggles, face shields, lab coats, aprons, gloves, and suitable clothing will be the responsibility of the Safety Officer.

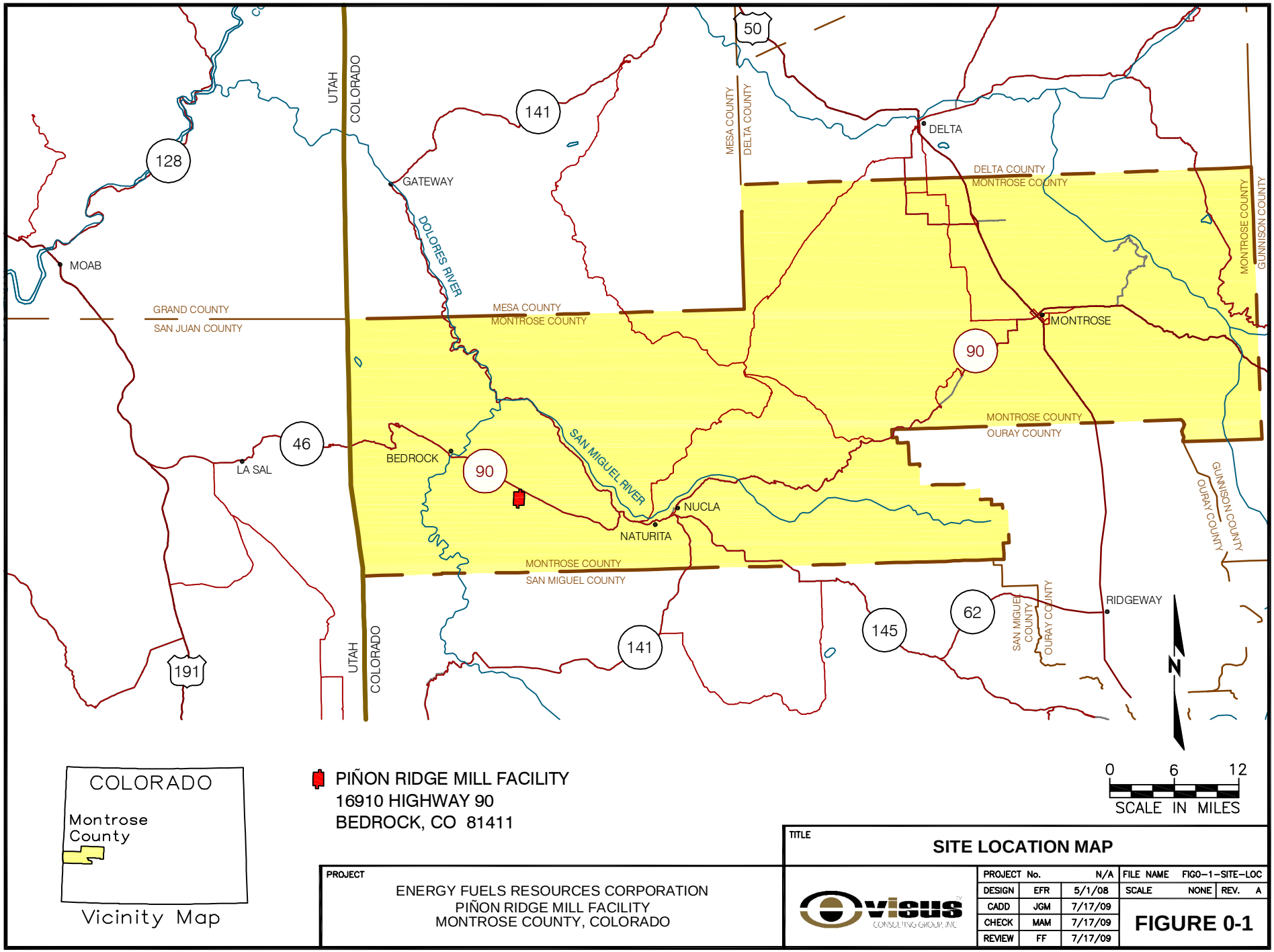
22.0 Training

Safety training must be provided by knowledgeable and experienced individuals to all appropriate employees upon hiring into the laboratory and routinely and periodically thereafter. This training must be documented. In addition, Energy Fuels can provide general safety training to cover the following topics:

- General laboratory and chemical fume hood safety.
- Emergency (including spill response) and evacuation procedures.
- Fire safety. Please note the following:
  - In case of fire or explosion, activate the nearest fire alarm pull station (KNOW THE NEAREST LOCATIONS).
  - ONLY PROPERLY TRAINED/competent and confident individuals may use fire extinguishers.
  - Do NOT use more than one extinguisher on a fire; if unsuccessful, evacuate the area to a safe location and wait to coordinate with emergency personnel.
- OSHA hazard communication standard:
  - Hazard recognition.
  - Medical surveillance.
  - Monitoring program.
- Acute and chronic health hazards.
- Respiratory protection.
- Radiation safety.
- Hazardous waste disposal.

23.0 Safety Inspections

The safety officer will conduct frequent safety inspections. Standard safety inspection forms will be utilized.



COLORADO

Montrose County

Vicinity Map

PIÑON RIDGE MILL FACILITY
16910 HIGHWAY 90
BEDROCK, CO 81411

TITLE

SITE LOCATION MAP

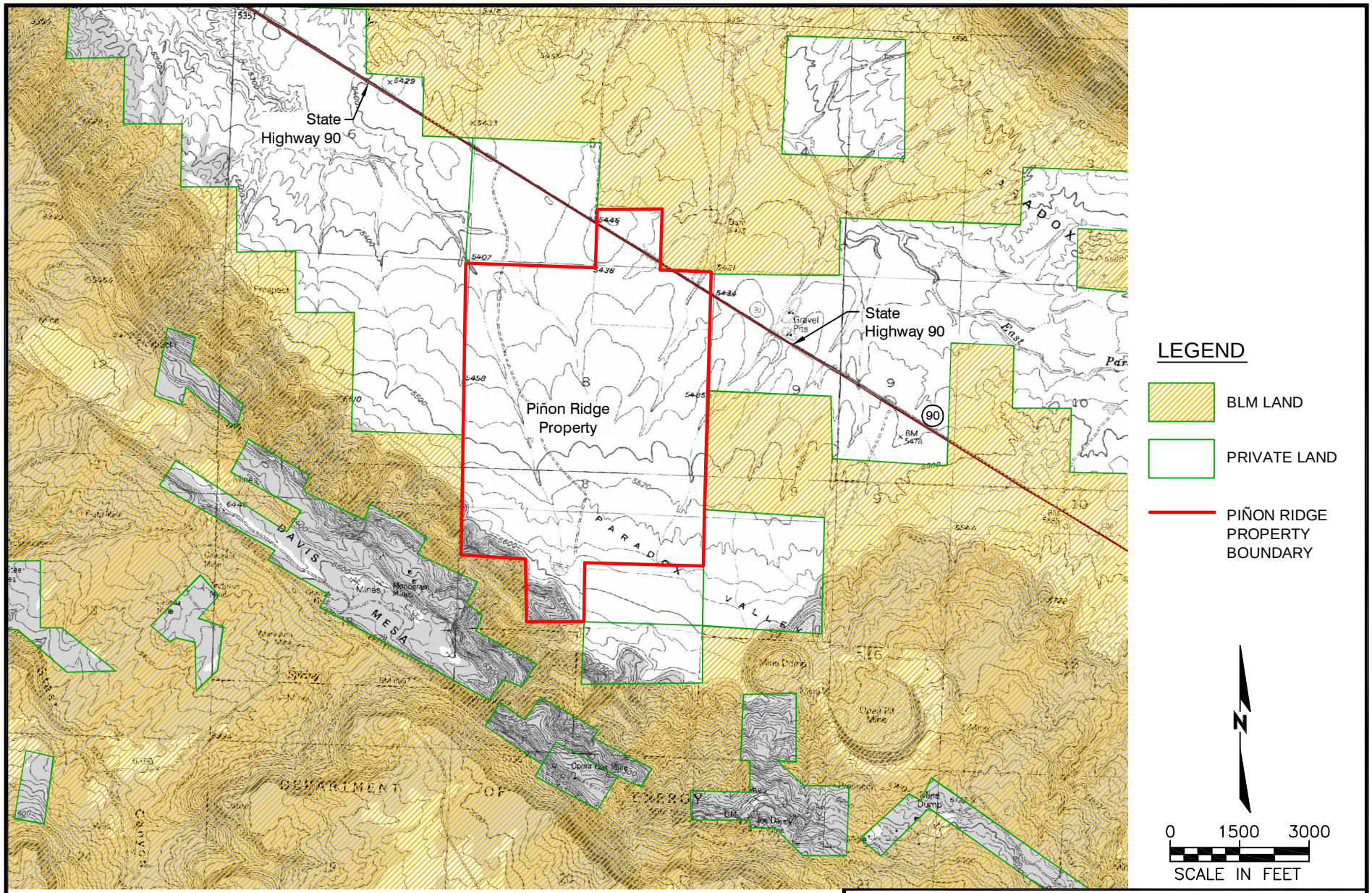
PROJECT

ENERGY FUELS RESOURCES CORPORATION
PIÑON RIDGE MILL FACILITY
MONTROSE COUNTY, COLORADO

PROJECT No.		N/A	FILE NAME	FIG0-1-SITE-LOC
DESIGN	EFR	5/1/08	SCALE NONE	REV. A
CADD	JGM	7/17/09		
CHECK	MAM	7/17/09		
REVIEW	FF	7/17/09		

visus CONSULTING GROUP, INC

FIGURE 0-1



TOWNSHIP 46N, RANGE 17W - NEW MEXICO PRIME MERIDIAN

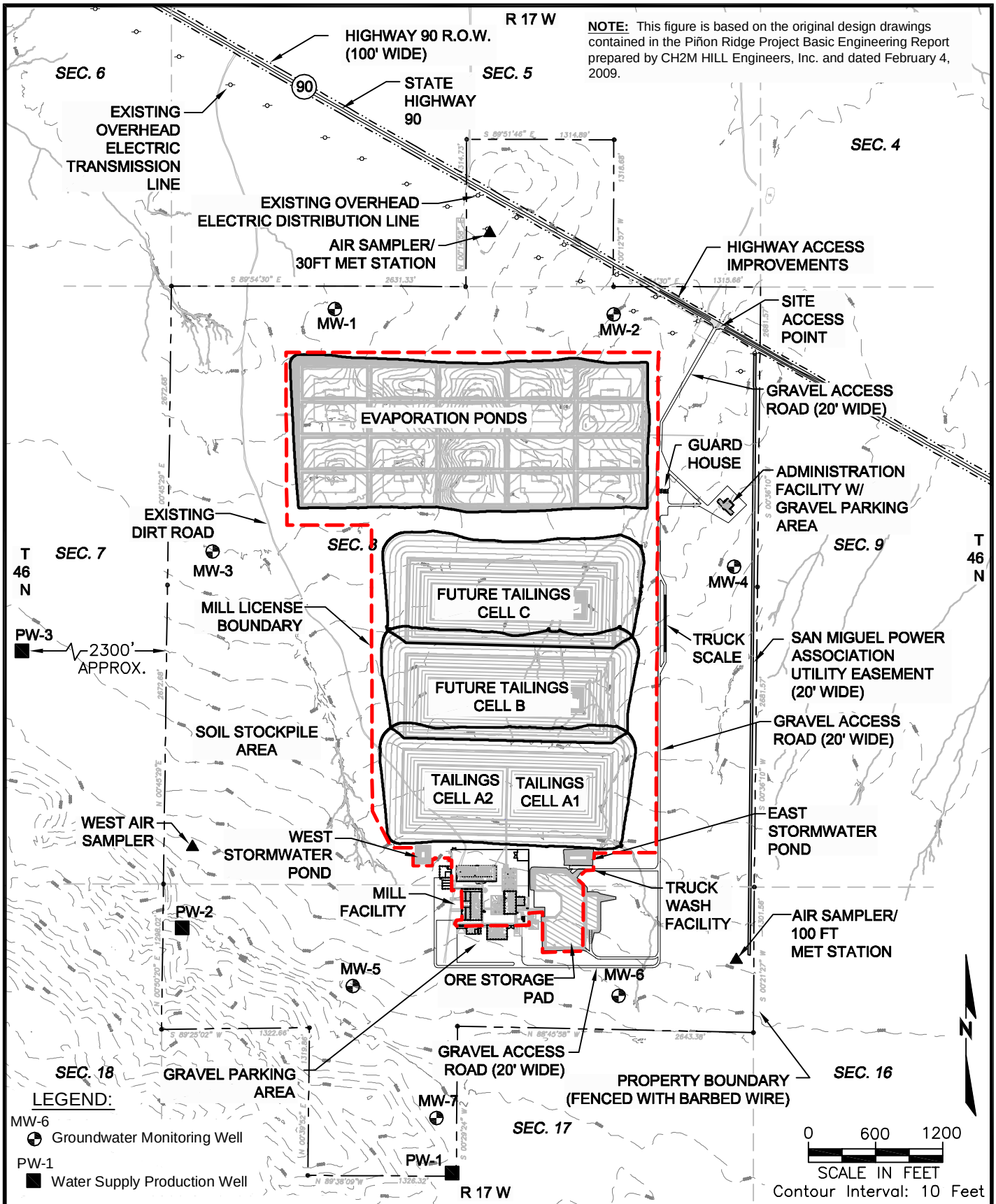
TITLE

PROPERTY MAP

PROJECT

ENERGY FUELS RESOURCES CORPORATION
PIÑON RIDGE MILL FACILITY
MONTROSE COUNTY, COLORADO

PROJECT No.		N/A	FILE NAME FIG0-2-PROP-MAP	
DESIGN	EFR	5/1/08	SCALE NONE	REV. A
CADD	JGM	7/17/09		
CHECK	MAM	7/17/09	**FIGURE 0-2**	
REVIEW	FF	7/17/09		



NOTE: This figure is based on the original design drawings contained in the Piñon Ridge Project Basic Engineering Report prepared by CH2M HILL Engineers, Inc. and dated February 4, 2009.

LEGEND:

MW-6 ⊕ Groundwater Monitoring Well

PW-1 ■ Water Supply Production Well

▲ Meteorological Tower/ Air Monitoring Station

TOWNSHIP 46N, RANGE 17W - NEW MEXICO PRIME MERIDIAN

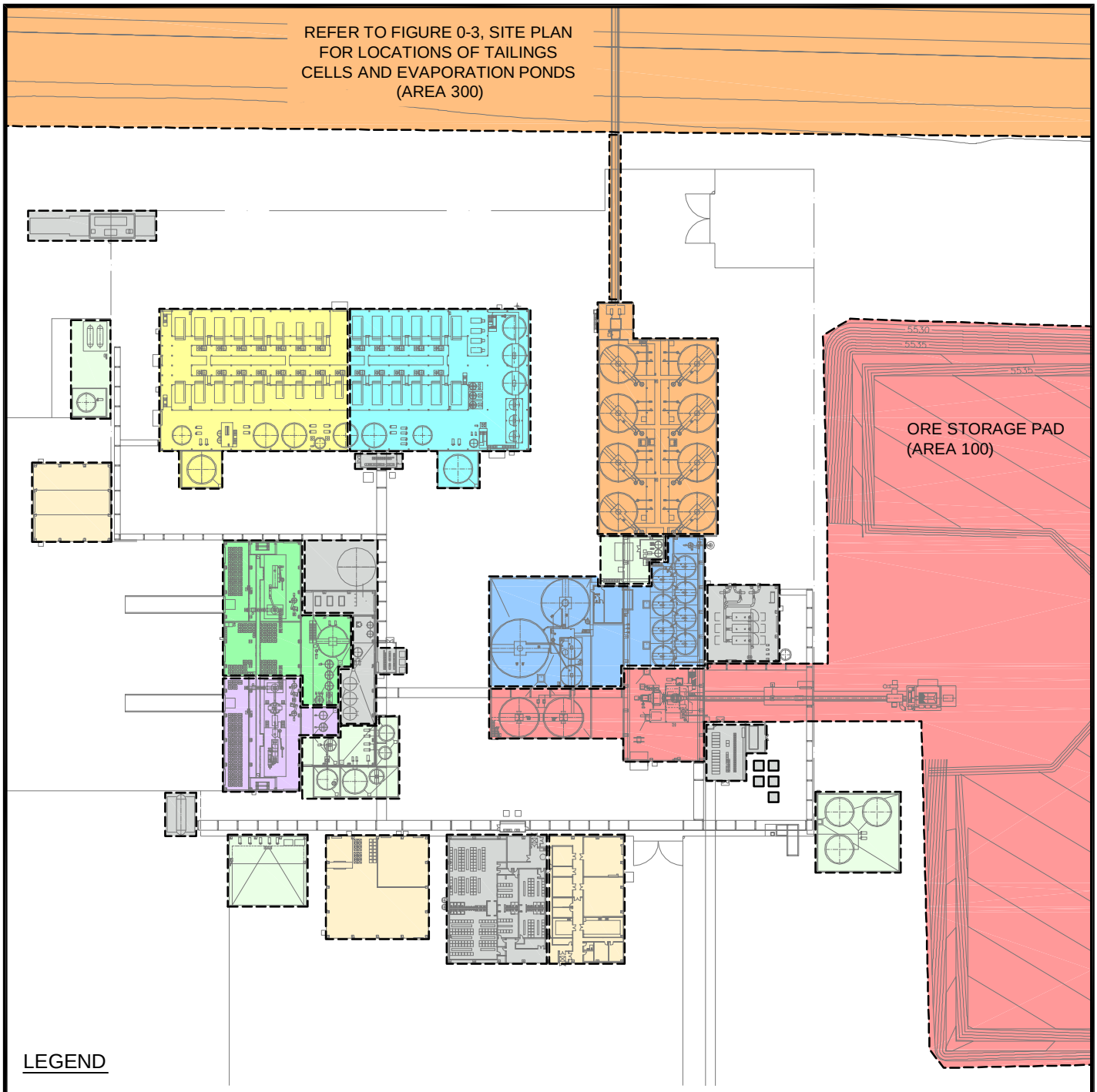
TITLE: **SITE PLAN**

PROJECT

ENERGY FUELS RESOURCES CORPORATION
PIÑON RIDGE MILL FACILITY
MONTROSE COUNTY, COLORADO

PROJECT No.		N/A	FILE NAME FIG0-3-SITE-PLAN
DESIGN	CH2M HILL	2/4/09	SCALE AS SHOWN REV. A
CADD	JGM	7/17/09	
CHECK	MAM	7/17/09	
REVIEW	FF	7/17/09	

FIGURE 0-3



NOTE: This figure is based on the original design drawings contained in the Piñon Ridge Project Basic Engineering Report prepared by CH2M HILL Engineers, Inc. and dated February 4, 2009.

TITLE

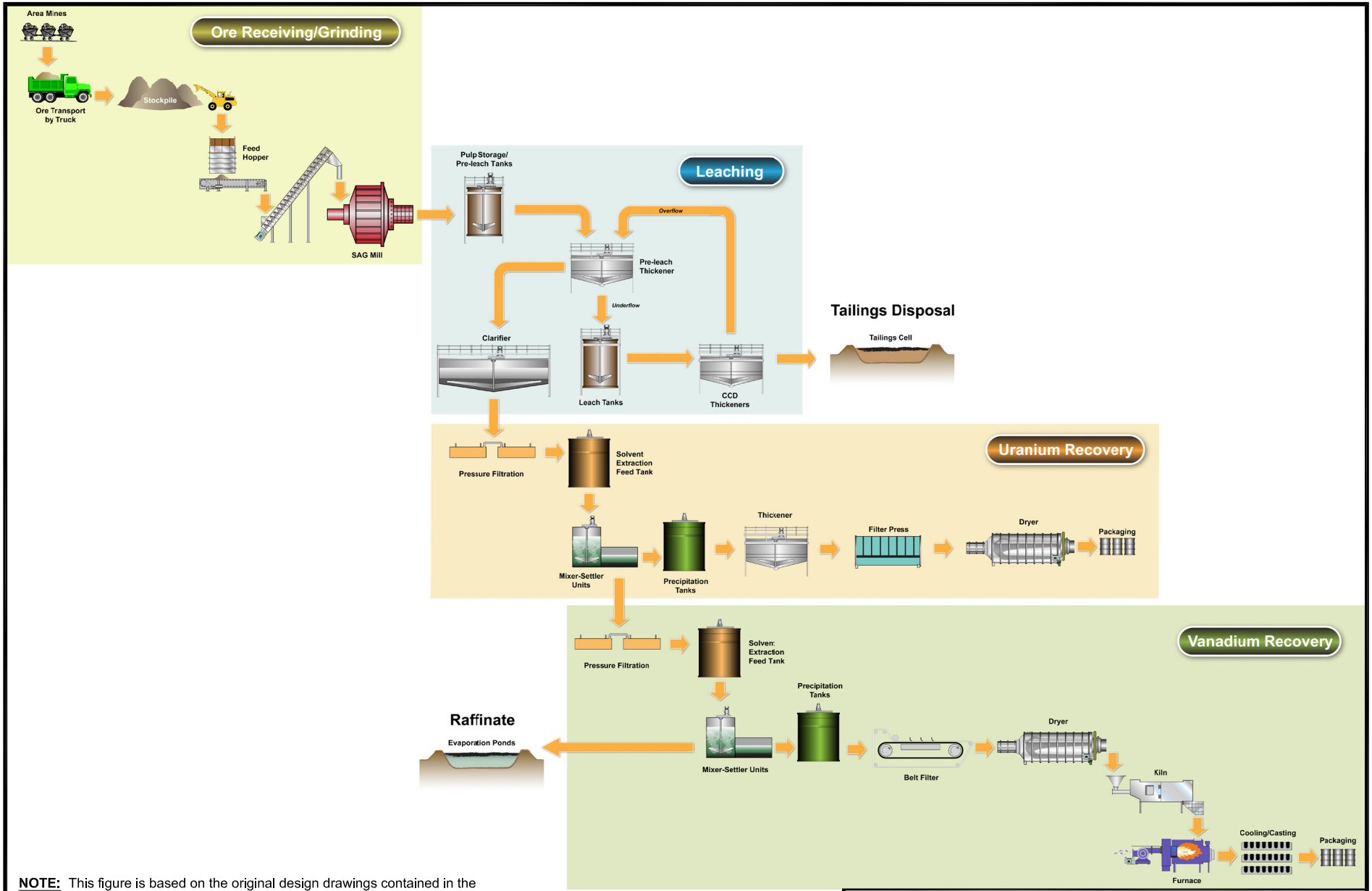
MILLING AND PROCESS AREA KEY MAP

PROJECT

ENERGY FUELS RESOURCES CORPORATION
PIÑON RIDGE MILL FACILITY
MONTROSE COUNTY, COLORADO

PROJECT No.		N/A	FILE NAME	FIG0-4-KEY-MAP
DESIGN	CH2M HILL	2/4/09	SCALE NONE	REV. A
CADD	JGM	7/17/09		
CHECK	MAM	7/17/09		
REVIEW	FF	7/17/09		

FIGURE 0-4



NOTE: This figure is based on the original design drawings contained in the Piñon Ridge Project Basic Engineering Report prepared by CH2M HILL Engineers, Inc. and dated February 4, 2009.

TITLE

PROCESS FLOW SHEET

PROJECT

ENERGY FUELS RESOURCES CORPORATION
PIÑON RIDGE MILL FACILITY
MONTROSE COUNTY, COLORADO

Vicus CONSULTING GROUP, INC.

PROJECT No.		N/A	FILE NAME	FIG0-5-PRO-FLOW
DESIGN	EFR	7/16/09	SCALE NONE	REV. A
CADD	JGM	7/17/09		
CHECK	MAM	7/17/09		
REVIEW	FF	7/17/09		

FIGURE 0-5

CONCRETE PAD AND CONTAINMENT WALLS

CONTROL ROOM BUILDING

GRINDING AND LEACH BUILDING

ORE STORAGE PAD (CONCRETE)

ORE CONVEYOR SYSTEM

ORE FEED HOPPER

RETAINING WALL

CONCRETE SEDIMENT BASIN

TRUCK WASH FACILITY

TRUCK DUMPING PLATFORM

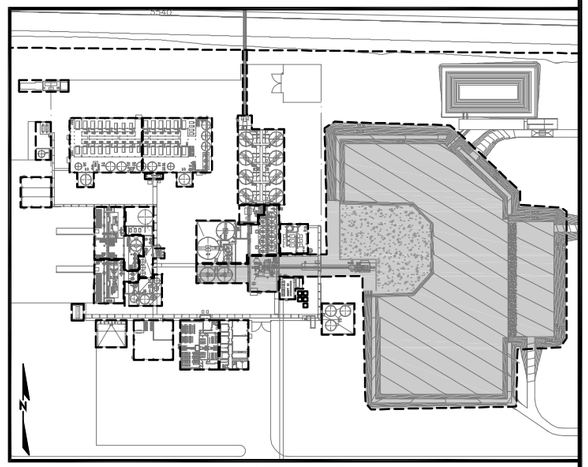
PULP STORAGE TANKS

SAG MILL

ORE STORAGE PAD (GCL)

5530
5535
5540
5545

N



KEY MAP

NOTE: This figure is based on the original design drawings contained in the Piñon Ridge Project Basic Engineering Report prepared by CH2M HILL Engineers, Inc. and dated February 4, 2009.

PROJECT

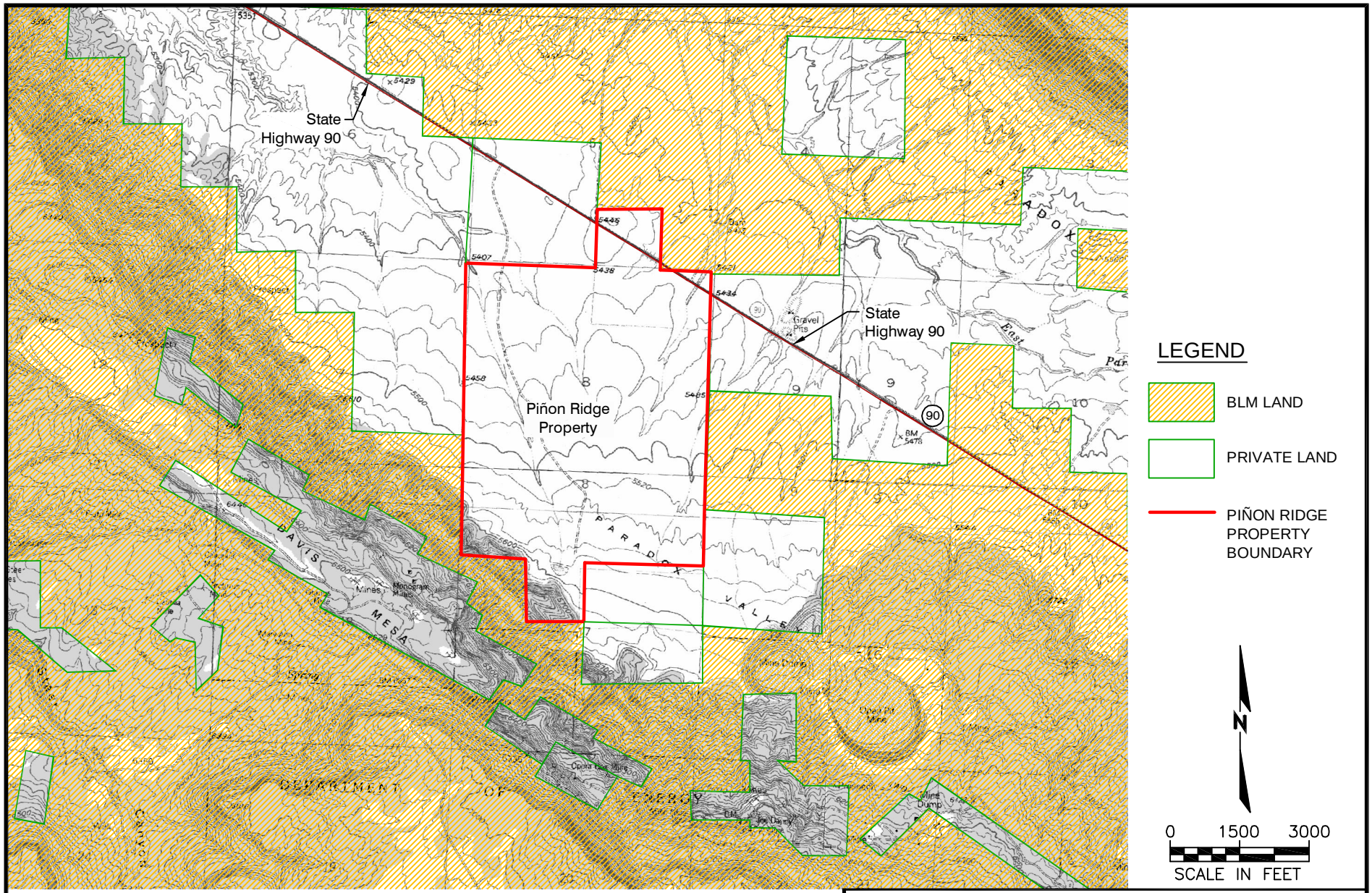
ENERGY FUELS RESOURCES CORPORATION
PIÑON RIDGE MILL FACILITY
MONTROSE COUNTY, COLORADO

TITLE

AREA 100 - ORE HANDLING AND GRINDING

PROJECT No.		N/A	FILE NAME	FIG1-1-AREA100	
DESIGN	CH2M HILL	2/4/09	SCALE	NONE	REV. A
CADD	JGM	7/17/09			
CHECK	MAM	7/17/09			
REVIEW	FF	7/17/09			

FIGURE 1-1



TOWNSHIP 46N, RANGE 17W - NEW MEXICO PRIME MERIDIAN

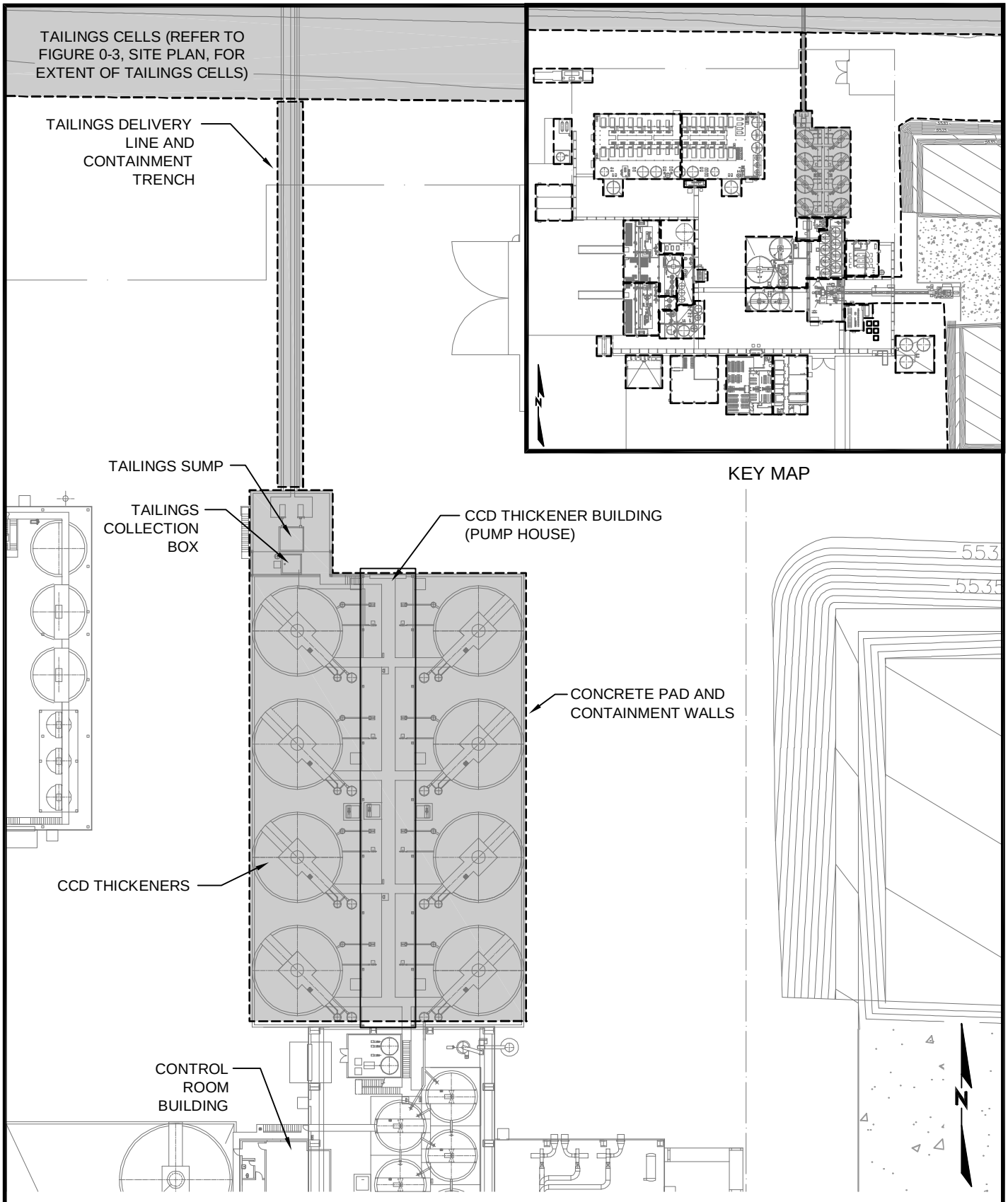
TITLE

PROPERTY MAP

PROJECT

ENERGY FUELS RESOURCES CORPORATION
PIÑON RIDGE MILL FACILITY
MONTROSE COUNTY, COLORADO

PROJECT No.		N/A	FILE NAME FIG0-2-PROP-MAP	
DESIGN	EFR	5/1/08	SCALE NONE	REV. A
CADD	JGM	7/17/09		
CHECK	MAM	7/17/09	**FIGURE 0-2**	
REVIEW	FF	7/17/09		



NOTE: This figure is based on the original design drawings contained in the Piñon Ridge Project Basic Engineering Report prepared by CH2M HILL Engineers, Inc. and dated February 4, 2009.

TITLE

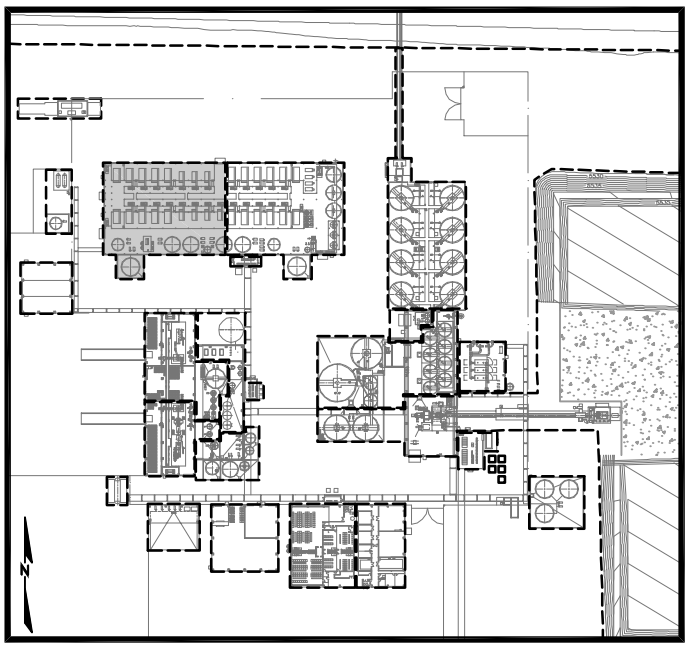
AREA 300 - CCD THICKENERS AND WASTE DISPOSAL

PROJECT

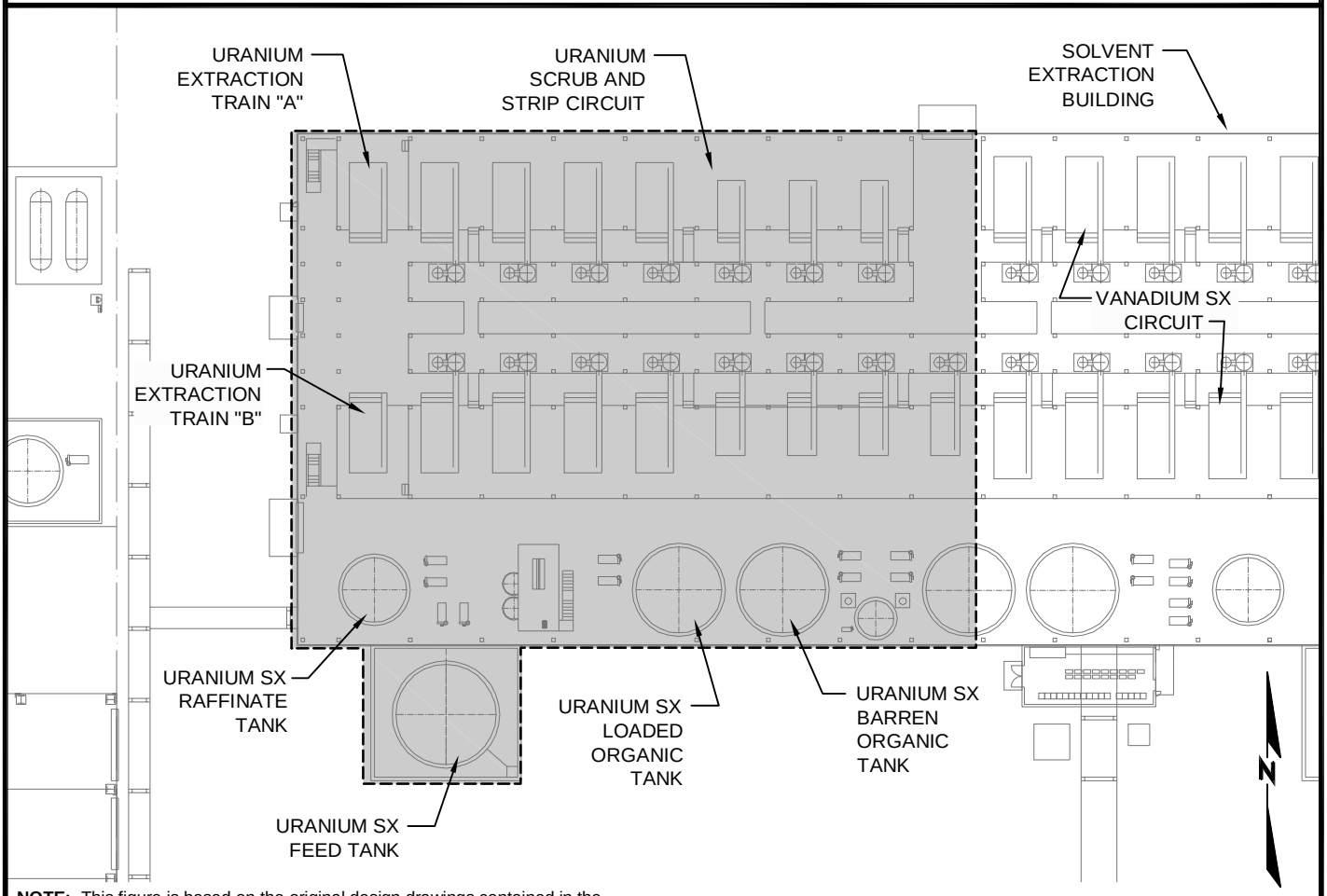
ENERGY FUELS RESOURCES CORPORATION
PIÑON RIDGE MILL FACILITY
MONTROSE COUNTY, COLORADO

PROJECT No.		N/A	FILE NAME	FIG3-1-AREA300
DESIGN	CH2M HILL	2/4/09	SCALE NONE	REV. A
CADD	JGM	7/17/09		
CHECK	MAM	7/17/09		
REVIEW	FF	7/17/09		

FIGURE 3-1



KEY MAP



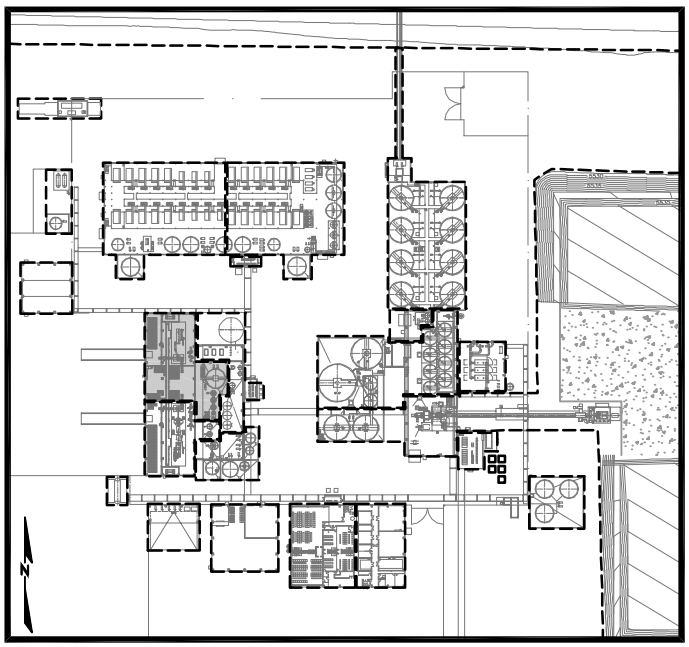
NOTE: This figure is based on the original design drawings contained in the Piñon Ridge Project Basic Engineering Report prepared by CH2M HILL Engineers, Inc. and dated February 4, 2009.

TITLE
AREA 400 - URANIUM SOLVENT EXTRACTION (SX)

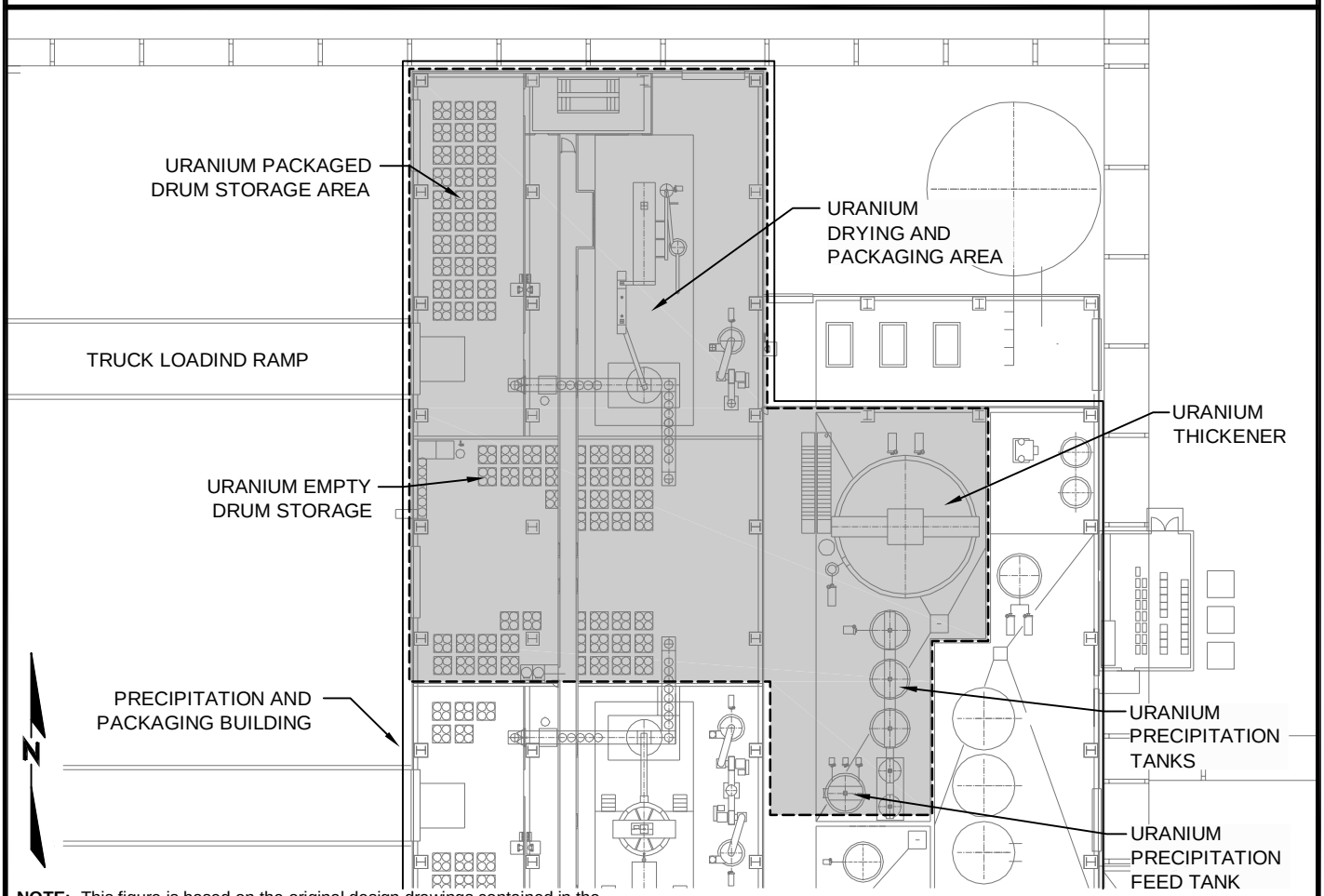
PROJECT
ENERGY FUELS RESOURCES CORPORATION
PIÑON RIDGE MILL FACILITY
MONTROSE COUNTY, COLORADO

PROJECT No.		N/A	FILE NAME	FIG4-1-AREA400
DESIGN	CH2M HILL	2/4/09	SCALE NONE	REV. A
CADD	JGM	7/17/09		
CHECK	MAM	7/17/09		
REVIEW	FF	7/17/09		

FIGURE 4-1



KEY MAP



NOTE: This figure is based on the original design drawings contained in the Piñon Ridge Project Basic Engineering Report prepared by CH2M HILL Engineers, Inc. and dated February 4, 2009.

TITLE

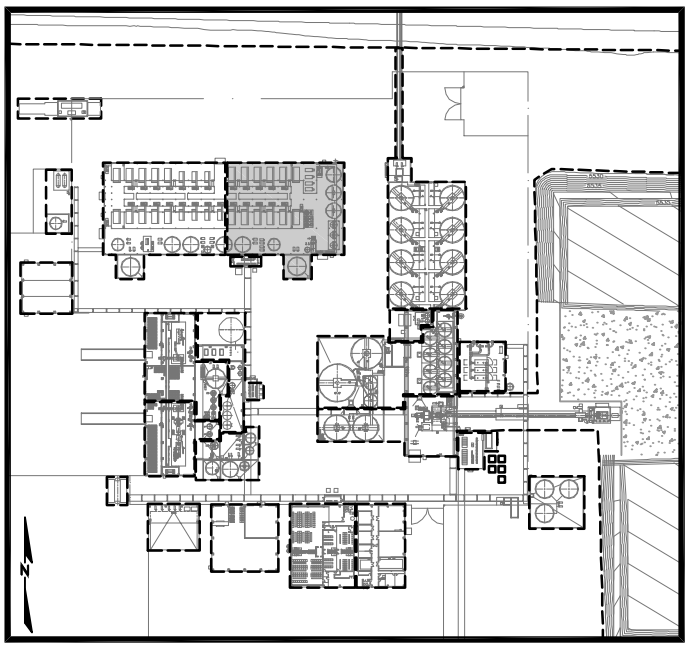
AREA 500 - URANIUM PRECIPITATION

PROJECT

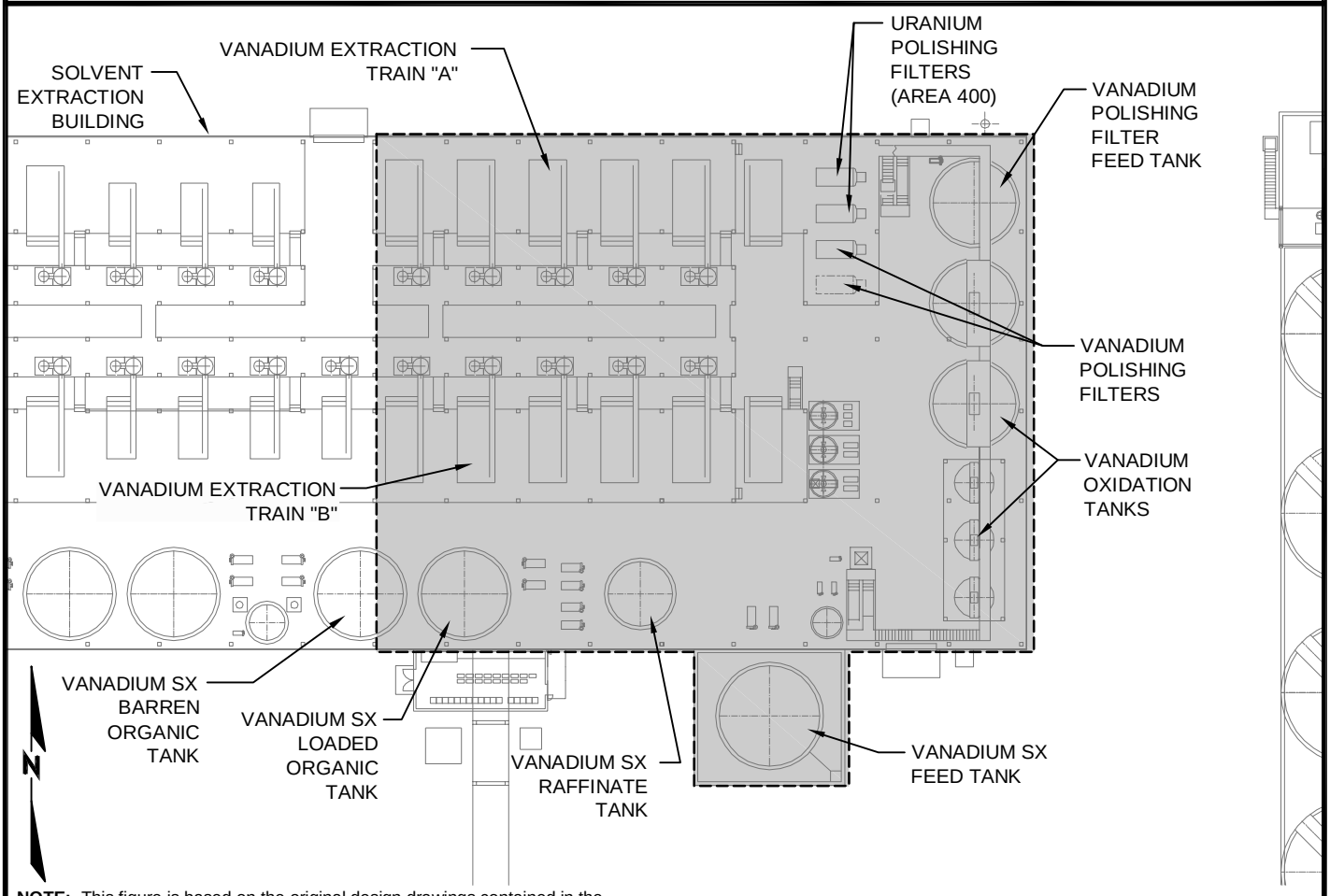
ENERGY FUELS RESOURCES CORPORATION
PIÑON RIDGE MILL FACILITY
MONTROSE COUNTY, COLORADO

PROJECT No.		N/A	FILE NAME	FIG5-1-AREA500
DESIGN	CH2M HILL	2/4/09	SCALE NONE	REV. A
CADD	JGM	7/17/09		
CHECK	MAM	7/17/09		
REVIEW	FF	7/17/09		

FIGURE 5-1



KEY MAP



NOTE: This figure is based on the original design drawings contained in the Piñon Ridge Project Basic Engineering Report prepared by CH2M HILL Engineers, Inc. and dated February 4, 2009.

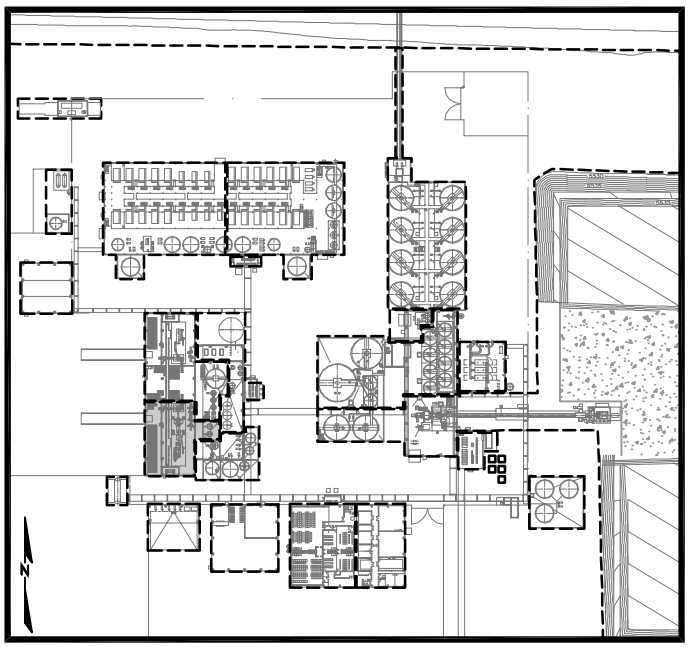
TITLE **AREA 600 - VANADIUM OXIDATION AND SOLVENT EXTRACTION (SX)**

PROJECT

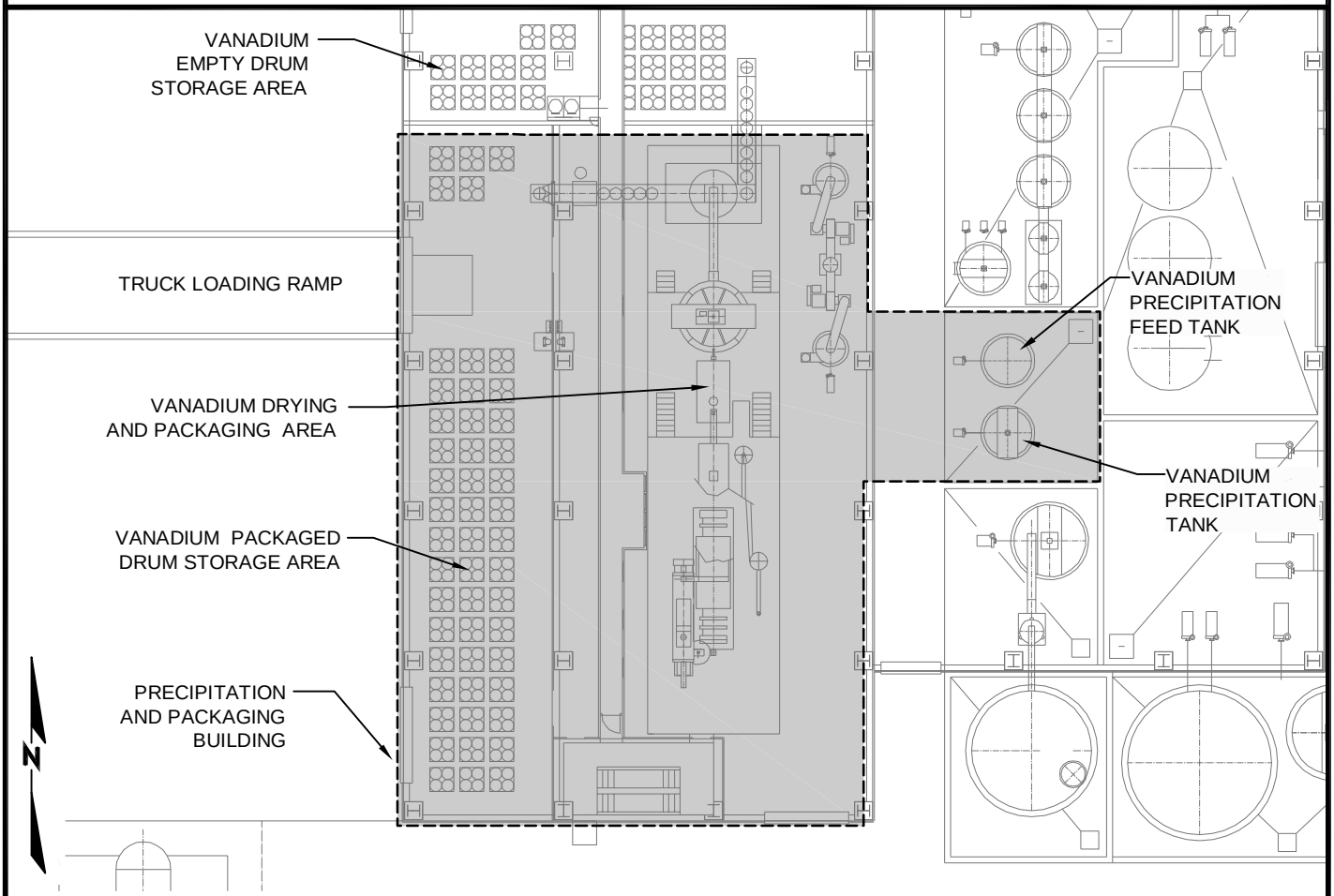
ENERGY FUELS RESOURCES CORPORATION
PIÑON RIDGE MILL FACILITY
MONTROSE COUNTY, COLORADO

PROJECT No.		N/A	FILE NAME	FIG6-1-AREA600
DESIGN	CH2M HILL	2/4/09	SCALE NONE	REV. A
CADD	JGM	7/17/09		
CHECK	MAM	7/17/09		
REVIEW	FF	7/17/09		

FIGURE 6-1



KEY MAP



NOTE: This figure is based on the original design drawings contained in the Piñon Ridge Project Basic Engineering Report prepared by CH2M HILL Engineers, Inc. and dated February 4, 2009.

TITLE

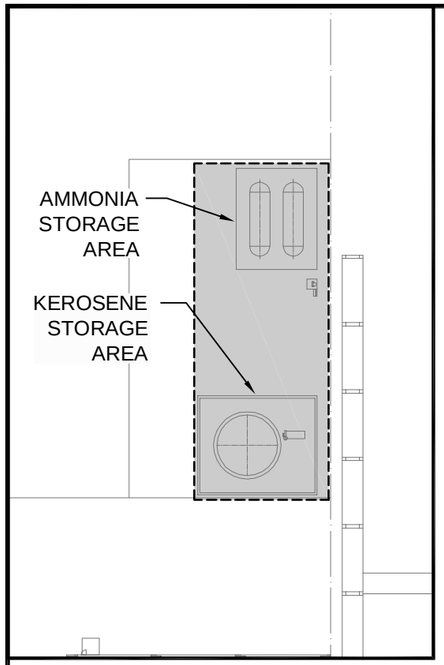
AREA 700 - VANADIUM PRECIPITATION

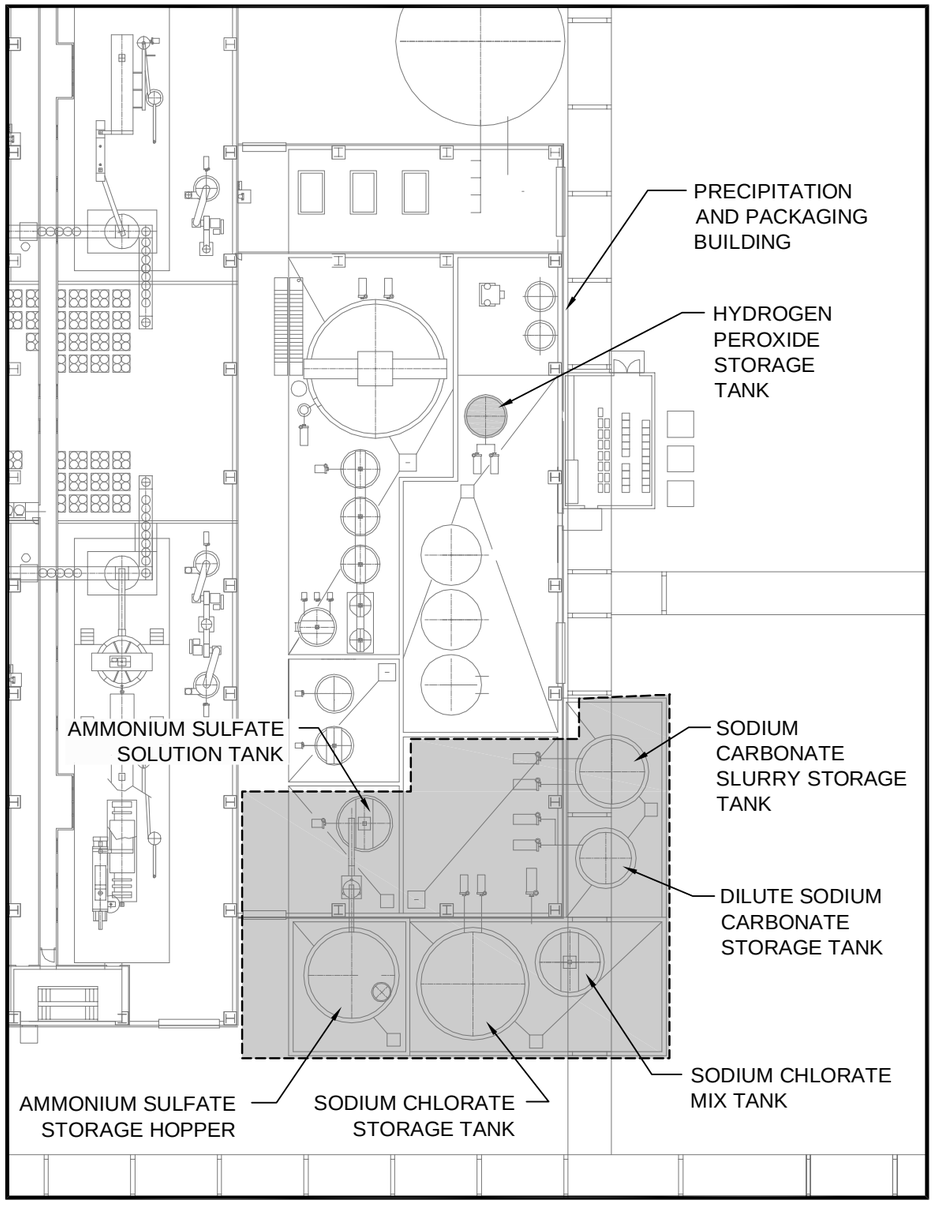
PROJECT

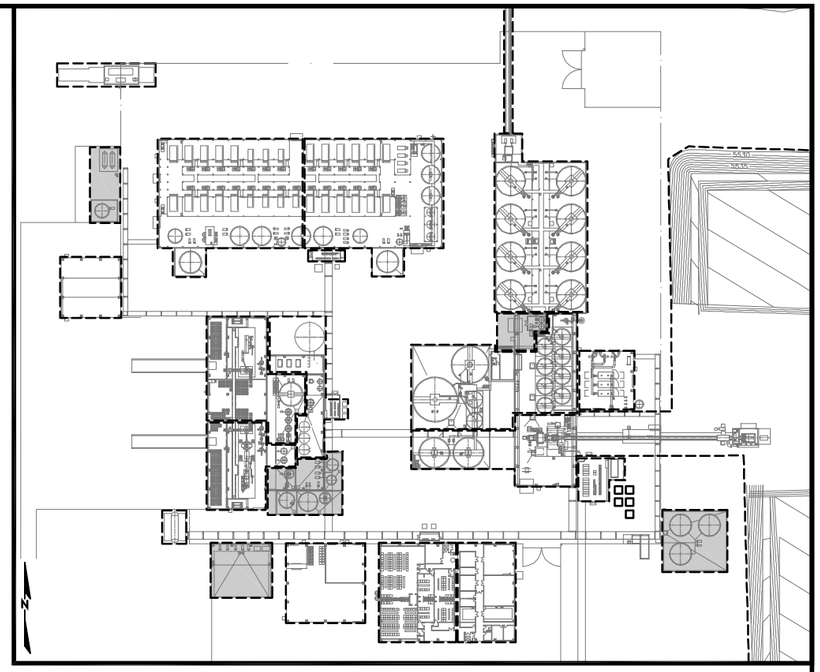
ENERGY FUELS RESOURCES CORPORATION
PIÑON RIDGE MILL FACILITY
MONTROSE COUNTY, COLORADO

PROJECT No.		N/A	FILE NAME	FIG7-1-AREA700
DESIGN	CH2M HILL	2/4/09	SCALE NONE	REV. A
CADD	JGM	7/17/09		
CHECK	MAM	7/17/09		
REVIEW	FF	7/17/09		

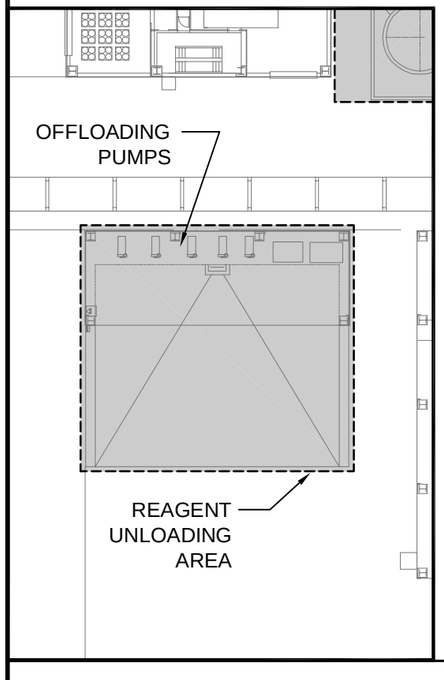
FIGURE 7-1

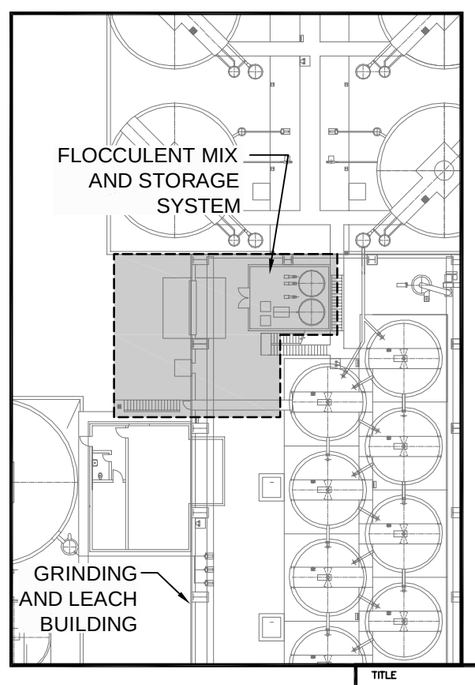


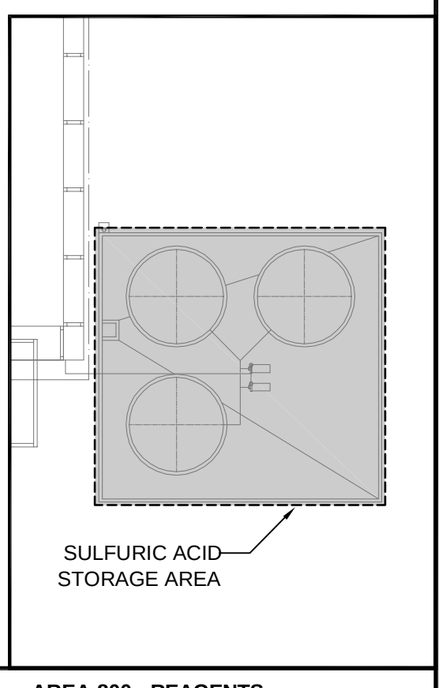




KEY MAP





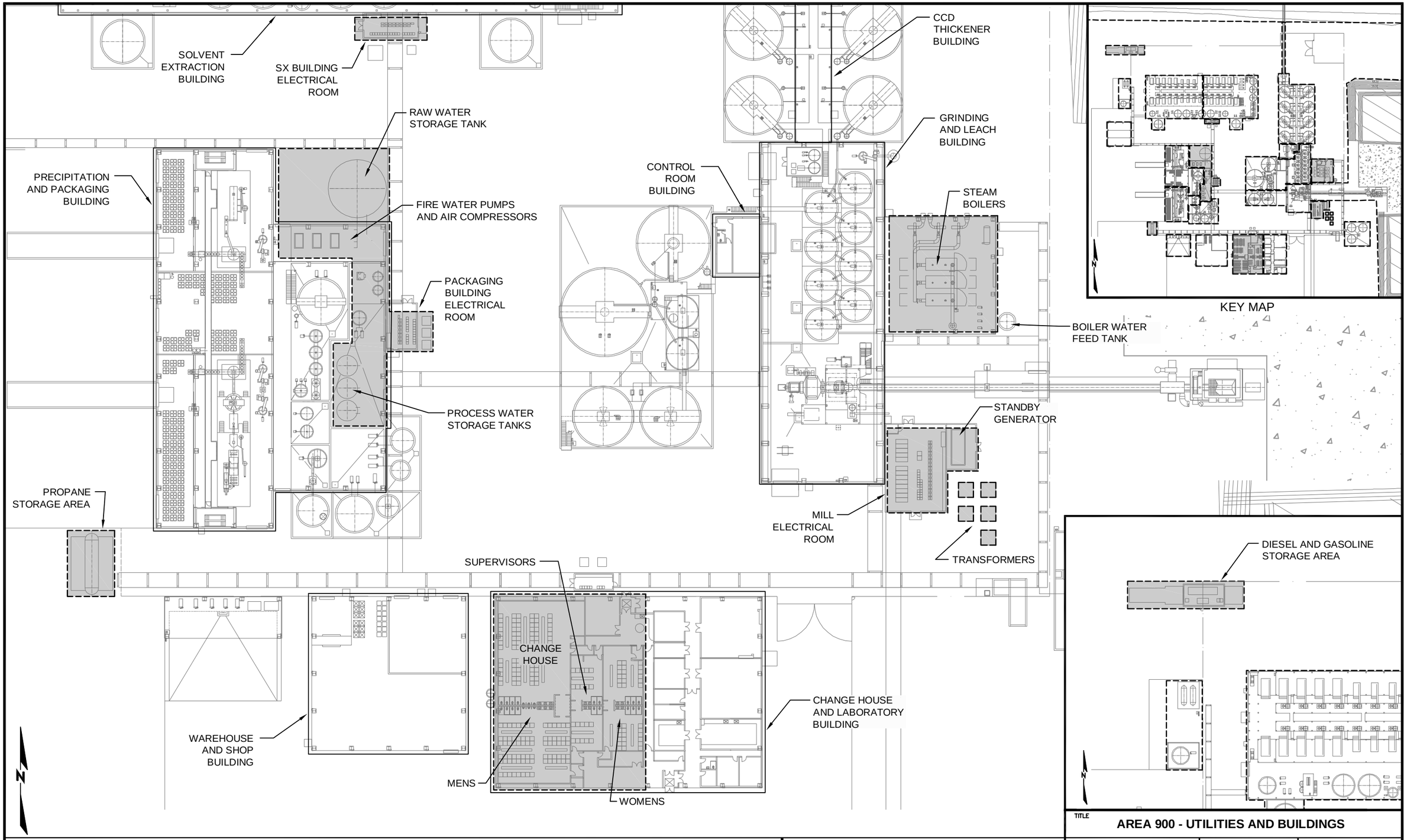


NOTE: This figure is based on the original design drawings contained in the Piñon Ridge Project Basic Engineering Report prepared by CH2M HILL Engineers, Inc. and dated February 4, 2009.

PROJECT
ENERGY FUELS RESOURCES CORPORATION
PIÑON RIDGE MILL FACILITY
MONTROSE COUNTY, COLORADO

TITLE
AREA 800 - REAGENTS

PROJECT No.		N/A	FILE NAME	FIG8-1-AREA800	
DESIGN	CH2M HILL	2/4/09	SCALE	NONE	REV. A
CADD	JGM	7/17/09	**FIGURE 8-1**		
CHECK	MAM	7/17/09			
REVIEW	FF	7/17/09			



NOTE: This figure is based on the original design drawings contained in the Piñon Ridge Project Basic Engineering Report prepared by CH2M HILL Engineers, Inc. and dated February 4, 2009.

PROJECT

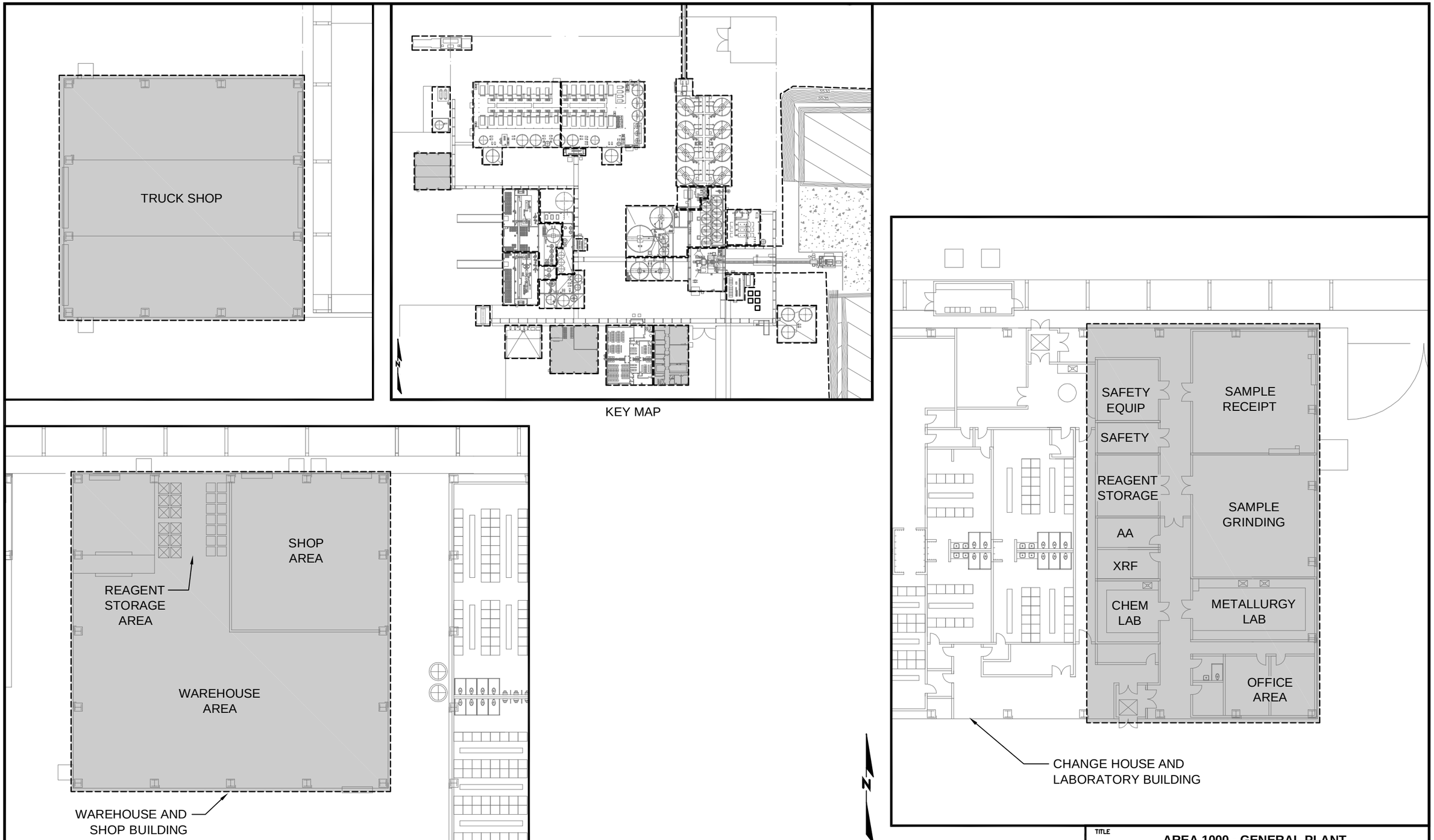
ENERGY FUELS RESOURCES CORPORATION
PIÑON RIDGE MILL FACILITY
MONTROSE COUNTY, COLORADO

TITLE

AREA 900 - UTILITIES AND BUILDINGS

PROJECT No.		N/A	FILE NAME	FIG9-1-AREA900	
DESIGN	CH2M HILL	2/4/09	SCALE	NONE	REV. A
CADD	JGM	7/17/09			
CHECK	MAM	7/17/09			
REVIEW	FF	7/17/09			

FIGURE 9-1



NOTE: This figure is based on the original design drawings contained in the Piñon Ridge Project Basic Engineering Report prepared by CH2M HILL Engineers, Inc. and dated February 4, 2009.

PROJECT
ENERGY FUELS RESOURCES CORPORATION
PIÑON RIDGE MILL FACILITY
MONTROSE COUNTY, COLORADO

TITLE
AREA 1000 - GENERAL PLANT

PROJECT No.		N/A	FILE NAME	FIG10-1-AREA1000
DESIGN	CH2M HILL	2/4/09	SCALE NONE	REV. A
CADD	JGM	7/17/09		
CHECK	MAM	7/17/09		
REVIEW	FF	7/17/09		

FIGURE 10-1

MINE OPERATIONS PLAN

PIÑON RIDGE MILL FACILITY
MONTROSE COUNTY, COLORADO

Submitted To
Colorado Department of Public Health and Environment
Radiation Management Program
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

Submitted and Prepared By

ENERGY FUELS RESOURCES CORPORATION
44 Union Boulevard, Suite 600
Lakewood, Colorado 80228

August 2009

1.0 Introduction 1-1

1.1 Mine Locations and Resources 1-1

1.2 Regional Geology 1-2

1.2.1 Chinle and Cutler Deposits 1-3
1.2.2 Salt Wash Deposits 1-4
1.2.3 Uranium and Vanadium Minerals 1-4

1.3 Types of Mines 1-4

1.3.1 Underground Mines 1-4
1.3.2 Surface Mines 1-5

1.4 Regulatory Requirements 1-5

1.4.1 Local Permitting Requirements 1-6
1.4.2 State Permitting Requirements 1-6
1.4.3 Federal Permits 1-7

2.0 Underground Mines 2-1

2.1 Mine Access and Ventilation 2-1

2.2 Mining Methods and Equipment 2-2

2.3 Surface Facilities and Infrastructure 2-3

3.0 Surface Mines 3-1

3.1 Mine Access 3-1

3.2 Mining Methods and Equipment 3-1

3.3 Facilities and Infrastructure 3-2

4.0 Waste Management and Reclamation 4-1

4.1 Waste Rock Disposal 4-1

4.2 Mine Water Treatment 4-2

4.3 Recycling of Used Oils, Antifreeze, and Solvents 4-2

4.4 Closure and Reclamation 4-3

5.0 Staffing Requirements 5-1

6.0 Ore Haulage 6-1

6.1 Ore Haulage Routes 6-1

6.2 Department of Transportation Haulage Requirements 6-2

List of Tables

Table 1.1	Energy Fuels Mine and Exploration Properties
Table 1.2	Applicable Permits for Uranium Mines
Table 2.1	Typical Equipment List
Table 5.1	Mine Related Staffing Estimates
Table 6.1	Potential Mill Feed Sources
Table 6.2	Piñon Ridge Mill Feed Zones

List of Figures

Figure 1.1	Colorado and Utah Mine and Exploration Properties
Figure 1.2	Principal Uranium Deposits & Major Structures of the Colorado Plateau
Figure 6.1	Potential Sources of Ore Feed to the Mill

List of Appendices

Appendix A	Traffic Impact Analysis
Appendix B	Ore Transportation Plan

Units of Measure and Abbreviations

%	Percent
BLM	U.S. Department of Interior – Bureau of Land Management
CDOT	Colorado Department of Transportation
CFR	Code of Federal Regulations
CMLRA	Colorado Mined Land Reclamation Act of 1976
cy	cubic yard
DMO	Designated Mining Operation
DOE	U.S. Department of Energy

DOGM	Utah Division of Oil, Gas and Mining
DRMS	Colorado Division of Reclamation, Mining and Safety
EA	Environmental Assessment
Energy Fuels	Energy Fuels Resources Corporation
EIS	Environmental Impact Statement
ft	foot or feet
H:V	Horizontal to Vertical
LHD	Loading-hauling-dumping
MSHA	Mine Safety and Health Administration
NEPA	National Environmental Policy Act
TES	Threatened, endangered, and sensitive
tpd	tons per day
U_3O_8	Uranium Oxide
UDOT	Utah Department of Transportation
UMLRA	Utah Mined Land Reclamation Act of 1975
$U0_2$	Uraninite (pitchblende)
USDOT	U.S. Department of Transportation
USFS	U.S. Department of Agriculture – Forest Service
$USiO_4OH$	Coffinite
VOOH	Montroseite

1.0 Introduction

1.1 Mine Locations and Resources

The Piñon Ridge Mill site, owned by Energy Fuels Resources Corporation (Energy Fuels), is located in Montrose County, Colorado between the towns of Bedrock and Naturita, as shown on Figure 1.1, Colorado and Utah Mine and Exploration Properties. This figure also shows the location of Energy Fuels mine and exploration properties in the region, which extend over three counties in Colorado (Mesa, Montrose, and San Miguel Counties) and three counties in Utah (San Juan, Grand, and Emery Counties). Energy Fuels plans to supply ore to the mill, over its estimated 40-year operating life, from its mines and mines operated by other mining companies in the area. The mines will be predominantly underground operations and will range in size from small mines producing 25 tons per day (tpd) of ore to larger mines producing up to approximately 300 tpd of ore. Many of the mines are expected to operate for numerous years; however, some mines with limited resources will operate for only a short time.

Energy Fuels has identified 3.1 million tons of mineable uranium/vanadium resources at ten of its properties listed in Table 1.1, Energy Fuels Mine and Exploration Properties. These properties have the potential to supply all of the mill feed for 17 years at the mill's 500 tpd processing rate. Energy Fuels also estimates that there are an additional 5.7 million tons of uranium/vanadium resources at approximately 50 properties controlled by other mining companies in the region. The properties controlled by other mining companies are generally located in the same areas as Energy Fuels mine and exploration properties with the highest concentration of mines occurring in Montrose County. The 5.7 million ton estimate does not include uranium mines operated by Denison Mines (USA) Corporation (Denison), as ore from these mines is shipped to the White Mesa Mill in Blanding, Utah. The resource estimate also does not include mines in the area for which Energy Fuels does not have any verifiable information.

Energy Fuels is also conducting exploration at numerous properties through out the area in an effort to expand its resource base. The exploration program is being conducted at the 10 mine properties with identified resources listed in Table 1.1 and the 11 exploration targets also listed in Table 1.1. Both the mine and exploration properties are shown on Figure 1.1.

Initially, approximately 75 percent (%) of the mill feed will come from Energy Fuels mine operations and 25% from other mining operations in the region. This supply

ratio may change over time depending on a number of considerations, including availability of resources, ore grade, uranium price, and mine permitting. Energy Fuels will initially provide ore to the mill from the fully permitted Energy Queen and Whirlwind mines and from one or two smaller Energy Fuels mines that will be permitted and developed prior to mill startup. The Energy Queen and Whirlwind mines are projected to produce 62,500 and 50,000 tons of ore per year, respectively, which is equivalent to 64% of the 175,000 tons of ore that will be milled each year. As discussed above, approximately 25% of the ore is expected to come from mine operations in the area that are owned and operated by others, many of which are permitted or are in the process of being permitted. Energy Fuels has had discussions with a number of these mine operators; however, contracts will not be executed until the permitting and financing for the mill are completed.

The source of mill feed will change over the life of the mill as mines are mined out and others are developed and come on line. At any one time, there will be a number of mines or mine properties in various stages of regulatory permitting, development, production, and reclamation. The number of mines necessary to supply the annual ore requirement of 175,000 tons will vary over the life of the mill; however, in general, the mill will be supplied by two to four larger mines supplemented by three to five smaller operations. The larger mines will supply between 2,500 and 6,000 tons of ore per month. The smaller mines will supply from 500 to 2,500 tons of ore per month.

Mine production rates vary based on the amount of ore currently defined by drilling in the deposit, and in the case of existing mines that have production capability remaining, by the amount of mining that had previously taken place. The mines and mining areas that Energy Fuels has evaluated have ore resources ranging from 10,000 tons to over 1,000,000 tons.

As the mine production rates vary based on the factors discussed previously, so will the mine operating lives. Several of the larger mines will have mine lives in excess of 15 years. The smaller mines, which have ore resources of 10,000 tons, will likely only operate for several years before being closed and reclaimed.

1.2 Regional Geology

The uranium-rich Colorado Plateau province covers nearly 130,000 square miles in the Four Corners region as shown on Figure 1.2, Principal Uranium Deposits & Major Structures of the Colorado Plateau. The Whirlwind Mine, Energy Queen Mine and most of the other properties currently held by Energy Fuels lie in the Canyon Lands Section in the central and east-central part of the Colorado Plateau in Utah and

Colorado. Rocks exposed in this part of the Plateau range in age from Precambrian through Quaternary; Mesozoic rocks predominate. The lower Paleozoic systems are thin and deeply buried. The strata are mostly flat lying except near salt diapirs and laccolithic intrusions where steep dips and numerous faults occur. Mesas and canyons characterize the area.

The lithology of the region consists of basement rocks including Proterozoic metamorphic rocks and igneous intrusions. The area was relatively stable and usually near sea level throughout the Paleozoic and Mesozoic Eras. During this time, uplifting, subsidence, and tilting resulted in the deposition of flat-lying sedimentary rocks, predominantly consisting of evaporites, limestones, marine clastic sediments, eolian sandstones, and fluvial detritus.

Major uranium deposits of the east-central Colorado Plateau principally occur in either of two paleo-fluvial sequences. The older sequence occurred at or near the base of the upper Triassic Chinle Formation. The younger sequence occurs in the Morrison Formation of late Jurassic age. The majority of the ore feed to the mill will originate from the Salt Wash member of the Morrison Formation; however, uranium deposits in the Chinle Formation and the underlying Cutler Formation in eastern Utah may also comprise some of the mill feed. While uranium occurs throughout the Colorado Plateau, there are numerous belts and districts where the uranium deposits are larger and more closely spaced than others. In addition to uranium, many of the Morrison Formation deposits contain considerable quantities of vanadium. Generally, the uranium deposits of the Chinle and Cutler Formations contain very little vanadium and contain more calcite, which results in higher acid consumption during milling. All of these deposits are located in sandstones with similar chemical characteristics, as discussed below.

1.2.1 Chinle and Cutler Deposits

Uranium deposits principally occur where the basal Chinle Formation is composed of channel sandstone and conglomerate that scoured into the underlying sediments. The channel system in southern Utah is referred to as the Shinarump Member. Farther north in eastern Utah, a younger channel system, known as the Moss Back unit, occurs in the basal member of the Chinle Formation.

Deposition of the Chinle Formation followed a period of tilting and erosion, and formed an angular unconformity with the underlying Permian aged Cutler Formation. Good uranium deposits occur in both the Chinle and Cutler Formations, where channel sandstones of the Chinle are in contact with sandstones of the Cutler Formation.

1.2.2 Salt Wash Deposits

The Salt Wash Member of the Morrison Formation consists of fluvial, fine-grained sandstones and mudstones deposited by meandering river systems across an aggrading, partly eroded plain with varying subsidence rates. The source area for much of the Morrison Formation was a magmatic arc highland to the southwest. The majority of the uranium production has come from the upper sandstones of the Salt Wash Member known as the Top Rim. The Brushy Basin Member of the Morrison Formation, which is located above the Salt Wash Member, was deposited on a large mud flat associated with lacustrine and fluvial environments. Sediments of the Brushy Basin Member originated from volcanic activity to the west. The Brushy Basin Member consists predominantly of mudstone.

1.2.3 Uranium and Vanadium Minerals

The primary uranium mineral is uraninite (pitchblende) (UO_2). Coffinite ($USiO_4OH$) also occurs, in minor amounts. Vanadium occurs as Montroseite (VOOH) as well as in vanadium clays and hydromicas. Where secondary oxidation has occurred, numerous vanadium and uranium oxides and uranium vanadates occur.

1.3 Types of Mines

Both surface and underground mining methods are used in the Colorado Plateau area to recover uranium and vanadium. However, underground mining is much more common in this region.

1.3.1 Underground Mines

Underground mining is the typical mining method utilized in the Colorado Plateau region. The underground process is utilized wherein the material of value (i.e., ore) is removed through a process that leaves the host rock in place. The process involves exploration, planning and permitting, mine development, shipping of the ore to the mill, and reclamation at the end of the mine life.

Most of the exploration is conducted using drill rigs; although given the small and variable nature of the uranium deposits, the drilling is typically not as extensive as that used to identify large deposits of precious or base metals. Once a viable deposit has been identified, engineering personnel design the underground mine and surface facilities. The design work is closely coordinated with the environmental staff to minimize environmental impacts. The environmental staff is also responsible for performing baseline studies and submitting the required permit applications to local, state, and federal regulatory agencies.

Mine development typically occurs by accessing the ore body or vein through a shaft, drift, adit, decline, or incline depending on the orientation of the ore body and its relation to the surrounding surface topography. The ore and waste, as necessary, is then removed by various mining methods. Different methods are utilized depending on the deposit characteristics. These characteristics include deposit type, host rock characteristics, grade, deposit size, deposit geometry, environmental factors, safety/regulatory factors, labor/political considerations, and economics. Some common underground mining methods utilized within the Colorado Plateau include random room and pillar, shrinkage stoping, and conventional cut and fill with slusher and jackleg. Random room and pillar mining using diesel equipment is the most common underground mining method in the region.

The ore is removed to the surface by small haul trucks, rail, or through headframe/hoist/skip arrangements. The ore is stored on the surface in a stockpile or storage bin. The ore is then loaded into highway haul trucks and shipped to local mills for extraction of the uranium and vanadium. Once mining of the deposit is complete, the mine workings are reclaimed in accordance with permit requirements.

1.3.2 Surface Mines

Surface mining, as the name implies, starts at the natural ground surface, and proceeds downward to the ore. Surface mining methods are utilized when the ore is at or near the surface. Surface mining is not extensively used in the Colorado Plateau region due to the small size of most surface deposits and because the majority of these surface deposits were mined prior to 1980. In general, surface mining tends to be less expensive than underground mining.

The mining process involves exploration, planning and permitting, mine development, removal of the uranium ore, shipping of the ore to the mill, and reclamation after the ore reserves have been exhausted. Some typical surface mining methods are open pit, strip mining, quarrying, auger mining, dredging and hydraulic mining. Most surface mines on the Colorado Plateau are open pit operations. A modified method of surface mining used in uranium extraction, but more common in oil and gas extraction, involves in situ leaching. In situ mining is uncommon on the Colorado Plateau, as the ore deposits in this region are typically not suitable for this type of extraction method.

1.4 Regulatory Requirements

Mining and mineral exploration activities in the United States are subject to multiple levels of regulatory oversight. In order to develop a producing mine, operators are

required to meet technical and financial requirements and must acquire numerous regulatory permits from federal, state, and local government agencies. The mine and reclamation permits administered by the Colorado Division of Reclamation, Mining and Safety (DRMS) and the Utah Division of Oil, Gas and Mining (DOGM) are the primary permits required to operate a mine in the states of Colorado and Utah, respectively. Details of the various permits required at a local, state, and federal level are provided below and summarized in Table 1.2, Applicable Permits for Uranium Mines.

1.4.1 Local Permitting Requirements

A Special or Conditional Use Permit Application is typically required by the local municipality (county or city) where the mine is located. This application requests approval for the proposed land use and is essentially a zoning determination by the municipality. The municipality typically adds conditions to these permits to minimize the impacts on county/city residents and infrastructure. This may include road maintenance requirements, noise and dust suppression, lighting requirements, and hourly or daily operating limits. Municipalities also typically require building and septic system permits, access road designs, and control of noxious weeds.

1.4.2 State Permitting Requirements

The Colorado Mined Land Reclamation Act of 1976 (CMLRA) requires that any person planning to conduct prospecting or mining operations in Colorado file for a mine and reclamation permit with DRMS. In Utah, DOGM is responsible for administering the Utah Mined Land Reclamation Act (UMLRA) of 1975. Both agencies have similar rules and permitting processes. In Colorado, uranium mines with less than 10 acres of surface disturbance file a 110d permit application while mines with greater than 10 acres of surface disturbance file a 112d permit. In Utah, mines with five or less acres of surface disturbance file as small mining operations and those with greater than five acres of surface disturbance file as large mining operations. In general, the larger mine facilities are required to provide more detailed mining and reclamation plans than the smaller-sized operations. Colorado amended the CMLRA in 2008 to require uranium mines to file as designated mining operations (DMO). DMOs are required to prepare detailed Environmental Protection Plans and are subject to more frequent inspections by DRMS. Utah does not have a designated mining classification in their rules. Both Colorado and Utah require that a mine operator post a reclamation bond for the estimated cost of reclaiming the mine prior to issuing a permit.

In addition to the state mine and reclamation permit, mine operations are usually required to obtain state permits for air emissions, stormwater discharge, mine water treatment and discharge, and water wells. If the project is located partially or entirely on State Lands, the state land agency must also approve the project. Projects adjacent to state highways are required to obtain access permits from the state Department of Transportation. Table 1.2 provides a summary of the state permits along with the names of the administering agencies in Colorado and Utah.

1.4.3 Federal Permits

A permit must be acquired from the land management agency if the project is located partially or entirely on public lands administered by federal agencies. These agencies most often include the U.S. Department of Interior – Bureau of Land Management (BLM), U.S. Department of Agriculture – Forest Service (USFS), and the U.S. Department of Energy (DOE). Both the BLM and USFS require the submittal of a "Plan of Operations." The Plan of Operations is similar in content to the state mine and reclamation applications, but also includes additional information on the project's impact on natural and socioeconomic resources including historic and pre-historic sites, vegetation, wildlife, streams and wetlands, roads, and local communities. The DOE requires the mine operator to submit a "Mining Plan" that is similar in content to a BLM Plan of Operations. The Mining Plan is reviewed jointly by the DOE and BLM; however, the DOE is the lead agency and is responsible for conducting the impact analysis required under the National Environmental Policy Act (NEPA) and for issuing project approvals. All three land-managing agencies conduct periodic inspections of the mine sites under their jurisdiction.

If a federal land management agency or any other federal agency requires a permit for the project, the project must be evaluated in accordance with NEPA. For most mines, this requires the development and approval of either an Environmental Assessment (EA) or an Environmental Impact Statement (EIS) by the federal agencies. Resource studies are also typically done for socioeconomic impacts, cultural resources, wetlands, and threatened, endangered, and sensitive (TES) plants and wildlife to support the NEPA evaluation process.

Another federal permit that is often required at mine sites is a 404 permit with the U.S. Army Corp of Engineers for work within wetlands or waters of the United States (e.g., drainages, streams, rivers). Most other federal environmental laws and rules, such as those administered by the U.S. Environmental Protection Agency, have been adopted by states, and are administered by state agencies. In addition to the environmental regulations discussed above, the mine is also required to meet all the federal safety requirements established by the Mine Safety and Health Act of 1977.

The act established the Mine Safety and Health Administration (MSHA), which enforces Title 30 of the Code of Federal Regulations. This code specifically addresses safety rules in the mining industry. Compliance with these regulations includes mine inspections by MSHA and submittal of plans and health and safety information.

2.0 Underground Mines

This section provides additional detail regarding underground uranium mines including access, ventilation, mining methods, mining equipment, and surface facilities and infrastructure. Waste management and mine reclamation are discussed later in Section 4.0, Waste Management and Reclamation.

2.1 Mine Access and Ventilation

Underground mine sites in the region are, in most cases, accessed by established county roads. Smaller two-track exploration roads and access roads to power drops and ventilation shafts may also need to be constructed from time to time. Access into the underground mines is established by various means depending on the property ownership, depth and orientation of the mine ore body, and various other factors.

The primary access to the underground workings is established via a decline, incline, or adit (i.e., horizontal tunnel) in cases where the ore body is relatively shallow and other conditions provide the opportunity to create these types of access. These access types are usually constructed by drilling and blasting the rock and then removing the broken rock with underground loaders and haul trucks. The waste rock is hauled to the surface to the mine waste disposal area.

Sinking a vertical or angled shaft is another common method of accessing ore bodies, especially those that are located at greater depth. The shaft is excavated to the depth of the ore body and a headframe, hoist, mancage, and skip provide the means for moving personnel, materials, equipment, and ore/waste in and out of the mine. Shafts can be constructed using a large drill rig if there is existing access underground from which the drill cuttings can be removed; otherwise, shafts are constructed using drilling and blasting methods with the waste rock being removed by a hoist system.

Once the mine access is established, a series of underground drifts (i.e., tunnels) are constructed to create access to the ore body, establish ventilation, and to allow haulage of ore and waste to the shaft or out to the surface. The drift system must include a secondary escape access via either a second portal or another shaft to the surface. If another shaft is used, it also typically functions as a ventilation shaft that provides fresh air to the miners.

Mine ventilation is necessary to provide fresh air for the miners and to exhaust deleterious gases and particulates. Large fans are installed throughout the mine and on the surface to move air through the mine. Gases removed include exhaust gases

from the vehicles as well as radon. Particulates removed include diesel particulate material and dust. Using air doors, bulkheads, auxiliary fans, and vent tubing, airflow is drawn into the mine workings where needed. Air is exhausted through vent holes or portals. This system supplies sufficient air for all working faces where miners are present. Working stopes are ventilated using auxiliary fans mounted upstream of their entrances. Ventilation borehole diameters range from 3 feet (ft) up to 14 ft.

2.2 Mining Methods and Equipment

Underground mining in the Colorado Plateau is typically accomplished through accessing the mine workings through either a portal or shaft. The ore tends to occur in "pancake veins" where the ore is close to horizontal in orientation. The random room and pillar mining technique is well suited to the thin and irregular ore deposits of the Uravan Mineral Belt because of its inherent flexibility and selectivity. In the random room and pillar method, flat to moderately dipping stopes are mined in a fashion that follows the ore and minimizes the excavation of waste. Pillars of differing sizes and shapes are left in random intervals and locations. In this method, ore recovery can be improved by preferentially placing pillars in waste. This differs from regular or classical room and pillar methods, whereby pillars are regularly spaced and have consistent sizes and shapes.

Room and pillar methods allow for the efficient recovery of ore and the minimization of waste and dilution by the use of highly selective mining methods. Using small, maneuverable, low-profile diesel-powered rubber-tired equipment in conjunction with "split-shooting" blasting techniques, ore can be mined with precision. Jackleg drills are the primary drilling equipment in the stopes. Like all labor-intensive operations, the room and pillar method is dependent on the skill of the stoping crew. A good crew can excavate a two-ft thick ore zone, with minimal dilution. While random room and pillar methods are less efficient than conventional methods in terms of productivity, the additional cost is more than offset by the improved grade.

Split-shooting is a blasting technique used to selectively mine thin seams of ore. It is a two-stage process. First, the ore is drilled, blasted and mucked. After the ore has been removed, the waste is then drilled, blasted and mucked to create space for advancing the mining equipment. The split-shooting method is more costly than conventional stoping because of the extra step of waste removal and attendant increase in cycle time. However, the selectivity of mining ore separately from waste provides a higher-grade product.

Historically, uranium mining in the Colorado Plateau was performed using jackleg drills, slushers and train-haulage. Train haulage was limited to near flat access-

ways. To reach the ore, miners were required to drive raises up to the ore and employ slusher-type equipment to move the ore. A slusher consists of a scraper pulled by wire ropes over a series of rotating drums. With the advent of diesel-powered haulage equipment, productivity was significantly improved. No longer were long, flat train haulages, or raises needed. Ore could be accessed directly from steeper inclines.

The mining cycle consists of drilling the ore and waste, blasting the rock with explosives, excavating the ore and waste, and hauling the excavated material to the surface or to the underground loading facilities that allow the material to be hoisted to the surface. Loading is typically accomplished with small, one (1) to three (3) cubic yard (cy), low-profile diesel-powered loaders. The loaders load low-profile diesel-powered underground trucks with capacities that range from five (5) to 15 tons. The drilling is accomplished with jackleg drills and/or drill jumbos.

Other activities associated with the mining process include mine maintenance, roof support, and utility work. The mine typically has a lube/fuel vehicle, mine lifts for access to the mine back (ceiling), utility vehicles for transportation of miners and materials, and surface support equipment. The mine typically employs a forklift or a front-end loader with lift attachment. Additionally, many mines have a small dozer for work on the mine dump and a motor grader for road upkeep and snow removal. Drills, maintenance equipment, and some pumps are powered by air; therefore, an air compressor is located either on the surface or underground. The equipment fleet varies by the size and production capability of the mine. In addition to the main ventilation fan, there are usually several small auxiliary fans and pumps for mine production support.

Table 2.1, Typical Equipment List, identifies the major equipment required for a medium to large size underground uranium mine producing approximately 50,000 tons of ore per year.

2.3 Surface Facilities and Infrastructure

Surface facilities at underground uranium mines have a relatively small footprint ranging in size from about 5 acres for a small mine up to about 30 acres for a larger mine. Topsoil and/or growth media is stripped from areas to be disturbed and is stockpiled on site for future reclamation purposes. Surface facilities include a small shop, office trailer, and an employee parking lot. Most underground mines also have a change house with showers and lockers for mine personnel. Cargo container boxes and/or semi-tractor trailers are typically used for storage. Gasoline and diesel fuel are stored on site in several surface tanks provided with secondary containment.

A raw water storage tank and potable water tank may also be located on the surface. In wet mines, raw water for drilling and other uses is usually stored underground in sumps. Explosives and primer magazines are located on the surface during initial development and sometimes remain in place during the life of the mine. However, underground magazines become more common as the mine expands in size. The surface facilities also have an electrical substation and, in cases where line power is not supplied, portable generators are utilized. An electric or diesel-powered compressor provides compressed air to the mine. Telephone service is provided by a landline or satellite communications systems.

The single largest structure at most underground mines is the waste rock disposal area or mine dump. Operation and reclamation of these facilities is discussed in Section 4.0, Waste Management and Reclamation.

An ore pad or ore bins are typically located near the portal or shaft. The surface area encompassed by an ore pad normally ranges from approximately 0.5 to 2 acres. Typically, high-grade and low-grade ores are blended to achieve a relatively uniform grade for shipping to the mill. If an ore pad is used, a front-end loader is present on site to load the ore transport trucks. If bins are used, the trucks load directly from the bottom of the bins.

The surface facilities also include surface water drainage controls that route stormwater runoff from undisturbed areas around the mine facilities and route mine water runoff to engineered retention structures. Wet mines have water treatment facilities to treat water that exceeds regulatory standards for water discharge.

The surface facilities supply compressed air, water, and power to the underground mine. Each mine usually has a surface storage area or lay down area for storing supplies, including ventilation tubing, air and water piping supplies, roof bolts, and other hardware such as spare fans, equipment, pumps, and spare parts. The mine has either a septic system or portable waste facilities on site. Additionally, if a headframe is utilized to remove ore and waste from the mine, a front-end loader and/or a truck are utilized on surface to transport ore to an ore pad and waste rock to the mine dump.

3.0 Surface Mines

This section provides additional detail regarding surface uranium mines including access, mining methods, mining equipment, and surface facilities and infrastructure. Waste management and mine reclamation are discussed in Section 4.0, Waste Management and Reclamation.

3.1 Mine Access

Surface mines are usually accessed via existing county roads. Wide haulage roads within the pit and waste dump areas allow for movement of ore and waste rock out of the pit. Smaller on-site roads provide access to the surface facilities and exploration drilling.

3.2 Mining Methods and Equipment

Surface mines incorporate open-pit mining methods to remove waste rock and ore using dozers, trucks, loaders, excavators, and shovels. The mining equipment selection is dictated by the geology, geometry, soils/rock conditions, the actual size of the deposit, and the production requirements. Any topsoil or growth media covering the overburden is removed to a designated storage area for use in future reclamation. Topsoil is also removed from the waste dump area prior to placement of waste rock.

Surface water diversions control stormwater runoff by channeling flow from undisturbed areas around the mine facilities. Stormwater runoff and resulting sediment from disturbed areas is collected in stormwater ponds.

Drilling and blasting is performed as necessary to break the overburden and waste rock into manageable sized pieces that can be loaded and hauled to the waste dump. Surface mines on the Colorado Plateau tend to be small open pits; therefore, once the overburden is removed, the ore zone is exposed and mined. If the ore consists of competent rock, it is drilled and blasted. Less competent rock can sometimes be broken by ripping with a dozer. The broken ore is loaded into a truck and transported either to an ore pad or to the mill. Ore can be hauled directly from the pit to the mill if the mine is located close enough or if the mine geometry allows direct loading of highway haul trucks. If an ore pad is utilized, ore is loaded from the ore pad into a highway truck and shipped to the mill.

Typical surface mining equipment used on the Colorado Plateau includes a surface drill, dozer, motor grader, front-end loader, excavator or shovel, haul trucks sized to match the loading equipment, and a water truck. Support equipment includes a

lube/fuel truck, forklift, boom truck, maintenance vehicles, wheel-mounted compressor, small generator, pickup trucks, welders, portable light sets, and pumps.

3.3 Facilities and Infrastructure

The facilities at a surface mine typically consist of a shop/office facility, storage tanks for fuels and lubricants, and a substation for electric power required for the shop and facilities. A change house or dry may also be present. The mine has water storage capability for water supply and dust suppression, and telephone or satellite communications on site. If the mine uses explosives for blasting, there are powder and primer magazines located on site.

As discussed above, an ore pad may be constructed to temporarily store ore until it can be transported to the mill. As with the underground mines, the waste dump is typically the largest single facility on site and is placed close to the pit to reduce haulage distances. Additional information on waste dumps is provided in Section 4.0, Waste Management and Reclamation.

The surface facilities also include the stormwater control structures including ponds, culverts, surface water diversions and drainage ditches. Each mine site has a large parking area for the mobile equipment and mine vehicles and a parking area for employee vehicles.

4.0 Waste Management and Reclamation

This section provides an overview of the waste management practices at uranium mines including disposal of waste rock, treatment and discharge of mine water, and recycling of used oil and solvents. Standard mine closure and reclamation practices are also discussed.

4.1 Waste Rock Disposal

Waste rock is generated through surface and underground mining as the ore is segregated from the host and/or cover rock. The waste rock is removed from the mine and placed in a designated waste rock disposal area, commonly referred to as the waste dump. Historically, waste dumps were placed close to the mine portal, shaft, or open pit to minimize haulage without regard to the environmental impacts. In many cases, this resulted in placement of waste within drainages or on the steep sides of canyons where the dumps polluted water and could not be easily reclaimed. Although proximity to the mining area is still a major consideration for siting waste dumps, modern mines are designed so that the waste rock is placed outside of drainages and in flatter areas where surface water runoff can be controlled and the facility can be reclaimed appropriately.

Prior to the placement of the waste rock, the dump area is cleared and grubbed. Salvageable topsoil and/or growth media is removed and stockpiled for later use during reclamation. Waste rock is placed in the designated storage areas in lifts. The material is dumped on the flat dump area and then pushed with a dozer to create angle-of-repose side slopes and a level top surface. Compaction occurs as the rubber-tire trucks operate on the waste dump, creating a low permeability top surface. Safety benches and drainage benches are also incorporated into the design of the waste dump.

The haul road on top of the dump is sprayed with water and/or treated with a soil binding agent such as magnesium chloride to reduce fugitive dust emissions. In some cases, concurrent reclamation is also performed on portions of the dump that have reached their final configuration. Water diversion ditches are typically placed around the waste dumps to prevent off-site runoff from entering the disposal area and contacting the waste rock. Internal runoff from the waste dumps is contained within berms, ditches, and/or sedimentation ponds.

4.2 Mine Water Treatment

If groundwater enters an underground uranium mine or open pit at rates exceeding what the mine can use, the excess water is discharged to a nearby stream or drainage. Mine water at uranium mines on the Colorado Plateau may contain radionuclides and/or metals in concentrations above surface water discharge standards. In these cases, the water is treated to comply with state standards prior to discharge. Mine discharge can only commence following regulatory approval of the treatment process and discharge requirements. State regulatory agencies require a monitoring program designating the sampling tests, frequency, and reporting requirements.

There are various methods for mine water treatment, including membrane treatment, filtering, reverse osmosis, evaporation, resin column removal, and chemical precipitation. The treatment method is determined based on effectiveness and relative cost. Precipitation with barium chloride is a common method used at many uranium mines to remove radium and uranium from the water. The barium combines with the sulfate in the water to form barium sulfate, which then co-precipitates with the radium and uranium.

The specific water treatment facilities vary at each site. Lined ponds or tanks are used for storing the mine water and the water is pumped or fed by gravity through the treatment facility for treatment with the appropriate process. The treated water is analyzed for water quality parameters and subsequently released to the receiving environment in accordance with regulatory criteria. The quality of discharge water must meet state requirements to maintain compliance. In some locations, there are designated beneficial uses of the receiving water, which may include agriculture.

The waste generated from most water treatment plants at uranium mines is relatively low in volume because the constituents being removed are present in very low concentrations, typically parts per billion. As this material accumulates, it is processed or disposed of in accordance with applicable regulations. If the uranium content is high enough, it may be shipped to a mill for uranium recovery. Wastes with low contaminant concentrations are generally disposed of on-site in accordance with the approved reclamation plan. Treatment wastes with elevated contaminant concentrations may require disposal at an appropriate, approved landfill.

4.3 Recycling of Used Oils, Antifreeze, and Solvents

Used oil from maintenance activities is stored on-site in a used oil tank or 55-gallon drums depending on the size of the mine. Smaller and more remote mines generally

use 55-gallon drums that can be transported to a recycling facility by pickup or flatbed truck. Larger mines commonly utilize a used oil tank, which is periodically emptied by a vendor using a tanker truck and vacuum line.

Used antifreeze is commonly transferred to 55-gallon drums or smaller containers and then transported to a recycling facility. Solvent stations are also used in some mine shops. These stations typically consist of a sink attached on top of a 35-gallon drum of solvent. The solvent is pumped into the sink for cleaning parts and then drains back into the drum after use. When the solvent becomes saturated with dirt and grease, the drum is replaced with a new drum of solvent. The used solvent is then transported to a recycling facility.

Used oil, antifreeze, and solvents are provided with secondary containment when stored on site in accordance with federal and state regulations.

4.4 Closure and Reclamation

Each mining operation has a reclamation plan that has been approved by the State and, if located on public land, the land management agency. Reclamation bonds are posted to ensure that financial mechanisms are in place to cover the costs associated with closure and reclamation in the event the owner becomes unable to do so. Mines can be placed in various stages of closure based on economics, regulatory requirements regarding closure, and the length of time that regulations allow for temporary cessation of mining. There are prescribed compliance requirements for each stage of closure.

Mine reclamation includes decontamination, demolition and removal or burial of mine structures, regrading of waste rock dumps and other disturbed areas, placement of topsoil and/or growth media, and seeding. Additionally, underground mine workings are sealed and high walls in open pits are reduced and/or blocked off from public access. These reclamation activities are summarized below.

- Decontamination: The ore pad and water treatment areas may contain elevated levels of radiation. These radioactive materials, which can be identified with gamma survey instruments, are typically excavated or otherwise removed and then either placed back in the mine workings or shipped to a mill for uranium recovery.
- Demolition: The mine structures, including foundations and concrete pads, are removed or demolished. Concrete and other inert material is broken up and buried on site. Other materials are either recycled or hauled to an appropriate landfill. Many of the smaller to medium-sized mines use trailers

and other portable equipment during operations, which can be easily mobilized off-site.

- Sealing of Mine Openings: Underground portals and shafts are, in most cases, sealed using concrete and steel bulkheads to prevent access by the public. After sealing, they are covered with soil and revegetated. In some instances, the underground openings are covered with metal bat gates. These gates are locked to prevent trespass, but have numerous openings, which allow bats to access and nest in the mine.
- Open pit mines vary substantially in configuration and reclamation varies considerably from one site to another. Common reclamation practices include blasting down and regrading high walls, backfilling to achieve positive drainage, and reclaiming and/or blocking access roads. Many open pits that have intercepted the water table have been successfully reclaimed as ponds or small lakes.
- Regrading and Ripping: The mine waste dump, ore pads, former building and water treatment areas, roads, and other mine features are graded to restore drainage through the site and create a more natural appearing topography that blends with the surrounding areas. Maximum slopes are typically limited to three horizontal to one vertical (3H:1V) or less steep to minimize erosion. Drainages may require riprap or other protection in steeper areas. Heavily compacted areas such as roads, storage pads, and the top of the waste dump are ripped to loosen the soil for subsequent placement of topsoil and/or growth media and seeding. On steeper areas, ripping is done along the topographic contour to minimize preferential erosion paths.
- Topsoil/Growth Media Placement and Seeding: Topsoil and/or growth media salvaged during mine development is used to cover the regraded areas. The soil is placed loose, then tilled and seeded. Extremely steep areas can be “pocked” using a hydraulic excavator. Pocking consists of making a series of depressions on the slope where water can collect and seed can more successfully germinate. A seed mixture suited to the area is used and is often based on recommendations by the Natural Resources Conservation Service. Federal land management agencies typically prefer seed mixes consisting of a variety of species native to the area. Seeding can be accomplished using a drill seeder or hydroseeder. Smaller, steeper, or rockier areas may be seeded using manual broadcast methods. Mulching with a weed-free hay or straw is also common. The mulch can be

spayed with a tackifier or manually crimped into the soil. Fertilizer is sometimes applied, but at relatively low rates given the semiarid nature of the Colorado Plateau. If available, trees, limbs, and large rocks may be spread over the reclaimed area to create a more natural appearance. Boulders are also useful in blocking future vehicle access that could damage the revegetated areas.

Mine reclamation is monitored by state and/or federal authorities as required. Reclamation performance standards must be met prior to release of owner liability. This tends to be a period of three to five years or longer following completion of reclamation activities.

5.0 Staffing Requirements

The Piñon Ridge Mill site will require mill feed from both Energy Fuels mines and mines owned and operated by other companies. The staffing level estimates for Energy Fuels mines, other company mines, and the truck haulage contractors are summarized below.

Energy Fuels will establish a mine management and support team, which will be based at the administration facility located at the mill site. Activities for the Energy Fuels mines and the supply contracts for other non-Energy Fuels mines will be coordinated from the administration facility. Table 5.1, Mine-Related Staffing Estimates, lists the projected staffing for both the Energy Fuels mine operations and other mine operations that could supply the balance of the mill feed. The staffing levels are based on Energy Fuels supplying 75% of the mill feed and other mining companies supplying 25% of the mill feed. A mine staffing level of 210 personnel is estimated for the combined staffs of Energy Fuels and other mining companies. The mining activities also include the delivery of 175,000 tons of ore per year to the mill site. Transportation of ore is provided by haulage contractors. Energy Fuels estimates that the haulage contractors will provide an additional 18 positions. Therefore, the total estimated mine-related staffing requirement is 228 personnel.

6.0 Ore Haulage

6.1 Ore Haulage Routes

The majority of uranium ore transported to the Piñon Ridge Mill Facility will arrive on Colorado State Highway 90, from either east or the west of the mill site. Additionally, some portion of the ore may come to the mill site directly from Monogram Mesa through the Cotter Corporation property located directly southeast of the mill site. Figure 1.1 shows the primary ore haulage routes from the mines to the Piñon Ridge Mill Facility.

Ore delivered from the west will primarily come from several mines in an area located just south and east of La Sal, Utah. Additional tonnage will come from the north on U.S. Highway 191 from its junction with I-70 and from the south on Highway 191 from mines located south of Monticello, Utah.

The route east of the mill will be used to deliver ore mined from the Monogram Mesa and Long Park areas via existing Montrose County roads connecting to Highway 90 roughly five miles east of the mill. Ore will be transported to Vancorum from the north via Colorado Highway 141 and then west via Highway 90 to the mill site. Ore from the north will be trucked from the mines to Highway 141 on existing Montrose County and Mesa County roads. Ore from the south will come through Naturita via Highway 141 and U.S. Highway 491. These highways are fed by numerous county roads located in both Colorado and Utah.

To better estimate potential traffic impacts associated with ore haulage, Energy Fuels developed a 40-year mill feed source of 7 million tons based on the ore resources currently identified on 10 of its properties plus 31 mines operated by others in the same region. The other mine properties were selected based on the general distribution of mine properties in the area with those mines closer to the mill given higher priority due to lower haulage costs. Mines with existing DRMS or DOGM permits were also accorded a higher priority. Denison mines were excluded from the analysis, as they ship their ore to the White Mesa Mill. Table 6.1, Potential Mill Feed Sources, provides a summary of the 10 Energy Fuels mine properties and the 31 selected mine properties operated by other companies. The 41 properties selected for the analysis represent approximately half the mine properties in the area with known resources.

Figure 6.1, Potential Sources of Ore Feed to the Mill, shows the location and distribution of the 41 mine properties used in the traffic analysis. Table 6.2, Piñon Ridge Mill Feed Zones, lists the direction from which mill feed will be delivered to the

mill site as a percentage of the annual mill feed requirement (i.e., seven million tons). Appendix A, Traffic Impact Analysis, provides additional details regarding locations of ore feed sources, haul routes, and projected trip counts.

6.2 Department of Transportation Haulage Requirements

The U.S. Department of Transportation (USDOT) is the primary regulatory authority for uranium ore haulage. To allow for efficient interstate commerce, the Colorado Department of Transportation (CDOT) and the Utah Department of Transportation (UDOT) have adopted the USDOT regulations in their entirety. USDOT regulations for transport of radioactive materials are codified in Title 49 of the Code of Federal Regulations (CFR). Appendix B, Ore Transportation Plan, describes Energy Fuels procedures and methods for shipping uranium ore from a mine site to an off-site mill. A brief summary of the plan follows.

The uranium ore shipped will typically average 0.15 to 0.25 percent uranium oxide (U_3O_8). At these levels, uranium ore is regulated as a Class 7 radioactive material under the hazardous material regulations. Uranium ores and concentrates of uranium ores, because of their low specific activity are generally exempt from most packaging, marking, labeling, and placarding requirements of other Class 7 radioactive elements.

The ore is loaded into highway haul trucks with a front-end loader, taking precautions to avoid spillage and inhalation of dust during loading. Precautions are also taken to meet the road weight limit requirements and to minimize tracking of materials onto roadways.

Prior to hauling, the load is covered and each transport vehicle is surveyed for leakage and radiation. Shipping papers must be fully completed and in the possession of the driver. Records of the inspections and radiation scans for each shipment are maintained on site. The transport carrier is responsible for compliance with all applicable laws and adhering to established procedures and protocols during the transport of the ore from the mine to the mill.

Emergency response information is immediately available to all persons who transport or handle uranium ore. The transportation contractor is responsible for implementing the plan in the event of an accident that results in the spillage of uranium ore onto a public road.

Mining and carrier personnel are trained for the proper loading and transporting of uranium ore. The training includes basic radiation concepts, dust and contamination control, vehicle scanning requirements, exclusive use transport provisions, and

emergency response contact and response information. Training records are documented and maintained on site.

Report Tables

Table 1.1

Energy Fuels Mine and Exploration Properties

Energy Fuels Mine Properties (3.1 Million Tons of Uranium and Vanadium Ore Resources)			
No.	**Name**	**County/State**	**Geographic Location**
1	Whirlwind Mine	Mesa, CO	Beaver Mesa
2	Torbyn Mine	Mesa, CO	Tenderfoot Mesa
3	New Verde Mine (C-G-26 and HC Group)	Mesa, CO	Calamity Mesa
4	C-G-27 Property	Mesa, CO	Outlaw Mesa
5	C-AM-19A Property	Montrose, CO	Atkinson Mesa
6	C-AM-20 Property	Montrose, CO	Atkinson Mesa
7	Farmer Girl Mine	Montrose, CO	Martin Mesa
8	Wilhunt Property	San Miguel, CO	Gyp Ridge
9	Energy Queen Mine	San Juan, UT	La Sal
10	Green River Properties	Emery, UT	San Rafael Swell
Energy Fuels Exploration Properties			
No.	**Name**	**County/State**	**Geographic Location**
1	Club Mesa and C-CM-24	Montrose, CO	Club Mesa
2	Cliffdweller	San Miguel, CO	Gypsum Valley
3	GVS	San Miguel, CO	Gyp Ridge
4	C-SR-16A	San Miguel, CO	Egnar
5	Spud Patch (Lynx joint venture)	San Miguel, CO	Egnar
6	Utah State Leases	San Juan, UT	Bean Fields (Sage Plain)
7	DAR Claims (Lynx joint venture)	San Juan, UT	Lisbon Valley
8	Redd Lease	San Juan, UT	La Sal
9	Hop Creek (Lynx joint venture)	San Juan, UT	La Sal Creek
10	Arths Pasture	Grand, UT	Seven Mile
11	Ethan Group	Grand, UT	Yellow Cat

Table 1.2

Applicable Permits for Uranium Mines

Local Agency		Permit Type
Colorado	**Utah**	
Mesa County Montrose County San Miguel County	San Juan County Grand County Emery County	Special Use/Conditional Use Permit Access Permit Septic System Permit Building Permit Road Maintenance Agreement
State Agency		**Permit Type**
Colorado	**Utah**	
Colorado Division of Reclamation, Mining and Safety	Utah Division of Oil, Gas and Mining	Mine Permit and Reclamation Contract
Colorado Water Quality Control Division	Utah Division of Water Quality	Surface Water and Stormwater Discharge Permits Well Permits
Colorado Division of Water Resources	Utah Division of Water Rights	Water Rights
Colorado Air Pollution Control Division	Utah Division of Air Quality	Air Emissions Permits
Federal Agency		**Permit Type**
Bureau of Land Management		Approval of Plan of Operations
U.S. Forest Service		Approval of Plan of Operations
Department of Energy		Approval of Mine Plan
U.S. Army Corps of Engineers		404 Permit

Notes:
1) This list is intended to provide an overview of key regulatory requirements that would govern project implementation.
2) Additional approvals, permits, reporting and authorizing actions may be necessary.

Table 2.1
Typical Equipment List

Underground Equipment	Quantity
Diesel LHD's, 1.5- and 3-cy capacity	2 – 3
Diesel Mine Trucks, 5- and 12-ton capacity	7
Development Drill, Jumbo	1
Production Drills, Jacklegs	8 – 10
Exploration Drills, Longhole	1 – 2
Diesel Boss Buggies and Utility Vehicles	8
Surface Equipment	**Quantity**
Front End Loader, 2- to 3-cy capacity	1
Backhoe/Skid Loader or Excavator	1
Highway Haul Trucks, 22- to 24-ton capacity (provided by haulage contractors)	2 – 8
Bulldozer	1
Motor Grader	1
Flat-Bed Truck, 1-ton capacity	1
Pick-up Truck, ¾-ton capacity (4wd)	2

Table 5.1 Mine-Related Staffing Estimates	
Energy Fuels Mining Staffing	
Employment Type	**Quantity**
Management / Support	18
Field Supervision	6
Field Labor	134
Subtotal	**158**
Non Energy Fuels Staffing	
Employment Type	**Quantity**
Management / Support	4
Field Supervision	2
Field Labor	46
Subtotal	**52**
Total Staffing	**210**

Table 6.1

Potential Mill Feed Sources[1]

Energy Fuels Properties (3.1 Million Tons of Uranium and Vanadium Ore Resources)

No.	Name	County/State	Geographic Location	Permitted[2]	Distance from Mill (miles)[3]
1	Whirlwind Mine	Mesa, CO	Beaver Mesa	Yes	65
2	Torbyn Mine	Mesa, CO	Tenderfoot Mesa	No	68
3	New Verde Mine (C-G-26 and HC Group)	Mesa, CO	Calamity Mesa	No	58
4	C-G-27 Property	Mesa, CO	Outlaw Mesa	No	54
5	C-AM-19A Property	Montrose, CO	Atkinson Mesa	No	31
6	C-AM-20 Property	Montrose, CO	Atkinson Mesa	No	30
7	Farmer Girl Mine	Montrose, CO	Martin Mesa	No	29
8	Wilhunt Property	San Miguel, CO	Gyp Ridge	No	45
9	Energy Queen Mine	San Juan, UT	La Sal	Yes	39
10	Green River Properties	Emery, UT	San Rafael Swell	No	134

Other Mine Properties (3.9 Million Tons of Uranium and Vanadium Ore Resources)

No.	Mine Name[4]	County/State	Geographic Location	Permitted[2]	Distance from Mill (miles)[3]
1	Cone	Mesa, CO	John Brown Mesa	No	65
2	October (ore pile)	Mesa, CO	John Brown Mesa	Yes	69
3	Monogram JoDandy	Montrose, CO	Monogram Mesa	Yes	5
4	Monogram Mines	Montrose, CO	Monogram Mesa	Yes	9
5	Last Chance #3 & #4	Montrose, CO	Davis Mesa	Yes	10
6	Blue Streak	Montrose, CO	Bull Canyon	No	15
7	Return	Montrose, CO	Carpenter Flats	No	35
8	Tramp	Montrose, CO	Club Mesa	Yes	34
9	Club Mesa	Montrose, CO	Club Mesa	No	42
10	Sunbeam	Montrose, CO	Long Park	No	17
11	C-LP-21	Montrose, CO	Long Park	Yes	14
12	C-JD-5	Montrose, CO	Monogram Mesa	Yes	4
13	JD-6	Montrose, CO	Monogram Mesa	Yes	6
14	C-JD-7	Montrose, CO	Monogram Mesa	Yes	5

Table 6.1 (continued)

Potential Mill Feed Sources[1]

Other Mine Properties (3.9 Million Tons of Uranium and Vanadium Ore Resources) (continued)

No.	Mine Name[4]	County/State	Geographic Location	Permitted[2]	Distance from Mill (miles)[3]
15	JD-7 Pit	Montrose, CO	Monogram Mesa	Yes	2
16	C-JD-8	Montrose, CO	Monogram Mesa	Yes	7
17	JD-9	Montrose, CO	Bull Canyon	Yes	18
18	SM-18/Wright Group	Montrose, CO	Spring Creek Mesa	Yes	27
19	CM-25	Montrose, CO	Club Mesa	No	30
20	J-Bird	Montrose, CO	Wray Mesa	Yes	32
21	Centennial	San Miguel, CO	Mineral Mountain	Yes	57
22	Burros/Ellison/Hawkeye	San Miguel, CO	Slick Rock	Yes	46
23	Dermo-Snyder	San Miguel, CO	Bean Fields	Yes	71
24	SR-13A	San Miguel, CO	Slick Rock	Yes	46
25	Ike No. 1 (SR-11)	San Miguel, CO	Slick Rock	Yes	81
26	Calliham	San Juan, UT	Bean Fields	No	75
27	Wilson-Silver Bell	San Juan, UT	Bean Fields	No	82
28	La Sal II	San Juan, UT	Big Indian	No	46
29	Velvet	San Juan, UT	South Lisbon Valley	Yes	79
30	Daneros	San Juan, UT	Red Canyon	Yes	177
31	#3 Decline (Big G)	Emery, UT	San Rafael Swell	No	131

Notes:
1) These 41 mine properties were used for the traffic analysis.
2) Permitted refers to whether or not the operation has a mine permit with either the Colorado Division of Reclamation, Mining and Safety or the Utah Division of Oil, Gas and Mining. The mines that do not have this permit typically have exploration or prospecting permits in place.
3) Distance from the mill is calculated based on travel over roads.
4) This list of mine properties does not include mines operated by Denison, as these mines ship ore to the White Mesa Mill.

Table 6.2
Piñon Ridge Mill Feed Zones

Location of Feed Zones	Percentage of Annual Mill Feed
West of Mill	42
Near Mill	17
East of Mill	41
Total	**100**

Report Figures

Appendix A

Traffic Impact Analysis

Appendix B

Ore Transportation Plan

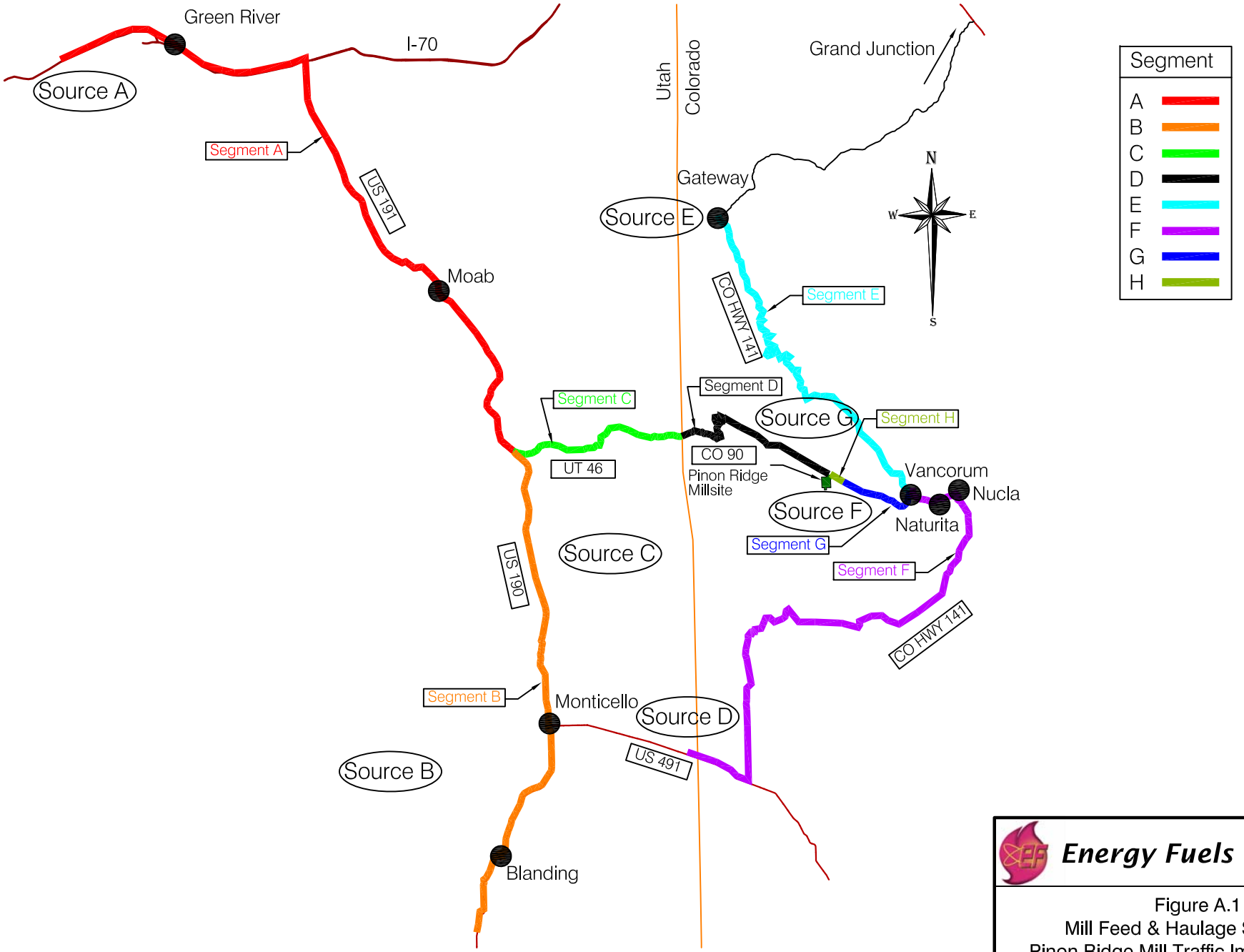
TRAFFIC IMPACT ANALYSIS
ENERGY FUELS RESOURCES CORPORATION

The traffic patterns for ore haulage to the Piñon Ridge Mill can be established by evaluating the location of the mines that will supply the life-of-mill feed and by estimating the ore tonnages that can be produced from those mines. Energy Fuels has identified over 60 mine operations that can reasonably produce ore during the 40-year timeframe. This number does not include exploration targets that are being drilled by Energy Fuels and others, which could also increase the known resource base for the region. The 60 potential sources were screened down to just over 40 sources that are the most likely candidates for mill feed, based on permitting, size of deposit, proximity to Piñon Ridge Mill, previous production capability, and Energy Fuels knowledge of the resource. The general location of these mines or sources can be seen on Figure A.1. Thirty-eight of the 41 mines are located within 82 highway miles of the mill site. The haulage highway segment is also identified on Figure A.1.

The sources were categorized by geographic location and highway access and placed into groupings that are shown as Sources A through G on Figure A.1. The data for the different source zones was then cumulated and summarized in Table A.1. The number of trucks required to transport the ore tonnage was calculated based on a tonnage factor of 24 tons per truck. A comparative analysis was performed by calculating the trucks required on a 350 day haul basis, which matches the mill operating days of the year, and then by using 250 days per year, which matches a mine operating schedule of 5 days per week. The 250-day haulage schedule results in 29 loaded trucks per day while the 350-day haulage schedule results in 21 loaded trucks per day. Energy Fuels anticipates that the shipping schedule will change over time depending on operational needs, weather conditions, and other factors; however, the 21 to 29 trucks per day is the expected range of traffic under normal operating conditions.

Table A.2 summarizes the highway haul segments identified on Figure A.1. The table shows truck numbers and tonnages by haulage segment for both 350 days per year haulage and 250 days per year haulage.

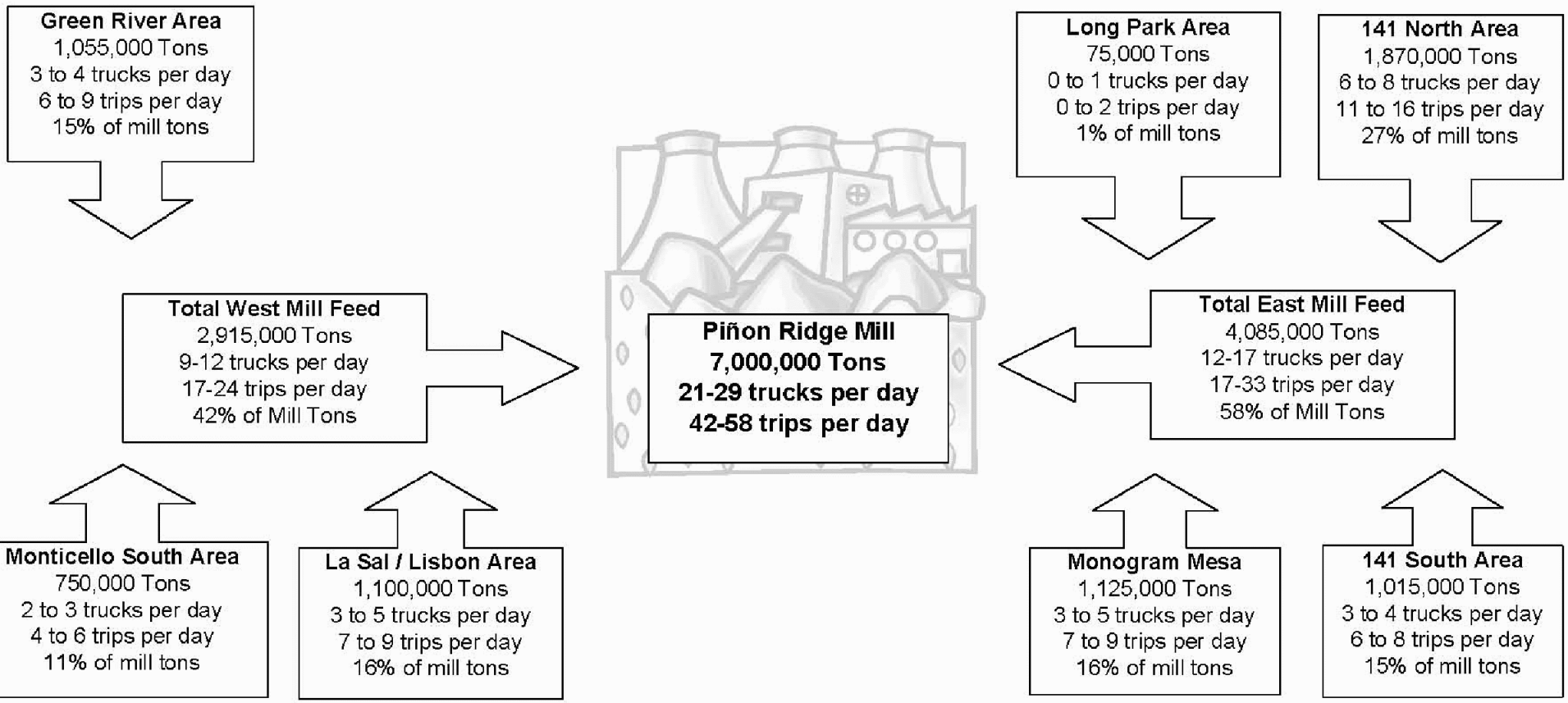
The key information found in the analysis of the haulage patterns is summarized in Figure A.2. As shown, 42% of the mill feed is expected to come from eastern Utah and 58% from western Colorado during the 40-year mill life. On average, 9 to 12 trucks are expected to access the mill from the west via Utah Highway 46 and Colorado Highway 90 and 12-17 trucks are expected to access the mill from the east via Colorado Highway 90.



Energy Fuels Resources

Figure A.1
Mill Feed & Haulage Segments
Pinon Ridge Mill Traffic Impact Analysis

Scale	Date	Drawn by
Not To Scale	August 24, 2009	J. Osborn



Notes:

1. 24 tons per truck
2. 500 ton per day mill capacity

Energy Fuels Resources

Figure A.2
Mill Feed Projections
Pinon Ridge Mill Traffic Impact Analysis

Scale	Date	Drawn by
No Scale	August 24, 2009	J.Osborn

Table A.1
Mill Feed Source Projections

						Days of Haulage per year ----------->	350	250	350	250	350	250	
Mill Feed Source	***Loaded Truck Route***	***Counties Potentially Impacted***	***Communities Potentially Impacted***	***Life of Mine Tons***	***Tons per year***	***Tons per Day***	***Tons per Day***	***Loaded Trucks per Day***	***Loaded Trucks per Day***	***Trips per day***	***Trips per day***	***Percentage of Total Mill Feed***
Source A - Green River, UT Area	County Roads to I-70 to US 191 South to UT-46	Wayne, UT; Emery, UT; Grand, UT; San Juan, UT	Green River, UT; Flow, UT; Crescent Junction, UT, Moab, UT	1,055,000	26,375	75	106	3	4	6	9	15%
Source B - Monticello, UT South	County Roads to US 191 North to UT-46	San Juan, UT	Blanding,UT; Verdure, UT; Monticello, UT	750,000	18,750	54	75	2	3	4	6	11%
Source C - La Sal/Lisbon, UT	County Roads to UT-46	San Juan, UT	La Sal, UT	1,110,000	27,750	79	111	3	5	7	9	16%
Source D - South 141, CO	County Roads to US 491 or CO-141 North to CO-90	San Juan, UT; San Miguel, CO; Dolores, CO; Montrose, CO;	Northdale, CO; Egnar, CO; Basin, CO; Naturita, CO	1,015,000	25,375	73	102	3	4	6	8	15%
Source E - North 141, CO	County Roads to CO-141 south to CO-90	Mesa, CO; Montrose, CO	Gateway, CO, Vancorum, CO	1,870,000	46,750	134	187	6	8	11	16	27%
Source F - Monogram Mesa, CO	County Roads to CO-90	Montrose, CO		1,125,000	28,125	80	113	3	5	7	9	16%
Source G - Long Park, CO	County Roads to CO-90	Montrose, CO		75,000	1,875	5	8	0	0	0	1	1%
Total Mill Feed				**7,000,000**	**175,000**	**500**	**700**	**21**	**29**	**42**	**58**	100%

Note: Loaded Trucks (tons): 24 tons per truck

Table A.2
Haulage Projections

			Days of Haulage per year ----------->		350	250	350	250	350	250	
Haul Segment	***Loaded Truck Route***	***Counties Potentially Impacted***	***Communities Potentially Impacted***	***Life of Mine Tons***	***Tons per Year***	***Tons per Day***	***Tons per Day***	***Loaded Trucks per Day***	***Loaded Trucks per Day***	***Trips per day***	***Trips per day***	***Percentage of Total Mill Feed***
Segment A	I-70 to US 191 South to UT-46	Wayne, UT; Emery, UT; Grand, UT; San Juan, UT	Green River, UT; Flow, UT; Crescent Junction, UT, Moab, UT	1,055,000	26,375	75	106	3	4	6	9	15%
Segment B	US 191 North to UT-46	San Juan, UT	Blanding,UT; Verdure, UT; Monticello, UT	750,000	18,750	54	75	2	3	4	6	11%
Segment C	UT-46 to CO-90	San Juan, UT	La Sal, UT	2,915,000	72,875	208	292	9	12	17	24	42%
Segment D	CO-90 to Piñon Ridge Mill Site	Montrose, CO	Bedrock, CO	2,915,000	72,875	208	292	9	12	17	24	42%
Segment E	County Roads to CO-141 south to CO-90	Mesa, CO; Montrose, CO	Gateway, CO, Vancorum, CO	1,870,000	46,750	134	187	6	8	11	16	27%
Segment F	County Roads to US 491 or CO-141 North to CO-90	San Juan, UT; San Miguel, CO; Dolores, CO; Montrose, CO;	Northdale, CO; Egnar, CO; Basin, CO; Naturita, CO	1,015,000	25,375	73	102	3	4	6	8	15%
Segment G	CO-90 to Monogram/Long Park Access Intersections	Montrose, CO		2,885,000	72,125	206	289	9	12	17	24	41%
Segment H	CO-90	Montrose, CO		4,085,000	102,125	292	409	12	17	24	34	58%

Note: Loaded Trucks (tons): 24 tons per truck

ORE TRANSPORTATION PLAN
ENERGY FUELS RESOURCES CORPORATION

1.0 Introduction

Energy Fuels Resources Corporation's (Energy Fuels') procedures and methods for shipping uranium ore from a mine site to an offsite mill are described in this plan. The plan may also be used for shipping to an off-site ore buying station, should one become available. The plan is based on compliance with federal, state and local regulations. The primary regulatory authority for ore haulage is the U.S. Department of Transportation (USDOT). To allow for efficient interstate commerce, the Colorado Department of Transportation (CDOT), the Utah Department of Transportation (UDOT) and other adjacent state highway departments have adopted USDOT regulations in their entirety. USDOT's regulations for transport of radioactive materials are codified in Title 49 of the Code of Federal Regulations (CFR). The procedures in this plan are designed to meet the requirements of Title 49 and are to be incorporated into contractual arrangements with the trucking and milling companies prior to the start of offsite ore shipments.

References to specific sections of CFR title 49 are referenced in this plan by part number only, e.g., CFR Title 49 Part 173.436 is referenced as (173.436)

2.0 Ore Characteristics and Shipping Classification

The majority of the ore that will be shipped will average 0.15 to 0.25 percent U_3O_8 based on gamma readings (typically expressed as eU_3O_8). This is equivalent to a uranium activity level of approximately 1.4×10^{-9} Curies/gram (Ci/g). Although this represents a relatively low radioactivity level, it is above USDOT's exemption level for uranium of 2.7×10^{-11} Ci/g for natural uranium (173.436). Accordingly, uranium ore is regulated as a Class 7 radioactive material under the hazardous material regulations (173.403). Uranium ores and concentrates of uranium ore are classified as Low Specific Activity (LSA), Group - 1 material. Because of their low specific activity, ore shipments are generally exempt from most of the packaging, marking, labeling, and placarding requirements of other Class 7 radioactive materials.

In addition to uranium ore, LSA-1 material may also include other low-toxicity alpha emitters that may be shipped from the mine to the mill such as:

1) Precipitated residues from the water treatment plant
2) Soils and rubble contaminated by uranium
3) Loaded ion exchange resins from water treatment facilities (not proposed at this time)

Materials 1 and 2 can be loaded and shipped in the same manner as uranium ore. Some additional restrictions apply to ion exchange resins that should be incorporated into the plan if resin columns are installed at a mine site for water treatment purposes.

3.0 Loading Requirements

The uranium ore is to be loaded into highway haul trucks using a front-end loader. Required dust and contamination control measures during loading include:

1) The loader operator and truck driver are to avoid inhalation of dust during loading operations. The ore is expected to be moist to wet when hauled from the mine to the ore pad. If the ore should dry out prior to loading, the stockpile will be sprayed with water to minimize the amount of dust generated during loading operations. Water sprays will be applied only to the extent necessary to moisten the ore and ore pad area.

2) Spillage onto the transport truck is to be avoided during loading operations. Any loose material that drops onto the cab, bumpers, running boards, or other exterior surfaces will be removed and placed back on the ore pad prior to leaving the site. The truck tailgate will be closed and a tarpaulin (or other suitable cover) will be placed over the entire load and adequately secured so that fine ore particles cannot be released to the environment during transport.

3) The tonnage to be shipped is not limited by Title 49, but rather, by the size of the trailer(s) and any weight restrictions imposed by local or state agencies on the roads to be traveled. Care shall be taken to not overload transport vehicles.

4) Shipment during muddy conditions is to be avoided to minimize off-site contamination and the potential for an accident. Muddy conditions could result in the tracking of ore material from the site onto adjacent public roads. A gravel tracking pad will be constructed at the exit to the ore pad if muddy conditions cannot be completely avoided.

4.0 Vehicle Survey and Shipping Papers

Prior to leaving the site, the loaded truck must be surveyed for leakage and radiation. Shipping papers must be completely filled out and in the possession of the driver. Mine personnel will be required to maintain records of the inspections and radiation scans performed for each shipment. Specific survey and shipping requirements include:

1) The truck will be scanned to verify that it meets gamma exposure rates stipulated in Title 49. Radiation levels shall not exceed 1rem/hr (10 millisievert/hr (mSv/hr)) at 3 meters from the load for an unshielded cargo (173.427), 200 mrem/hr (2 mSv/hr) on the conveyance or package surface, and 10 mrem/hr (0.1 mSv/hr) at 2 meters from the conveyance or package surface (173.441). The transport index (TI) is equal to the maximum gamma exposure rate in mrems/hr at 1 meter (3.3 feet) from the conveyance or package surface, rounded up to the nearest tenth. The TI must be below 10. The TI measurements will be performed at the front of the tractor, on both sides of the trailer, and at the tailgate.

2) A gamma survey will be conducted within the cab of the transport tractor. The average reading in mrem/hr will be recorded to verify that the occupied space does not exceed the regulatory limit of 2 mrem/hr (173.441).

3) The truck and trailer will be visually inspected to ensure that the load is adequately covered, there is no leakage from the bed of the truck/trailer, and there is no loose ore spilled onto the tractor or trailer.

4) Shipping papers will be prepared by mine personnel and provided to the truck driver. Each ore shipment must include the following information.

   a) Date of shipment:
   b) Name and address of shipper:
   c) Name and address of transporter:
   d) Name and address of mill destination:
   e) Shipping name: RQ, Radioactive Material, Low Specific Activity (LSA-1), Fissile Exempted
   f) Form: Solid ore
   g) Hazard Class: Class 7 Radioactive Material
   h) Identification Number: UN 2912
   i) Quantity of Material (lbs.):
   j) Transport Index:
   k) Grade U_3O_8:
   l) Activity of Radioactive Material (Terabecquerels, Tbq):
   m) Emergency Contact Telephone Numbers:
   n) Energy Fuels' shipper certification
   o) Exclusive use statement: Exclusive Use Shipment

   The activity level of the shipped ore is dependent on the tonnage and grade. The activity level, in units of terabecquerels (Tbq), can be found from the table presented in Appendix A. One Tbq is equal to about 27 Curies (Ci).

   The emergency contact numbers in the shipping papers should include the emergency response contractor stipulated in the ore haulage contract, appropriate Energy Fuels personnel, appropriate mill personnel, state patrol offices, and local fire station and sheriff offices. Home telephone numbers are to be included for all key response personnel.

   The shipping papers will include the following certification statement that will be signed by the responsible person at the mine: *"This is to certify that the above-named materials are properly classified, described, packaged and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation." (172.204(1))*

   As an alternative one may include the following certification statement: "*I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labelled/placarded, and are in all respects in proper*

condition for transport according to applicable international and national governmental regulations."

An exclusive use statement must be included on or with the shipping papers indicating that the tractor and trailer are used exclusively for shipping uranium ore. An example of an exclusive use statement is: *"This shipment of uranium ore is being shipped as an exclusive (sole) use shipment."* Accordingly, the contents of the shipment must be loaded at the mine and unloaded at the mill, absent any unloading or additional loading prior to delivery at the mill. The transportation conveyance trailer must be utilized only for uranium ore transport until such time that mill personnel conduct a survey of the interior and exterior of the trailer and determine that the trailer can be released for unrestricted use. At such time that the trailer is released for unrestricted use, all markings related to the radioactive material must be removed from the conveyance trailer."

5.0 Ore Transport

The contract carrier will be responsible for compliance with all applicable laws and adhering to the following procedures and protocols during transport of the ore from the mine to the mill.

1) The truck must be equipped with appropriate vehicle markings. The words "RADIOACTIVE LSA" must be stenciled or otherwise affixed to both sides of the trailer in 3-inch letters.

2) The trailer must be kept closed at all times, when containing uranium ore and when empty, by use of a tarpaulin or other suitable cover. The carrier must ensure that there is no leakage or spillage of uranium ore from the truck trailer. The trailer must remain placarded when it is empty (172.514).

3) The carrier will inform appropriate mine and mill personnel of the route to be taken from the mine to the mill.

4) Shipments of ore will be transported without unnecessary delay from the mine to the mill. The carrier may designate suitable locations for temporary storage of vehicles along the route from the mine to the mill if it is necessary to coordinate delivery times at the mill. These "safe havens" are subject to approval by the mine and the mill.

5) Carrying and delivering to the mill a copy of the shipping papers.

6) Maintaining exclusive use of the transport vehicle for uranium ore shipment. An unrestricted use release survey will have to be conducted by the mill before the vehicle can be used for other purposes.

7) Unloading the uranium ore shipment at the mill in accordance with the procedures stipulated by the mill.

8) Carrying and adhering to an Emergency Response Plan (see Section 6).

9) Ensuring that all drivers are properly trained (see Section 7).

6.0 Emergency Response

Emergency response information is to be immediately available to all persons who transport, offer to transport, or handle uranium ore (170.600). That information can be provided by Energy Fuels Resources or the transportation contractor. The transportation contractor is responsible for implementing the plan in the event of an accident that results in the spillage of uranium ore (or other spillage during transport) on public roads. The plan must meet the requirements of (172.600) and be immediately available to responders (172.602).

Energy Fuels can and would prefer to be the primary provider of technical support and cleanup assistance in the event of an accident because the company has the expertise and specialized equipment necessary to do the work. However, emergency response functions may also be provided by the transportation contractor, the mill, or a 3rd-party emergency response contractor. The mine's role in an accident will depend on contractual requirements between the mine and the transportation contractor. These responsibilities need to be clearly spelled out and understood prior to the start of ore haulage. The emergency response plan must clearly define who is responsible for each type of emergency response action and provide the necessary emergency contact information.

The Emergency Response Plan must contain the following information: (172.602)

1. The basic description and technical name of the hazardous material
2. Immediate hazards to health
3. Risks of fire or explosion
4. Immediate precautions to be taken in the event of an accident or incident
5. Immediate methods for handling fires
6. Initial methods for handling spills or leaks in theabsence of fire and
7. Preliminary first aid measures.

7.0 Training

Mine safety personnel will provide training to mine and carrier personnel for the proper loading and transporting of uranium ore. The training will include: basic radiation concepts, dust and contamination control, vehicle scanning requirements, exclusive use transport provisions, and emergency response contact and response information. The training record will be documented and maintained on site.

The transportation contractor will be required to provide training to its drivers (172.602) including job functions to be performed by the employee, emergency response procedures, self protection measures, and accident prevention methods. A record of current training, inclusive of the preceding three years, will be kept for every employee of the transportation contractor. Guidance on evaluating the effectiveness of an Emergency Response Plan is presented in Appendix B of this plan.

In accordance with the requirements of 49 CFR 177.800 and 177.816, each truck driver and any other carrier personnel involved in the loading or unloading of uranium ore onto and from the

uranium transport truck must be trained in the applicable requirements of 49 CFR Parts 390 through 397 and the procedures necessary for the safe operation of the vehicle. Driver training must include the following subjects:

1) Pre-trip safety inspection;
2) Use of vehicle controls and equipment, including operation of emergency equipment;
3) Operation of vehicle, including turning, backing, braking, parking, handling, and vehicle characteristics including those that affect vehicle stability, such as effects of braking and curves, effects of speed on vehicle control, dangers associated with maneuvering through curves and steep grades, and dangers associated with weather or road conditions that a driver may experience (e.g., storms, high winds);
4) Procedures for crossing through tunnels, bridges, and railroad crossings;
5) Requirements pertaining to attendance of vehicles, parking, smoking, routing, incident reporting, and loading and unloading of materials.

The above training is the responsibility of the transportation contractor and may be satisfied by compliance with the current requirements of a Commercial Driver's License with a hazardous materials endorsement.

APPENDIX A
ACTIVITY OF RADIOACTIVE MATERIAL CONTAINED IN TRUCK (TBq)

Activity of radioactive material Contained in Truck (TBq)

	Net Pounds of Ore in Truck											
	36,000	38,000	40,000	42,000	44,000	46,000	48,000	50,000	52,000	54,000	56,000	58,000
Grade	Net Tons of Ore in Truck											
($\%U_3O_8$)	18	19	20	21	22	23	24	25	26	27	28	29
0.20	0.0018	0.0019	0.0020	0.0021	0.0022	0.0023	0.0024	0.0025	0.0026	0.0027	0.0028	0.0029
0.21	0.0019	0.0020	0.0021	0.0022	0.0023	0.0024	0.0025	0.0026	0.0027	0.0028	0.0029	0.0030
0.22	0.0020	0.0021	0.0022	0.0023	0.0024	0.0025	0.0026	0.0028	0.0029	0.0030	0.0031	0.0032
0.23	0.0021	0.0022	0.0023	0.0024	0.0025	0.0026	0.0028	0.0029	0.0030	0.0031	0.0032	0.0033
0.24	0.0022	0.0023	0.0024	0.0025	0.0026	0.0028	0.0029	0.0030	0.0031	0.0032	0.0034	0.0035
0.25	0.0023	0.0024	0.0025	0.0026	0.0028	0.0029	0.0030	0.0031	0.0033	0.0034	0.0035	0.0036
0.26	0.0023	0.0025	0.0026	0.0027	0.0029	0.0030	0.0031	0.0033	0.0034	0.0035	0.0036	0.0038
0.27	0.0024	0.0026	0.0027	0.0028	0.0030	0.0031	0.0032	0.0034	0.0035	0.0036	0.0038	0.0039
0.28	0.0025	0.0027	0.0028	0.0029	0.0031	0.0032	0.0034	0.0035	0.0036	0.0038	0.0039	0.0041
0.29	0.0026	0.0028	0.0029	0.0030	0.0032	0.0033	0.0035	0.0036	0.0038	0.0039	0.0041	0.0042
0.30	0.0027	0.0029	0.0030	0.0032	0.0033	0.0035	0.0036	0.0038	0.0039	0.0041	0.0042	0.0044
0.31	0.0028	0.0029	0.0031	0.0033	0.0034	0.0036	0.0037	0.0039	0.0040	0.0042	0.0043	0.0045
0.32	0.0029	0.0030	0.0032	0.0034	0.0035	0.0037	0.0038	0.0040	0.0042	0.0043	0.0045	0.0046
0.33	0.0030	0.0031	0.0033	0.0035	0.0036	0.0038	0.0040	0.0041	0.0043	0.0045	0.0046	0.0048
0.34	0.0031	0.0032	0.0034	0.0036	0.0037	0.0039	0.0041	0.0043	0.0044	0.0046	0.0048	0.0049
0.35	0.0032	0.0033	0.0035	0.0037	0.0039	0.0040	0.0042	0.0044	0.0046	0.0047	0.0049	0.0051
0.36	0.0032	0.0034	0.0036	0.0038	0.0040	0.0041	0.0043	0.0045	0.0047	0.0049	0.0050	0.0052
0.37	0.0033	0.0035	0.0037	0.0039	0.0041	0.0043	0.0044	0.0046	0.0048	0.0050	0.0052	0.0054
0.38	0.0034	0.0036	0.0038	0.0040	0.0042	0.0044	0.0046	0.0048	0.0049	0.0051	0.0053	0.0055
0.39	0.0035	0.0037	0.0039	0.0041	0.0043	0.0045	0.0047	0.0049	0.0051	0.0053	0.0055	0.0057
0.40	0.0036	0.0038	0.0040	0.0042	0.0044	0.0046	0.0048	0.0050	0.0052	0.0054	0.0056	0.0058
0.41	0.0037	0.0039	0.0041	0.0043	0.0045	0.0047	0.0049	0.0051	0.0053	0.0055	0.0057	0.0059
0.42	0.0038	0.0040	0.0042	0.0044	0.0046	0.0048	0.0050	0.0053	0.0055	0.0057	0.0059	0.0061
0.43	0.0039	0.0041	0.0043	0.0045	0.0047	0.0049	0.0052	0.0054	0.0056	0.0058	0.0060	0.0062
0.44	0.0040	0.0042	0.0044	0.0046	0.0048	0.0051	0.0053	0.0055	0.0057	0.0059	0.0062	0.0064
0.45	0.0041	0.0043	0.0045	0.0047	0.0050	0.0052	0.0054	0.0056	0.0059	0.0061	0.0063	0.0065
0.46	0.0041	0.0044	0.0046	0.0048	0.0051	0.0053	0.0055	0.0058	0.0060	0.0062	0.0064	0.0067
0.47	0.0042	0.0045	0.0047	0.0049	0.0052	0.0054	0.0056	0.0059	0.0061	0.0063	0.0066	0.0068
0.48	0.0043	0.0046	0.0048	0.0050	0.0053	0.0055	0.0058	0.0060	0.0062	0.0065	0.0067	0.0070
0.49	0.0044	0.0047	0.0049	0.0051	0.0054	0.0056	0.0059	0.0061	0.0064	0.0066	0.0069	0.0071
0.50	0.0045	0.0048	0.0050	0.0053	0.0055	0.0058	0.0060	0.0063	0.0065	0.0068	0.0070	0.0073

APPENDIX B
EMERGENCY RESPONSE GUIDELINES
ORE TRANSPORATION CARRIERS

EMERGENCY RESPONSE GUIDELINES
ORE TRANSPORTATION CARRIERS

The following guidelines provide direction to Energy Fuels personnel in evaluating the effectiveness of an Emergency Response Plan (Plan) for ore transportation carriers. Each ore transportation contractor must have a comprehensive plan in place for responding to accidents and other incidents involving the spillage of uranium ore. It is recommended that the principal emergency responders named in each Plan be contacted to verify their capability of responding to an incident that might occur anywhere along the proposed haulage route(s).

Emergency Contact Information: The Plan should include emergency telephone numbers for the transportation contractor, the mine, the mill, and a third-party emergency response contractor, if applicable. Additionally, the Plan should include telephone numbers for the state patrol, local fire stations, local law enforcement, and emergency medical services. These telephone numbers should include all localities along the carrier's route to the mill. The plan should clearly spell out who is to be contacted depending on location and type of incident. The driver should also be provided with a radio and/or mobile telephone suitable for the area traveled. Because of the relative remoteness of our mine sites, some communication units may not provide adequate coverage.

Scene Assessment: Prior to performing any action at an accident, the scene will need to be quickly evaluated for potential hazards including injuries, fires, fuel spills, downed power lines, traffic hazards, and proximity to streams or rivers. Identified hazards are to be avoided and, if possible, abated as soon as possible. It is recommended that the driver carry a copy of USDOT's current Emergency Response Guidebook and be trained in its use so that he/she can better identify potential hazards and the appropriate response procedures. Contacting the local fire station and/or sheriff's department is often the fastest method for gaining assistance when responding to identified hazards.

Succession of Authority: The driver, if capable, is responsible for the accident site and related area on public roads or highways until the arrival of the fire department or law enforcement personnel. Once the site has been secured and the preliminary investigation is complete, the assigned supervisor of the contracted Emergency Response Team shall be in charge of traffic control and cleanup activities.

Traffic Control: Initially, reflective triangles, flares, and volunteer flaggers can be used to control traffic until emergency responders arrive. Professional traffic control measures will be needed for any subsequent clean-up actions.

Qualifications of Emergency Response Crews: General construction skills are needed plus experience in the use of radiological monitoring instruments. Emergency response crews should be located in close proximity to the ore haulage route. If a haulage route is relatively long, different crews may be needed to respond to different sections of the route.

Potential for Exposure: The uranium ore transported to the mill ranges from 0.15 to 0.35 percent eU_3O_8. Based on EPA and NRC health-based standards, a cleanup action of material having this low of uranium content will not result in a worker becoming overexposed to radiation, even if the action extends over several work days.

Required Personal Protection Equipment (PPE): Level "D" PPE consisting of work pants, sleeved work shirt, and sturdy work boots or shoes is required. Gloves, hard hats, safety glasses, dust masks, and steel-toed safety shoes/boots may be also required as needed.

Cleanup Procedures: Because of its potential to cause a fire or contaminate nearby water courses, containment and cleanup of any fuel spills is normally the first priority. Many of the fire departments carry adsorbents and booms to contain and clean up these types of spills. Spilled ore materials, depending on the size of the spill, can be cleaned up with a loader, hand shovels, rakes, and shop brooms. If the spill is large, the ore should be transferred directly to another truck approved for uranium ore haulage. Smaller spills can be placed in barrels or other suitable containers. If it is windy, dust can be controlled with light water sprays; however, large volumes of water should not be used because this could result in runoff of water containing uranium and other contaminants. If the spill occurs near or within a stream or river, efforts should be made to limit the quantity of ore released to the water course. Because of its relatively low uranium content, however, no long-term environmental impacts would be expected if some of the material cannot be safely recovered.

Cleanup Verification: After visible spilled ore material has been removed, a scintillometer or gamma meter should be used to identify any "hot spots" of residual radiation on ground surfaces. The hot spots can be marked using spray paint, chalk, or utility flags. After these hot spots are further cleaned, they should be rechecked with the instrument to verify that the area is at or near background radiation levels. This is normally readily achievable on hard surfaces such as concrete or asphalt. Some over-excavation of underlying soils may be necessary in gravel or grassy areas. If there is a concern regarding the cleanup levels achieved, soil samples can be taken of the contaminated area and a nearby uncontaminated area to establish background levels. Cleanup to a level of 5 pCi/g above background is normally considered adequate for protection of the environment.

Disposal of Recovered Materials: Recovered materials that have been loaded for transport can be released by the assigned cleanup supervisor to be transported to the mill. Any materials contaminated with oil or fuel should be containerized and transported to a suitable holding area for later characterization and appropriate disposal.

Decontamination of Equipment and Tools: The contract Emergency Response Team should have specific procedures in place for decontaminating equipment and tools for "free release" of these items. These procedures generally include cleaning protocols, collecting swipe samples for analysis, and scanning for radiation levels.

Agency Notifications: Depending on the severity of the incident, one or more state and federal agencies may need to be notified. These notifications may include both verbal and written requirements and should be made by the transportation contractor with the assistance of the

Emergency Response Team supervisor. Notification requirements, including contact information, should be included in the carrier's Plan. Depending on location, potential notifications include:

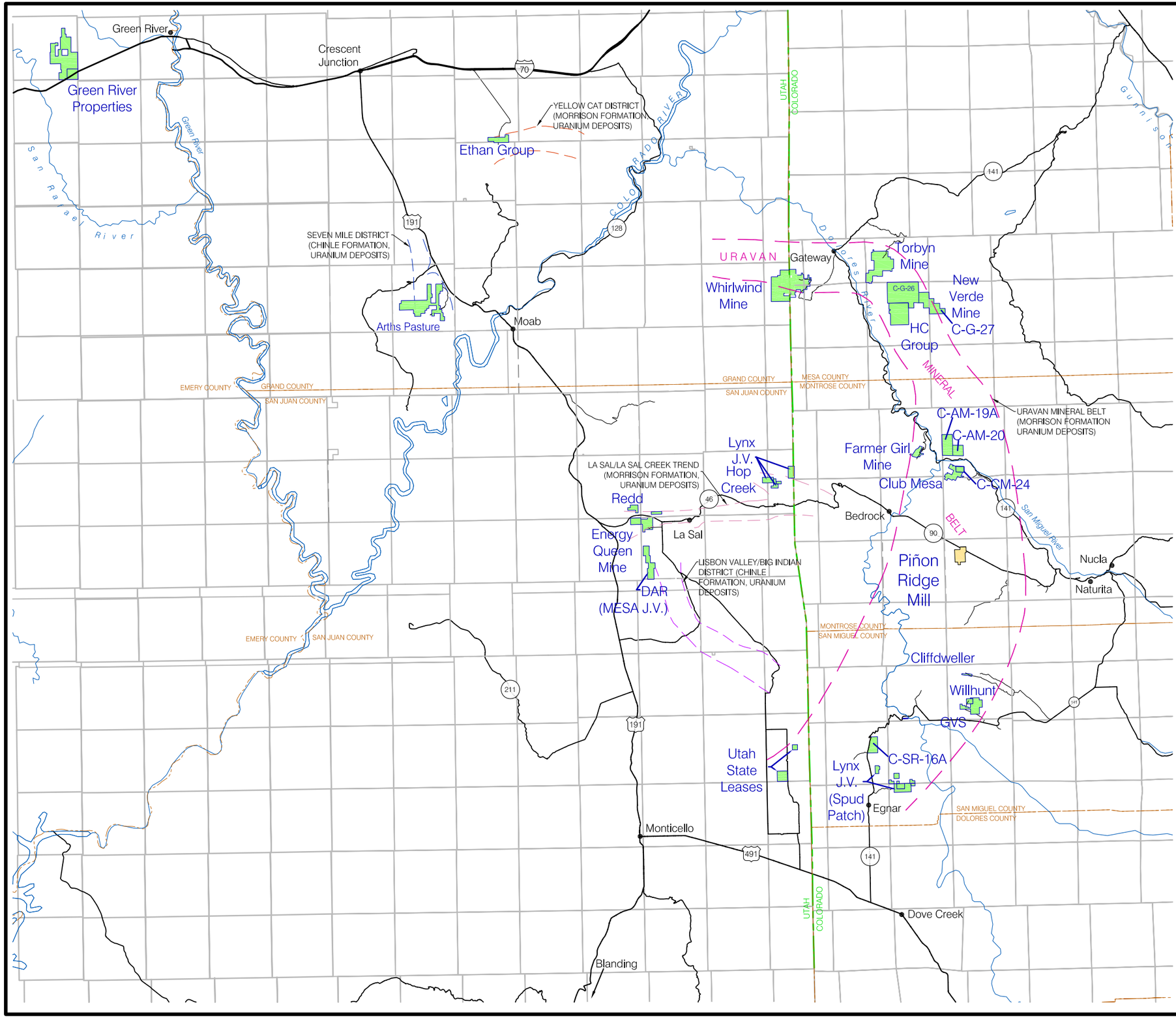
1. Colorado Department of Public Health and Environment, Division of Emergency Management: (303) 756-4455

2. The Utah Department of Environmental Quality, 24-Hour Answering Service: (801) 536-4123

3. The U.S. Environmental Protection Agency, National Response Center: (800) 227-8914

4. The U.S. Department of Transportation: Written report within 30 days

The reportable quantity (RQ) for uranium is 0.1 Ci or 0.0037 TBq (see 49 CFR 172.101). It is unlikely that this threshold will be exceeded in an accident unless the ore is of relatively high grade and the entire load is spilled (see activity levels in Appendix A). However, associated events such as fire, serious injury, public evacuation, or closure of a major transportation artery can also trigger the reporting requirement. Agency notifications typically have time limits that must be observed, so it is important that the Plan clearly lists the notification requirements for each agency that may be involved.



LEGEND

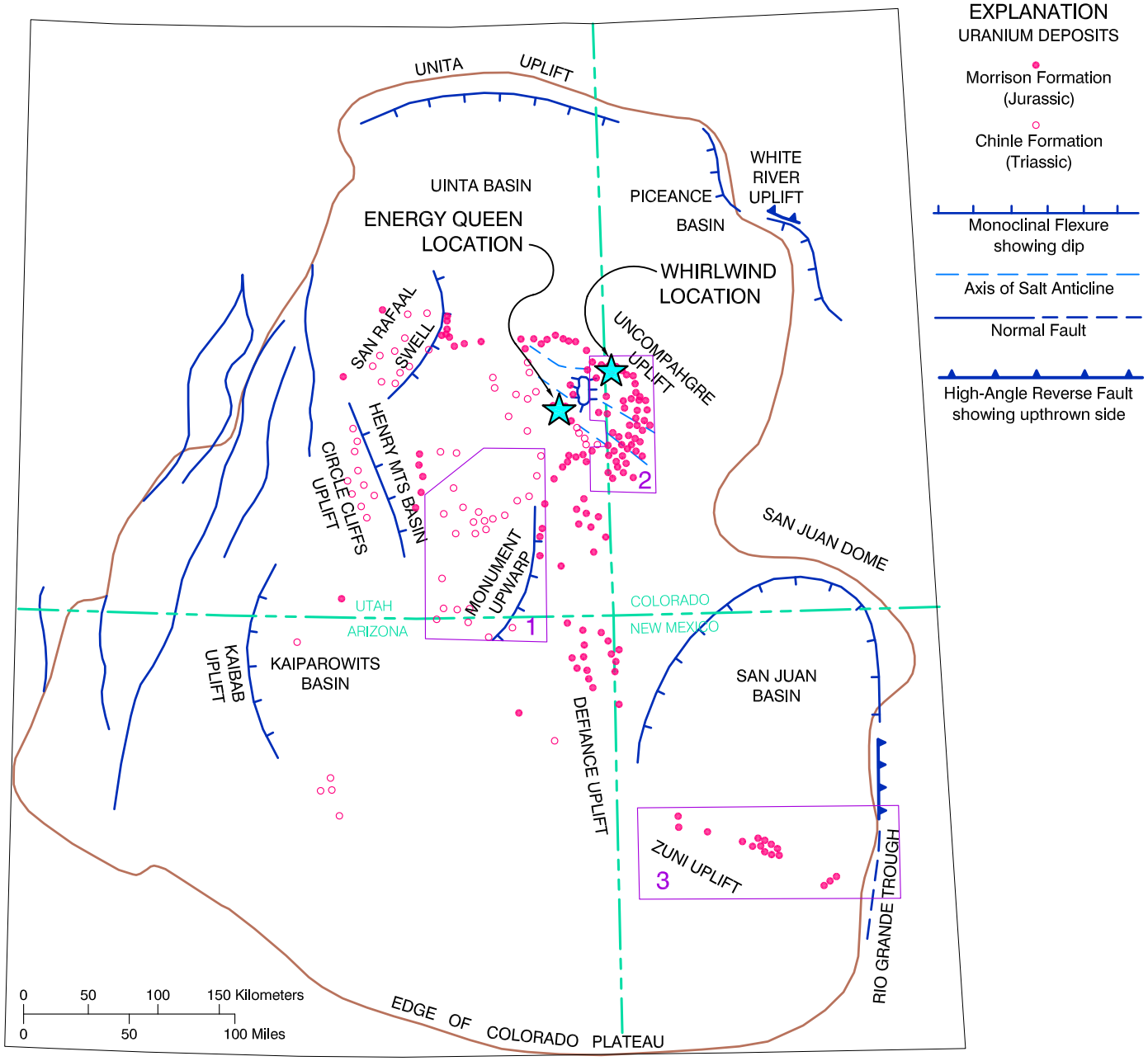
- Energy Fuels Resources Piñon Ridge Mill
- Energy Fuels Resouces Uranium-Vanadium Properties
- Uranium Deposits
- Road
- Rivers

Energy Fuels Resources

Figure 1.1
Colorado and Utah
Mine and ExplorationProperties

Scale	Date	Drawn by
1" = 10 miles	August 25, 2009	K. SLEDD

D:\Projects\EF\frank filas\CO-UT MINE PROPS-FIG 1.1.dwg



Principal Uranium Deposits and Major Structural Features in the Colorado Plateau Province.
Blocks outline the approximate area of the following districts:
(1) Monument Valley - White Canyon, (2) Uravan, (3) Grants.
(after Nash et al., 1981; as modified from Fischer, 1968).

Energy Fuels Resources

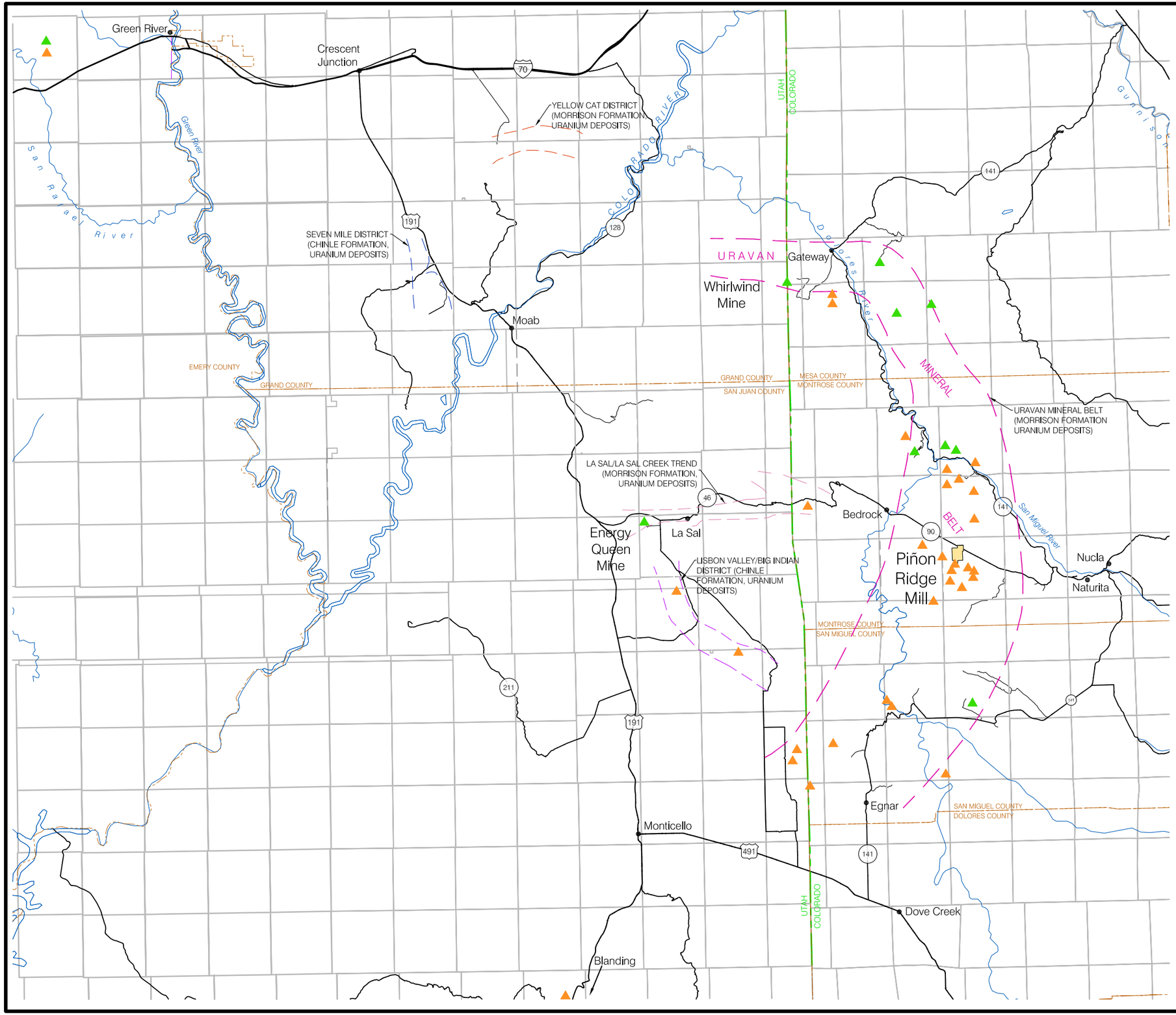
Figure: 1.2

PRINCIPAL URANIUM DEPOSITS

& MAJOR STRUCTURES OF THE COLORADO PLATEAU

Scale	Created	Drawn by
1"=75 miles	Aug. 25, 09	SleddCAD

D:\Projects\EF\frank filas\COLO PLAT-FIG 1.2.dwg



Energy Fuels Resources

Figure 6.1
Potential Sources of Ore Feed to the Mill

Scale	Date	Drawn by
1" = 10 miles	August 25, 2009	K. SLEDD

D:\Projects\EF\frank filas\CO-UT MINE PROPS-FIG 6.1.dwg

Socioeconomics Baseline and Impact Analysis for the Proposed Piñon Ridge Uranium Mill

Montrose County, Colorado

November 5, 2009

Prepared for
Energy Fuels Resources Corporation
Lakewood, Colorado

by

The Louis Berger Group
Lakewood, Colorado

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 Site Location 1
1.2 Study Area 1
2.0 SOCIOECONOMIC Baseline 3
2.1 Land Ownership and Land Use 3
2.1.1 Agricultural Practices 3
2.1.2 Timber Harvesting 8
2.1.3 Recreation 8
2.1.4 Energy and Mining 9
2.2 Economic Characteristics 14
2.2.1 Employment 14
2.2.2 Income and Earnings 17
2.2.3 Unemployment 21
2.2.4 Economic Base 22
2.3 Demographic Characteristics 24
2.3.1 Population 24
2.3.2 Race and Poverty 26
2.3.3 Housing 29
2.4 Community Services 30
2.4.1 Emergency and Health Care Services 30
2.4.2 Water and Wastewater Services 31
2.4.3 Education 31
2.5 Transportation 31
2.5.1 Montrose County Highways 31
2.5.2 Highway Fatalities and Accidents 34
2.6 Fiscal Conditions 36
3.0 IMPACT ANALYSIS 38
3.1 Construction Phase 38
3.2 Operations 45

LIST OF TABLES

Table 1. Land Ownership Patterns in Counties within the Study Area 3
Table 2. Farm and Agricultural Statistics for Colorado Counties 6
Table 3. Farm and Agricultural Statistics for Utah 7
Table 4. Deer, Elk and Black Bear Hunting Data in Game Management Unit 70 9
Table 5. Status of Conventional Uranium Milling Operations in the U.S. 12
Table 6. Total Labor Force by Industry for Counties in the Study Area, 2007 15
Table 7. Most Common Industries that Employ Men and 17
Table 8. Commuting Patterns for Montrose County, 2000 17
Table 9. Average Monthly Earnings per Job, in Colorado Study Area Counties 19
Table 10. Average Monthly Earnings per Job, Utah Study Area Counties 20
Table 11. Labor Location Quotients for the Counties in Colorado, 2007 23
Table 12. Labor Location Quotients for the Counties 24
Table 13. Estimated Population for Counties in the Study Area for 2007 25

Table 14. Population Centers in the Study Area 25
Table 15. Race and Poverty Characteristics of Counties, Cities, and Towns within the Study Area 28
Table 16. Housing Units and Vacancy Rates of Surrounding Counties Within Colorado 29
Table 17. Average Value of Single-Family Home 30
Table 18. Traffic Crash Injuries and Fatalities for Counties Near 34
Table 19. Fatality Rates per Million Vehicle Miles Traveled 35
Table 20. Existing 2007 PM Peak Hour Traffic Volumes at SH 90 and SH 141 (VPH) 36
Table 21. Montrose County Taxing Districts, 2008 37
Table 22. Average Labor Estimate During Construction of Piñon Ridge Mill 39
Table 23. Estimated Available Workforce for Construction of the 39
Table 24. IMPLAN Model Inputs for Construction Phase of Pinon Ridge Mill 41
Table 25. Economic Impacts from Construction 42
Table 26. Estimated Sales and Use Tax Revenues 44
Table 27. Economic Impacts from Operation 46
Table 28 Estimated Annual Sales Tax Revenues - Operational Phase 48
Table 29. Taxing Districts and 2008 Mill Levies 49
Table 30 Estimated Property Taxes During First Ten Years of Mill Operation[1] 49

LIST OF FIGURES

Figure 1. Site Location 2
Figure 2. Montrose County Farms by Size 5
Figure 3. Historical Uranium Prices 13
Figure 4. Montrose County Employment Trends by Industry 16
Figure 5. Per Capita Income Trends, 1996 - 2006 (2007$) 18
Figure 6. Annual Average Unemployment Rates 21
Figure 7. Population Forecasts for Counties in the Study Area, 2010-2035 26
Figure 8. Location of Major Transportation 33

1.0 INTRODUCTION

Energy Fuels Resources Corporation (EFR) proposes to license, construct and operate a conventional acid leach uranium and vanadium mill at the Piñon Ridge Mill site (the "Site") in western Montrose County, Colorado. Site facilities will include an administration building, a 17-acre mill, tailing cells totaling 90 acres, a 40-acre evaporation pond (expansion capacity to 80 acres), a 6-acre ore storage pad, and access roads. The mill will process ore produced from mines within a reasonable truck-hauling distance and will initially process up to 500 tons of ore per day ("t/p/d"). However, as designed, the mill may be expanded to process up to 1,000 t/p/d. The expected operating life of the mill is 20 to 40 years, depending on the milling rate.

The Piñon Ridge Mill is subject to regulation by Montrose County and the State of Colorado. The mill license (Radioactive Source Material License) will be issued and administered by the Radiation Management Program of the Colorado Department of Public Health and Environment (CDPHE). The activities described in this document were performed as part of the baseline characterization required for the Environmental Report (ER) in accordance with Section 3.8.8, Part 3, 6 CCR 1007-1. This report presents the results of the socioeconomic baseline assessment and impact analysis conducted by the Louis Berger Group for EFR in support of the mill license application.

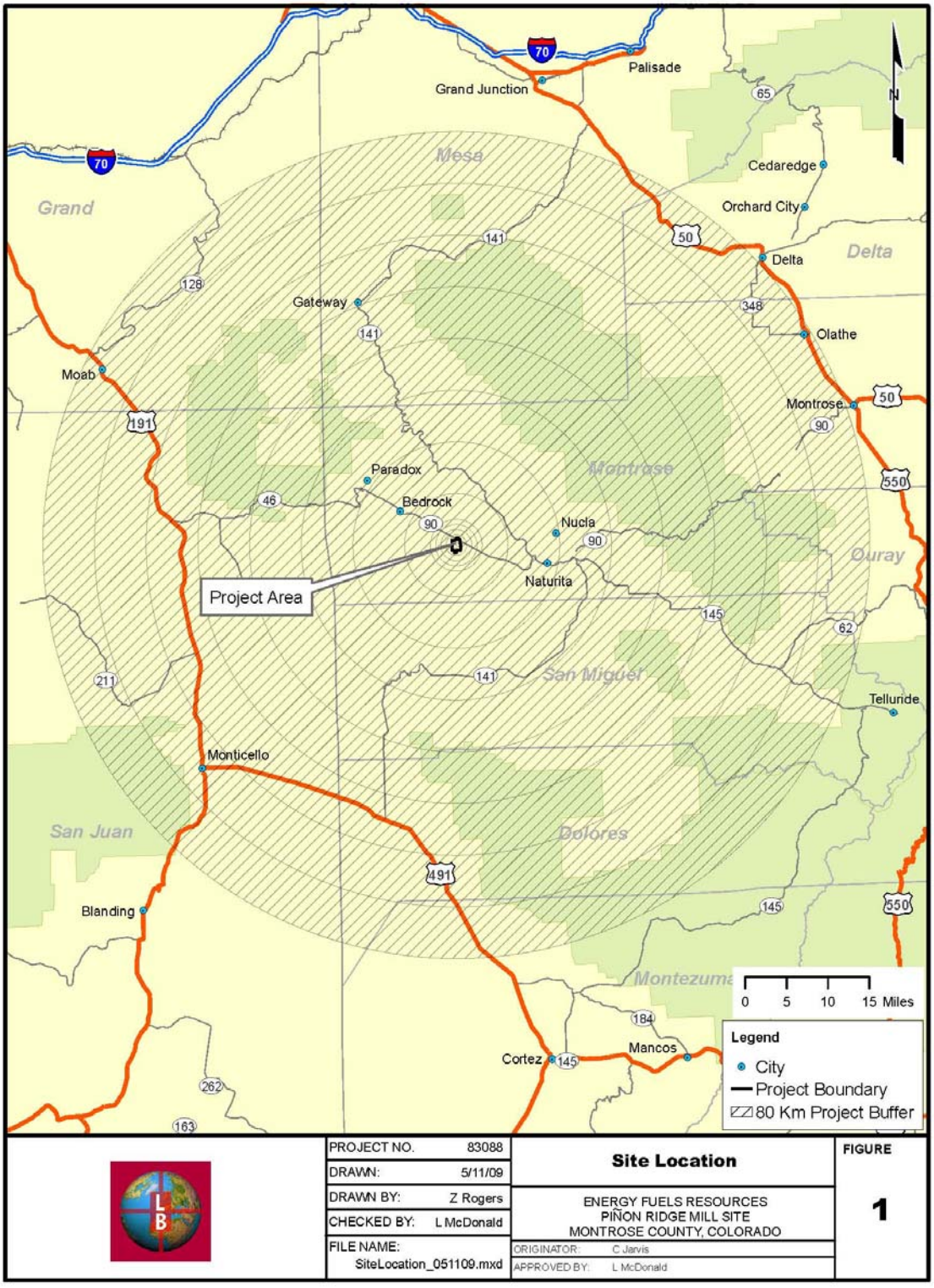
1.1 Site Location

The Site, which covers 880 acres, is located in the Paradox Valley at 16910 Highway 90, approximately eleven km (seven miles) east of Bedrock and 21 km (13 miles) west of Naturita. Both Bedrock and Naturita are located in Montrose County, Colorado. The Site's legal description is the Southwest ¼ of the Southeast ¼ of Section 5, all of Section 8, the North ¼ of Section 17, and the Southeast ¼ of the Northwest ¼ of Section 17, Township 46 North, Range 17 West, of the New Mexico Principal Base and Meridian. The Site is located on both the Davis Mesa Quadrangle and Bull Canyon Quadrangle 1:24,000 United States Geological Survey (USGS) topographic/geologic maps. The Site location is shown in Figure 1.

1.2 Study Area

The study area ("Study Area") for the project is defined as all areas within an 80-km (50-mile) radius of the Site, and is depicted in Figure 1. The use of an 80-km study area was based on guidance published by the U.S. Nuclear Regulatory Commission regarding the preparation of Environmental Reports for Uranium Mills (USNRC, 2003). The 80-km Study Area includes all or portions of Delta, Dolores, Mesa, Montezuma, Montrose, Ouray and San Miguel counties in western Colorado and Grand and San Juan counties in Utah. The collection of data and information for this Report was done on two levels. Initially, data and information was collected to help describe the socioeconomic characteristics throughout all nine of the counties. Second, more specific information was obtained for resources, activities, infrastructure and services that are most likely to lead to socioeconomic impacts associated with the proposed mill.

Figure 1. Site Location



2.0 SOCIOECONOMIC BASELINE

2.1 Land Ownership and Land Use

Land ownership for all counties in the Study Area is summarized in Table 1. Like other areas of the western U.S., this area is dominated by Federal public lands. In all counties but Montezuma and Ouray Counties, Federal public lands comprise greater than half of the land base.

Table 1. Land Ownership Patterns in Counties within the Study Area

Land Ownership	County								
	Delta, CO	Dolores, CO	Mesa, CO	Montezuma, CO	Montrose, CO	Ouray, CO	San Miguel, CO	Grand, UT	San Juan, UT
Private	44%	36%	27%	28%	31%	54%	37%	4%	8%
State	1%	3%	0%	35%	1%	1%	3%	15%	5%
Federal	55%	61%	73%	38%	68%	44%	59%	72%	61%
Tribal	0%	0%	0%	0%	0%	0%	0%	8%	26%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%

Source: U.S. Bureau of Land Management, 2009.

Montrose County, which includes the Site, encompasses approximately 2,200 square miles in southwestern Colorado. The Uncompahgre Plateau runs northwest to southeast through the central part of the County. This geological feature divides the County into the Uncompahgre/Gunnison River basins on the east and the Dolores/San Miguel River basins on the west. In addition to being the agricultural hub of the Western Slope, Montrose County is home to Black Canyon of the Gunnison National Park, as well as the Gunnison Gorge National Recreation and Wilderness Areas. A majority of the county is made up of federally managed lands including Bureau of Land Management (BLM) (44 percent), National Forest (23 percent), and National Park lands (1 percent). Private lands (31 percent) and state lands (1 percent) make up the balance of Montrose County.

Major land uses on public and private lands in the Study Area include agriculture, mining, oil and gas exploration and production, timber harvesting, and recreation. All land uses are subject to valid existing rights, which may be conveyed by title, deed, right-of-way, permit, withdrawal, or any other legally recognized instrument. Lands and access roads in the Study Area provide the public with multiple use opportunities.

2.1.1 AGRICULTURAL PRACTICES

Agricultural land uses dominate both the public and private lands in the Study Area. Agricultural uses are measured as part of the U.S. Department of Agriculture's (USDA) Census of Agriculture on a five-year basis.[1] Relevant data from the latest Census of Agriculture are

[1] The 2002 Census of Agriculture, conducted by the United States Department of Agriculture's (USDA) National

summarized in Table 2 and Table 3. Data in the table show that the percentage of land area in farms and ranches in the Study Area ranges from two percent in Grand County, Utah to 63 percent in Montezuma County Colorado. Approximately 22 percent of the acreage in private ownership in Montrose County was utilized for farming and ranching in 2007 (USDA, 2008). Given the arid nature of the Study Area, the percentage of total farm and ranch acreage on private lands in crops is relatively small, ranging from two percent in San Miguel, County to twelve percent in Dolores County. Though data were not provided by the Census, it is assumed that the majority of lands in farms not in croplands are used for grazing. Grazing is likely occurring on both improved and unimproved pastures. Improved pasture contains low successional native grasses and forbs characteristic of native prairie, but may also contain forage crops for cattle and is often irrigated. Improved and unimproved pastures support cattle production through cow-calf operations. In addition, a significant percentage of public lands are used for grazing operations throughout the Study Area (USDOE, 2007).

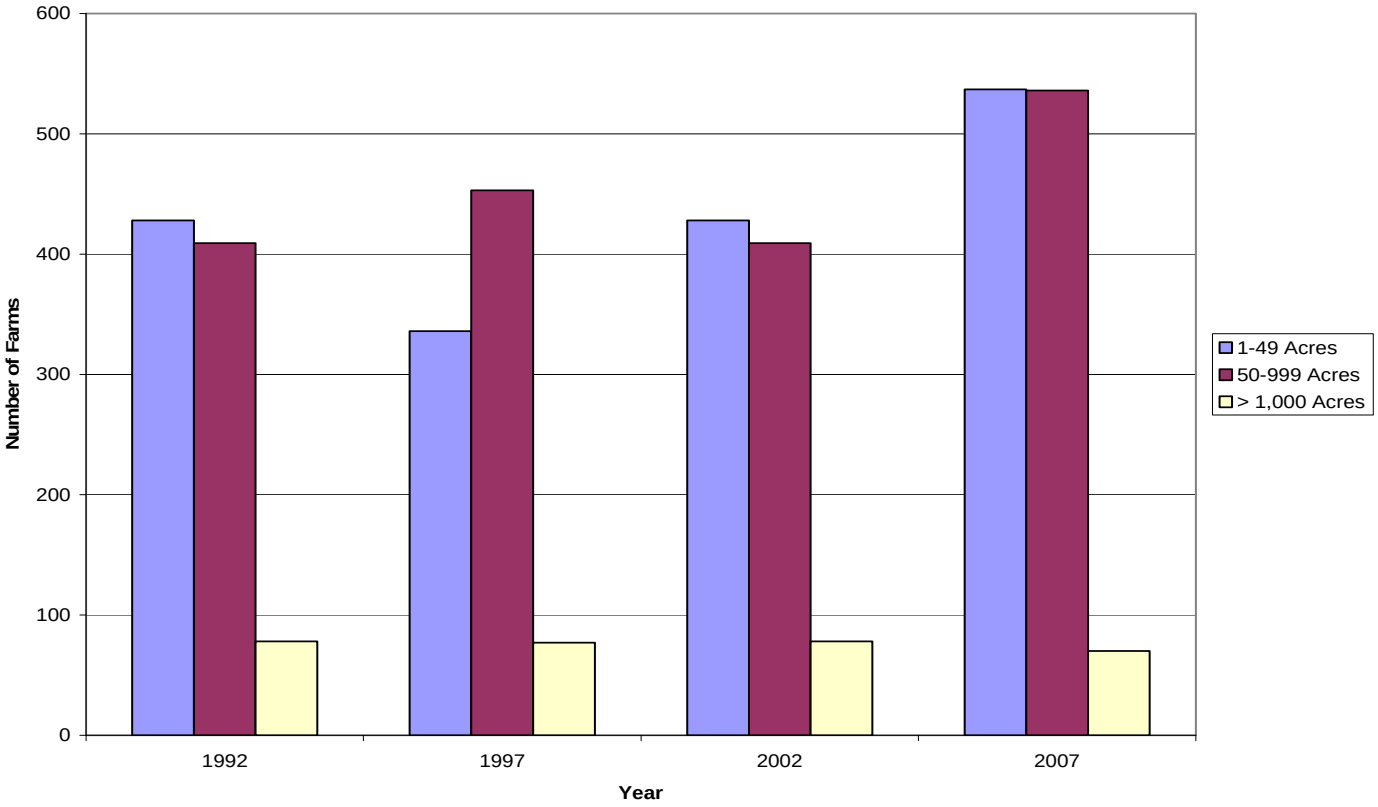
The BLM has determined that public lands within the immediate areas surrounding the Site, would require 30 to 50 acres to support one cow-one calf pair for a month (animal unit month (AUM)[2]). This minimal amount of forage available for domestic livestock in the area would not support concentrated grazing (USDOE, 2007).

Figure 2 depicts the change in farm and ranch size in Montrose County from 1992 to 2007 as defined by the USDA. The total number of farms and ranches overall has increased from 915 in 1992 to 1,143 in 2007. The percentage of small farms (1 to 49 acres) has remained relatively stable during this period at 48 percent though the total number of small farms has increased between 1992 (428) and 2007 (537). The medium size farms and ranches (50 to 999 acres) has also realized an increase in absolute numbers between 1992 (409 farms and ranches) to 2007 (536 farms and ranches). The large size farms and ranches (greater than 1000 acres) have decreased 10 percent from 1992 (78 farms and ranches) to 2007 (70 farms and ranches) (USDA NASS 2008).

Agricultural Statistics Service (NASS) is taken to measure agricultural activity and productivity for each county, State, and region of the United States. It covers production and sales of agricultural products during 2002 and inventory of livestock, poultry, and machinery and equipment as of December 31, 2002 (USDA, 2004).

[2] An AUM is defined as the amount of forage needed to feed one cow-calf pair for a month.

Figure 2. Montrose County Farms by Size



Source: USDA, 2008.

Table 2. Farm and Agricultural Statistics for Colorado Counties

State	Colorado																				
County	Delta			Dolores			Mesa			Montezuma			Montrose			Ouray			San Miguel		
	1997	2002	2007	1997	2002	2007	1997	2002	2007	1997	2002	2007	1997	2002	2007	1997	2002	2007	1997	2002	2007
Total Area [1] (Acres)	730,880			682,880			2,129,920			1,303,680			1,434,240			346,880			823,680		
Land Area in Farms (Acres)	281,889	262,443	252,530	155,741	158,518	173,872	416,613	385,255	372,511	935,330	818,677	704,261	371,881	334,747	321,056	116,906	108,088	93,839	161,937	151,093	150,947
Ave Farm Size (Acres)	271	247	195	973	734	623	280	241	211	1,303	988	627	429	366	307	1 480	1,126	894	1,951	1,349	1,227
Cropland (acres)	75,090	79,134	67,298	68,413	82,687	82,075	92,482	119,920	131,178	102,915	118,944	103,916	89,191	106,613	93,262	14 651	15,342	10,152	27,921	21,708	17,807
Irrigated Cropland (acres)	70,981	54,184	66,169	7,508	9,966	9,377	87,648	66,052	64,272	61,081	48,703	57,087	85,040	75,459	85,656	18 349	10,548	10,681	12,341	5,246	12,694
Corn (acres)	3,511	2,887	5,214	0	NA	NA	6,229	2,915	4,542	NA	0	NA	8,688	6,172	13,618	NA	NA	0	0	0	NA
Wheat (acres)	633	351	220	17,248	10,535	13,579	4,626	3,499	199,446	8,988	2,147	4,215	2,047	895	288	NA	150	0	4,418	NA	NA
Oats (acres)	NA	263	151	NA	228	288	NA	89	56	NA	113	NA	NA	192	124	0	0	0	NA	NA	0
Barley (acres)	90	NA	75	NA	0	NA	448	283	NA	NA	0	NA	947	1,429	422	0	0	0	0	0	0
Beans (acres)	1,809	1,368	NA	12,732	488	NA	662	859	NA	5,400	NA	6,618	8,765	7,063	4,208	0	0	0	NA	0	NA
Forage (acres)	32,273	24,775	33,646	11,638	9,087	10,433	38,718	35,917	34,438	49,848	38,117	39,328	37,437	35,748	38,467	9,094	9,089	7,581	5,090	3,800	5,656
Vegetables (acres)	NA	1,016	1,135	NA	0	NA	NA	734	793	NA	14	29	NA	3,876	3,117	NA	NA	3	NA	NA	0
Orchards (acres)	NA	2,521	2,743	NA	8	14	NA	2,410	2,742	NA	263	411	NA	295	318	NA	0	NA	NA	0	4
Crops Market Value ($1,000)	$15,177	$14,413	$20,158	$8,601	$1,805	$6,198	$20,146	$29,554	$30,262	$12,913	$6,463	$17,295	$19,654	$21,039	$23,252	$579	$394	$613	$474	$330	$654
Livestock Market Value ($1,000)	$23,906	$24,664	$26,642	$53,753	$1,968	$2,651	$30,304	$29,670	$30,969	$8,961	$8,058	$9,378	$68,621	$36,952	$43,908	2 659	$2,840	$2,991	$2,423	$3,281	$2,696

NA = Information not available.

USDA NASS 2008

Table 3. Farm and Agricultural Statistics for Utah Counties from 2007 Agricultural Census

Sate	Utah					
County	Grand			San Juan		
	1997	2002	2007	1997	2002	2007
Total Area [1] (Acres)	2,356,480			5,004,800		
Land Area in Farms (Acres)	75,801	52,729	NA	1,673,079	1,558,661	1,546,914
Average Size of Farms (Acres)	892	561	NA	7,243	6,747	2,041
Total Cropland (acres)	6,001	2,450	7,956	150,143	29,693	143,231
Irrigated Cropland (acres)	4,472	3,360	4,712	9,078	2,089	5,177
Corn (acres)	NA	0	0	NA	NA	59
Wheat (acres)	NA	0	60	38,138	26,557	31,163
Oats (acres)	NA	0	75	538	0	NA
Barley (acres)	0	0	0	135	0	NA
Beans (acres)	NA	0	NA	NA	NA	1,468
Forage (acres)	2,664	2,165	3,147	8,230	2,317	6,498
Vegetables (acres)	NA	111	144	NA	NA	155
Orchards (acres)	90	80	96	46	NA	52
Market Value of Crops ($1,000)	$850	$739	$944	$3,503	$1,592	$4,391
Market Value of Livestock ($1,000)	$1,439	$1,437	$1,608	$5,594	$5,924	$5,909

NA = Information withheld to avoid disclosing data for individual farms.

USDA NASS 2008

[1] City-Data.com 2007

2.1.2 TIMBER HARVESTING

Commercial forests, such as those made up of ponderosa pine (*Pinus ponderosa*), Douglas fir (*Pseudotsuga menziesii),* and Engelmann spruce (*Picea engelmannii*), are very limited in the Study Area due to minimal rainfall, steep topography, and relatively low elevations. However, on public lands near the Site there is limited harvesting of piñon pine (*Pinus edulis*) and juniper (*Juniperus spp.)* trees for firewood and fence posts (USDOE, 2007).

2.1.3 RECREATION

A vast majority of BLM lands within the Study Area are accessible to the public for off-highway vehicle use, mountain biking, hiking, hunting, and other recreational uses. The BLM categorizes public lands into two recreational management areas: Special Recreation Management Areas (SRMAs) and Extensive Recreation Management Areas (ERMAs). SRMAs are areas where recreation is recognized as the principal land-use management objective. ERMAs are areas where recreation is not the principal objective, but it is considered along with other uses under a multiple land-use management objective and, as such, ERMAs receive only custodial care (USDOE, 2007).

The Dolores River Canyon is the only SRMA within close vicinity of the Site. It extends from McPhee Reservoir north of the town of Dolores 167 km (104 miles) north to the town of Bedrock. The SRMA includes one of the more popular rafting and canoeing rivers in the southwestern United States and the BLM and the U.S. Forest Service have constructed recreational sites along the river to accommodate recreational uses. The peak period for river activity is from April 30th to June 15th during spring runoff. However, the flow is inadequate in some years to support rafting.

Fifty km (31 miles) north of the Site, the Gateway area and surrounding Unaweep Canyon have recently become the focus of targeted development. It is the intent of a private landowner to promote the area as a destination resort and encourage recreational activities in the area (USDOE, 2007). BLM is currently in the process of conducting inventories of recreational resources to determine if SRMA designation is warranted (USDOE, 2007). As the resort and community are further developed, it is recognized that additional tourism and traffic would result. To date, no studies have been conducted, nor have projections been made to identify the magnitude of the increased activity.

Big game hunting is a popular activity in the area around the site of the proposed Pinon Ridge Mill. The proposed site is located within Game Management Unit (GMU) 70 in Colorado. Hunting of elk, deer and black bear are allowed within this GMU. Hunting statistics for this GMU were obtained from the Colorado Division of Wildlife and summarized in Table 4. Over the last four years, these hunting activities have attracted between 5,000 and 6,500 hunters, resulting in approximately 25,000 to 30,000 recreational days per year.

Table 4. Deer, Elk and Black Bear Hunting Data in Game Management Unit 70 in Western Colorado

Year	Big Game Species	Total Harvest	Total Hunters	Total Recreation Days
	Deer	1,373	2,016	9,351
2008	Elk	1,267	4,475	23,348
	Black Bear	18	N/A	46
	Deer	1,261	1,838	7,559
2007	Elk	1,306	4,193	21,378
	Black Bear	14	N/A	56
	Deer	842	1,230	6,121
2006	Elk	1,458	4,517	23,218
	Black Bear	8	N/A	38
	Deer	771	1,160	4,557
2005	Elk	1,378	4,013	19,382
	Black Bear	8	N/A	34

2.1.4 ENERGY AND MINING

Colorado has a rich mining heritage, beginning with the discovery of gold in 1859 (CMA 2008). Uranium mining in Colorado dates back to the 1880's when uranium was produced as a by-product of radium. The mining industry in the state continues to evolve with the discovery and development of new reserves. The following energy and mineral products are produced in significant amounts in Colorado: coal, oil and gas, gold, gypsum, limestone, silver, molybdenum, soda ash and sodium bicarbonate. Colorado's energy and mining industry directly employed 29,109 persons in the third quarter of 2008 according to the Colorado Department of Labor and Employment (Colorado Department of Labor and Employment, 2009). In addition, Colorado ranks third among the states in mineral royalty receipts (CMA 2008).

The Colorado Geological Survey (CGS) estimates the total value of 2007 mineral and energy production in Colorado to be $11.811 billion (CGS, 2009). This is less than a one percent decrease from the revised 2006 total value of $11.846 billion. The past mineral and energy production values are as follows (CGS 2004, 2005):

- 2002 - $4.1 billion,
- 2003 - $6.7 billion
- 2004 - $8.5 billion, and
- 2005 - $12.2 billion.

Energy, carbon dioxide[3], and mineral production values for 2007 are estimated at (CGS, 2009):

- Natural gas - $6,803 million
- Oil - $1,498 million
- Carbon dioxide - $541 million
- Coal - $1,075 million
- Nonfuel minerals - $1,886 million

Considerable mineral exploration and development has occurred historically in the Study Area. Minerals produced in the Study Area have included coal, oil, natural gas, carbon dioxide, sand and gravel, radium, uranium, and vanadium. Uranium and vanadium exploration and mining, coal mining and oil and gas exploration and production are currently the predominant mineral activities in the area. If the demand for uranium and vanadium continues to increase, it is expected that the amount of uranium and vanadium mined and milled in the Study Area will increase accordingly.

The Uravan mineral belt is a zone of uranium-vanadium deposits in San Miguel, Montrose, and Mesa counties in Colorado, and Grand County in Utah (Wikipedia, 2009). This mineralized zone is the oldest uranium mining region in the U.S. Historically, approximately 1,200 mines were located within the Uravan mineral belt which produced over 63 million pounds of uranium and 330 million pounds of vanadium from 1948 to 1978 (Colorado DNR, 2008). Uranium and vanadium mineralization occurs in the Burro Canyon, Morrison, Entrada, and Chinle Formations within the Uravan Mineral Belt in Colorado. However, nearly all of the production was derived from the Salt Wash Member of the Morrison Formation. In Addition, uranium-vanadium deposits occur in both the Salt Wash and the Chinle and Cutler Formations in other districts within the Study Area including the La Sal, Lisbon Valley (a/k/a Big Indian), East Canyon, and Montezuma Canyon districts in San Juan County, Utah and the Polar Mesa district in Grand County, Utah. The industry has experienced booms and busts throughout the century, and by 1985 all production ceased as the price of uranium fell. Several flurries of mine activity occurred in 1989 and 1997 when the price of vanadium increased, but these were short-lived.

After years of prices in the single digits, the change in market fundamentals has caused a new interest in uranium mining and milling in the Uravan District. Many old mines are undergoing renovation, and thousands of claims have been staked in preparation for resumption of production. The BLM has estimated that approximately 66,000 unpatented mining claims existed historically in western Colorado, the majority of which are in areas of known or suspected uranium and vanadium mineralization (BLM 1984). The CGS estimates that more than 60 percent of the 5,700 new mineral claims (3,500 filed in 2006) were filed in counties which are likely to be for uranium. The BLM estimates that as of January 2007 there were approximately 4,800 mining claims in Mesa, Montrose, and San Miguel Counties located for uranium mineralization. The extent of active work on the mining claims has not been summarized. BLM estimates that approximately 95 percent of Colorado's uranium production is on public lands (CGS, 2006).

[3] Carbon dioxide is used in various industrial applications including enhanced oil recovery.

During the past five years, there has been some active uranium mining in the Study Area. The Cotter Corporation opened the JD-9 mine in Montrose County in 2003. In 2005, they produced approximately 250,000 pounds of U_3O_8 at their mill from ore produced at four mines in Montrose County including the JD-9, JD-8, JD-6 and SM-18. Cotter's ore was shipped via truck to their mill in Canon City for processing. Cotter put all four of their mines in Montrose County on standby in November 2005, laying off 49 workers, due to unprofitable operations (CDNR, 2008).

In early 2007, Denison Mines (USA) Corporation reopened the Sunday and West Sunday Mines near Slick Rock in San Miguel County and the Pandora Mine near La Sal in San Juan County, Utah. Denison also reopened the Tony M mine near Hanksville, Utah in late 2007; however this mine is west of the Study Area. These mines, including the Tony M produced 75,000 tons of uranium/vanadium ore in 2007. Denison operated five mines within the Study Area in 2008: the Sunday and West Sunday Mines, Pandora, and Rim & Beaver (near La Sal, Utah) but shut down the Tony M Mine late in the year. In addition, Denison recently announced the temporary closure of the Rim and Sunday Mines. All three of these mines are lower grade producers. Production from Denison's mines in 2008 was not available. The ore from these mines is shipped to Denison's White Mesa Mill in Blanding, Utah, which was restarted in April 2008. Several small, independent mines in both Colorado and Utah also sold and shipped ore in smaller lots to the White Mesa Mill in 2007 and 2008. Denison announced in May 2009 that the mill would temporarily switch from conventional ore feed to alternative feed in June 2009 (Denison, 2009). Ore from their operating mines continues to be stockpiled at the mill.

The Whirlwind Mine, located west of Gateway, Colorado and operated by Energy Fuels Resources, recently obtained operating permits in 2008. However, the mine was placed on standby in November of 2008 because the company was unable to obtain a satisfactory ore sales or toll milling agreement with the White Mesa Mill. Energy Fuels also operates the Energy Queen Mine near La Sal, Utah, which is currently being rehabilitated.

A potential bottleneck to opening additional uranium mines exists because of a lack of conventional mills to process uranium ore. Table 5 summarizes the status of all conventional uranium processing mills in the U.S as reported by the U.S. Energy Information Agency. Currently, the only conventional mill operating in the U.S. is the White Mesa Mill in Blanding, Utah which reopened in April 2008. Denison invested approximately $31 million in new mill equipment in refurbishing this facility. In 2008, they produced 791,000 pounds of uranium and 1,233,000 pounds of vanadium from processed ores. Cotter Corporation recently announced a plan to reopen their mill in Canyon City although production is not expected at the plant until 2014 (Finley, 2009).

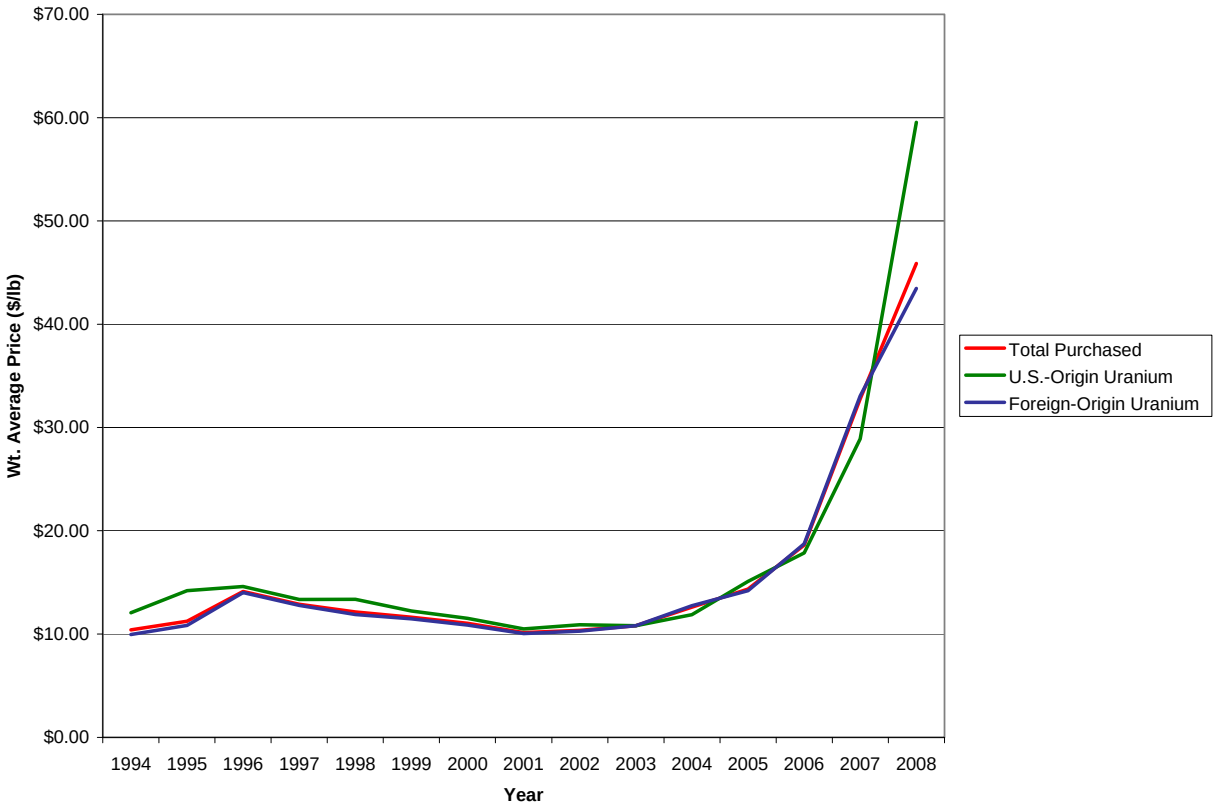
Table 5. Status of Conventional Uranium Milling Operations in the U.S. (4th Quarter 2008)

Mill Owner	Mill Name	Capacity (short tons of ore per day)	Status
Cotter Corporation	Canyon City Mill	400	Standby
Denison White Mesa	White Mesa Mill	2,000	Operating
Energy Fuels Resources	Piñon Ridge Mill	1,000[1]	Developing
Kennecott Uranium Co.	Sweetwater Uranium Project	3,000	Standby
Uranium One	Shootaring Canyon Uranium Mill	750	Changing License to Operational
Total		**7,150**	

Source: Energy Information Administration, 2008.
[1] The mill is designed to process 1,000 t/p/d, but will initially be permitted at a process rate of 500 t/p/d.

Historic uranium prices were obtained from the Energy Information Agency as shown in Figure 3. The weighted average price for uranium ($/lb) increased by over 260 percent between 2004 and 2008. Prices continued to increase for much of 2007, reaching over $130 per lb. However, by the end of 2007, prices declined to near $55 per pound of U_3O_8. For much of 2008 and 2009, spot prices have fluctuated between $40 and $55 per lb. The latest data available show spot prices for U_3O_8 at $42.50 per lb (tradetech.com, September 25, 2009). The long-term price for U_3O_8 has remained relatively stable over the past several years and was $65 per lb as of September, 2009 (tradetech.com).

Figure 3. Historical Uranium Prices



Source: EIA, 2008.

Coal is used to produce 68 percent of Colorado's electricity needs (CGS 2009). As of 2007 there were eleven active coal mines in Colorado, four of which are surface mines. Coal was produced in eight Colorado counties in 2007. The production of coal in Colorado has remained relatively stable with 39.8 million tons in 2004, 37.8 million tons in 2006 and 35.5 million tons in 2006 and 36.1 million tons in 2007 (CGS 2009). Delta County was the state's top coal producing county with 10.3 million tons, all from underground mining. The New Horizon Mine in Montrose County produced 406,279 tons of coal in 2007, up from 405,661 tons in 2006. This mine supplies coal to the Nucla Station, a 100-megawatt power plant in Nucla, Colorado.

Oil and gas production in the Study Area is concentrated in Montezuma and San Miguel Counties along the Colorado-Utah border in the Paradox Basin. Proven oil and gas reserves are also located to the east and south of the Slick Rock within the Study Area. Production of carbon dioxide in Colorado is concentrated in Montezuma County just outside the Study Area where 95 percent of the state's production occurred in 2007.

Oil and gas production within the State of Colorado has increased by 207 percent between 2002 and 2007. The oil, natural gas, and carbon dioxide production values for Colorado are as follows (CGS, 2004, 2005,2009):

- 2002 - $2.7 billion,
- 2003 - $5.0 billion,
- 2004 - $6.7 billion,
- 2005 - $9.3 billion,
- 2006 - $9.1 billion, and
- 2007 – $8.3 billion.

The CGS estimate the total value of oil, natural gas, and carbon dioxide production in the state in 2007 was $8.3 billion. This represents a 3 percent decline from the 2006 values ($9.1 billion). Natural gas production increased by as much as nine percent during 2007, however prices continued to decline over the year averaging $5.15 per mcf in 2007 down from a high of $7.39 during 2005. Oil production declined slightly during 2007 but prices were somewhat higher for crude oil. The production of carbon dioxide was flat during 2007 but prices nearly doubled causing the value of carbon dioxide to increase from $291 million in 2006 to $531 million in 2007 (CGS, 2007).

2.2 Economic Characteristics

This section focuses on trends associated with specific economic characteristics within the Study Area (all areas within an 80-km (50 miles) radius of the Site). This includes employment, income and earnings, unemployment and economic base industries.

2.2.1 EMPLOYMENT

Information on total employment by industry for 2007 for all the counties in the Study Area was obtained from the U. S. Bureau of Economic Analysis (BEA, 2009a) and is summarized in Table 6. Given the rural nature of most of these counties, employment is often concentrated in a few industries. For instance, in seven of the nine counties, government services ranks first or second in percentage of employment, ranging from 10.6 percent in Mesa County to 29 percent in San Juan County. Retail trade also provided a high percentage of jobs in five of the nine counties (Delta, Mesa, Montezuma, Montrose and Grand). It is expected that these counties would show strong employment in retail trade given the location of economic hubs including Delta, Grand Junction, Cortez, Moab and Montrose. Montrose, San Miguel and Ouray Counties showed a strong concentration of employment in construction, which is expected given the boom in development in certain parts of these counties. Based on the total number of employees, mining was a significant employer in Mesa, Delta and San Juan Counties.

Employment trends in Montrose County by industry for 2001 through 2007 are summarized in Figure 4. Industries showing the greatest increase in employment during this period include construction (899), services (2,455), and trade (349). Industries showing the largest decline in employment in Montrose County between 2000 and 2007 were farming and ranching (-102), manufacturing (-37), and forestry, fishing and related services (-23).

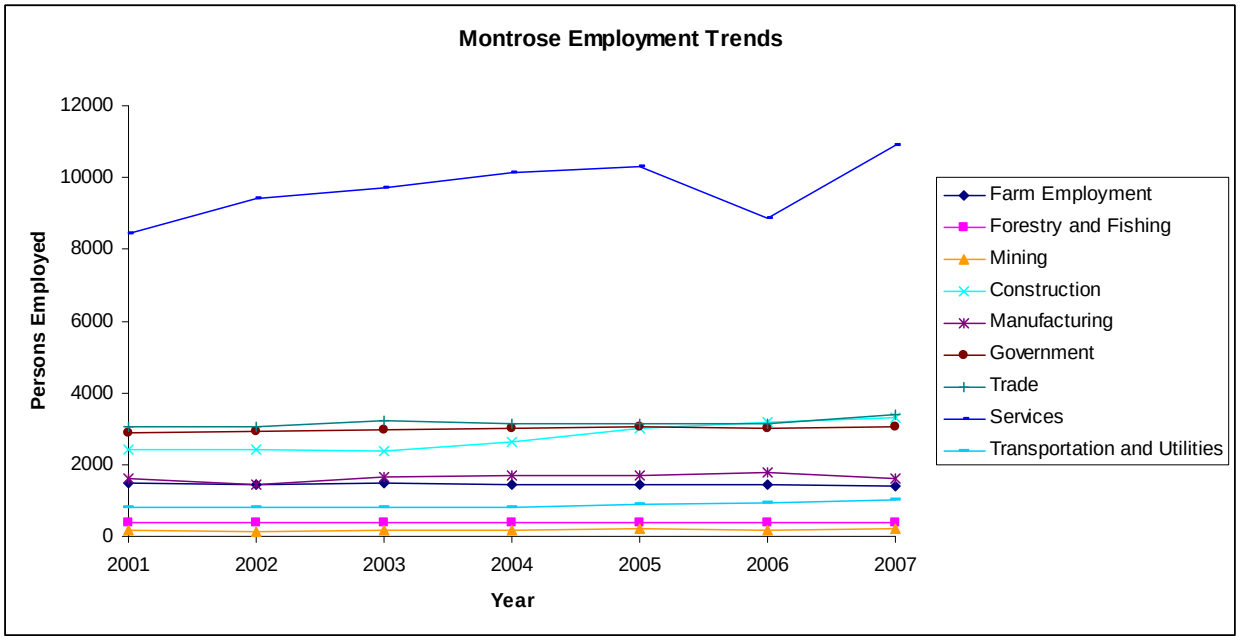
Table 6. Total Labor Force by Industry for Counties in the Study Area, 2007

Industry	Workforce by County								
	Colorado							Utah	
	Delta	Dolores	Mesa	Montezuma	Montrose	Ouray	San Miguel	Grand	San Juan
Farm employment	1,408	220	1,998	940	1,383	87	120	97	292
Forestry, fishing, and related activities	356	NA	299	174	368	NA	NA	NA	NA
Mining	552	NA	3,425	165	213	NA	NA	NA	380
Utilities	72	0	234	100	226	NA	15	NA	NA
Construction	1,566	130	9,054	1,588	3,298	619	1,469	568	439
Manufacturing	828	17	3,743	576	1,595	60	163	100	127
Wholesale trade	356	NA	2,768	234	613	33	49	86	NA
Retail trade	1,990	93	11,006	1,848	2,794	291	618	944	493
Transportation and warehousing	195	NA	3,239	279	797	NA	76	NA	128
Information	198	NA	1,147	142	280	41	159	74	13
Finance and insurance	444	NA	3,551	384	676	97	199	114	125
Real estate and rental and leasing	836	NA	4,717	633	1,384	302	1,180	428	134
Professional and technical services	679	40	4,286	634	1,203	244	544	298	NA
Management of companies and enterprises	43	0	134	NA	40	NA	39	NA	NA
Administrative and waste services	646	23	4,649	NA	992	NA	352	NA	179
Educational services	NA	NA	608	86	121	NA	121	103	135
Health care and social assistance	NA	23	9,921	1,392	2,062	NA	258	380	514
Arts, entertainment, and recreation	239	NA	1,868	214	428	108	608	379	NA
Accommodation and food services	846	58	6,574	1,139	1,431	555	1,131	1,456	NA
Other services, except public administration	991	63	4,885	805	1,572	171	519	290	321
Government and government enterprises	2,461	198	9,347	3,155	3,041	374	839	860	1,766
Total Employment	15,983	1,024	87,453	14,955	24,517	3,287	8,674	6,752	6,086

Source: BEA, 2009a

NA = Not Available

Figure 4. Montrose County Employment Trends by Industry



Source: BEA, 2009a

For towns closest to the Site, data were collected on the most common industries for employment by residents. For both Naturita and Nucla, data were available as summarized in Table 7 and showed construction, mining and utilities are important industries for men in terms of employment. Women in these communities tend to take more service-oriented jobs such as accommodation and food service, educational services and health care. The construction and service level jobs are likely located in resort areas such as Telluride.

For the small communities of Bedrock and Paradox, employment information was collected through interviews (White, 2009). The interviews indicated that most persons employed in Bedrock and Paradox work in ranching, truck driving, the local charter school, or government (e.g. Colorado and Montrose Departments of Transportation; US Bureau of Reclamation de-salination project), and small businesses (community store, organic gardening, bed and breakfast). A few individuals work in construction and services in the Telluride region (10-15 people) and a small number work out of their homes.

Table 7. Most Common Industries that Employ Men and Woman in Naturita and Nucla, Colorado

Naturita		Nucla	
Men	**Women**	**Men**	**Women**
Construction (37%)	Food and Beverage Stores (17%)	Construction (27%)	Accommodation and food services (30%)
Utilities (10%)	Accommodation and Food Service (17%)	Mining (9%)	Educational services (13%)
Mining (9%)	Education Services (10%)	Accommodation and food services (9%)	Health care (10%)
Education Services (6%)	Admin and support and waste management services (8%)	Utilities (7%)	Utilities (7%)
Public Admin (6%)	Public Admin (7%)	Truck transportation (7%)	Building material and garden equipment and supplies dealers (5%)
Accommodation and Food Service (5%)	Health Care (6%)	Educational services (7%)	Finance and insurance (5%)
Motor vehicle and parts sales (3%)	Retail Sales (5%)	Public administration (5%)	Public administration (5%)

Source: City-Data.com, 2007

Data from the 2000 U.S. Census indicate that a significant percentage of residents in the western Montrose County travel outside the county in order to reach their job location. For the Nucla Census County Division (CCD), which includes western portions of Montrose County, over 31 percent of workers indicated they traveled outside the county to reach their job location . This appears to be much higher than the percentage of workers that travel outside the county for employment in the eastern portions of the county (Montrose CCD and Olathe CCD).

Table 8. Commuting Patterns for Montrose County, 2000

Place of Employment	Area		
	Montrose CCD	**Nucla CCD**	**Olathe CCD**
Montrose County	87.9%	68.6%	83%
Another Colorado County	11.2%	29.1%	16.5%
Another State	0.9%	2.3%	0.5%
Source: US Census Bureau, 2000a			

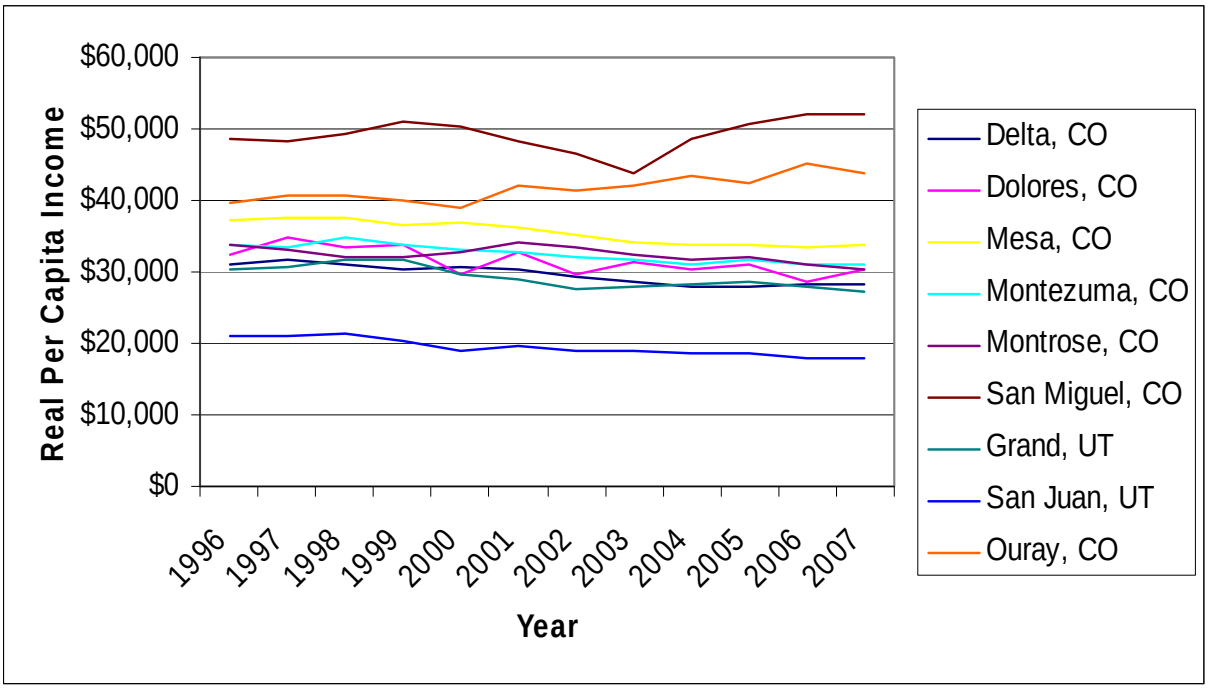
2.2.2 INCOME AND EARNINGS

Real Per Capita Income

Trends in real per capita income for all the counties in the Study Area, Colorado, Utah and the U.S. for 1996 through 2007 are summarized in Figure 5 (BEA, 2008b). In most counties in the Study Area, real per capita income has declined between 1996 and 2007. The exception was San Miguel and Ouray Counties in Colorado that experienced an increase in real per capita income over the later part of the period. In addition, most of the counties in the Study Area reported per capita income that was lower than the state or national levels. The exception was San Miguel and

Ouray Counties, which consistently reported per capita income levels higher than the U.S. average. In 2007, Montrose County had a per capita income level that was 70 percent of per capita income in the State of Colorado and 75 percent of the U.S. average. San Juan County in Utah reported the lowest levels of per capita income, which were 58 percent of per capita income in Utah and 44 percent of the U.S. average in 2007.

Figure 5. Per Capita Income Trends, 1996 - 2006 (2007$)



Source: BEA, 2009

Average Earnings per Industry

Data were obtained from the Colorado Department of Labor and Employment and the Utah Department of Workforce Services on the average monthly payroll wages for the State of Colorado and Utah for each of the counties in the study area. The data are summarized in Table 9 and Table 10. In 2007, average payroll wages in all the counties in the Study Area were lower than the state averages. For Colorado counties in the Study Area, average monthly payroll wages ranged from 48 percent to 90 percent of the average for the State of Colorado for most industries. For the Study Area counties in Utah, average monthly wages ranged from 78 to 88 percent of the state average. Industries that provide the highest paying jobs in the Study Area include mining, business services, financial activities, and construction.

Table 9. Average Monthly Earnings per Job, in Colorado Study Area Counties

Average Monthly Wages by Colorado County, 2008

Industry	Delta	Dolores	Mesa	Montezuma	Montrose	Ouray	San Miguel	Colorado
Agriculture, Forestry, Fishing & Hunting	$1,980	$1,516	$2,108	$2,040	$1,944	$3,332	NA	$2,184
Mining	$4,608	NA	$5,944	$5,640	$5,352	$7,212	$9,800	$7,448
Utilities	$4,048	NA	$4,332	$3,532	$4,356	NA	$5,972	$5,480
Construction	$2,372	$2,520	$3,664	$3,144	$2,960	$3,340	$3,544	$3,684
Manufacturing	$2,452	NA	$3,144	$2,268	$2,288	$1,524	$3,788	$4,488
Wholesale Trade	$2,828	NA	$3,840	$2,772	$3,136	$2,156	$4,940	$5,184
Retail Trade	$1,772	$1,380	$2,044	$1,908	$1,984	$1,588	$2,204	$2,052
Transportation and Warehousing	$3,320	$2,076	$3,552	$2,992	$2,356	$3,112	$2,476	$3,396
Information	$1,760	NA	$2,960	$2,108	$2,332	$2,232	$2,020	$5,776
Finance and Insurance	$2,640	NA	$3,720	$2,796	$3,288	$3,112	$4,264	$5,412
Real Estate and Rental and Leasing	$2,076	NA	$2,576	$2,248	$2,640	$2,436	$4,120	$3,196
Professional and Technical Services	$2,088	$1,888	$3,696	$2,752	$3,164	$3,952	$4,204	$5,908
Management of Companies and Enterprises	$5,016	NA	$6,000	NA	$11,024	NA	NA	$8,196
Administrative and Waste Services	$2,336	$3,276	$2,360	$2,380	$1,852	$2,648	$2,452	$2,520
Educational Services	NA	NA	$2,640	$2,136	NA	$2,292	$2,812	$2,972
Health Care and Social Assistance	$2,296	$2,272	$3,280	$2,164	$2,592	$2,400	$2,584	$3,360
Arts, Entertainment, and Recreation	$1,268	NA	$1,032	$2,056	$1,552	$2,424	NA	$2,272
Accommodation and Food Services	$904	$1,668	$1,176	$1,056	$1,100	$1,324	$1,836	$1,328
Other Services, Ex. Public Admin	$2,392	NA	$2,276	$2,112	$2,364	$1,756	$2,616	$2,496
Public Administration	$3,128	NA	$3,944	$2,856	$3,656	$2,376	$3,104	$4,120
Unclassified	NA	NA	$3,316	NA	NA	NA	NA	$4,116

Source: Colorado Department of Labor and Employment; Utah Department of Workforces Services, Workforce Development & Information Division.

Table 10. Average Monthly Earnings per Job, Utah Study Area Counties

Average Monthly Wages by Utah Counties, 2007

Industry	Grand County	San Juan County	Utah
Mining	$4,247	$4,287	$5,664
Agriculture, Forestry, Fishing and Hunting	NA	$1,942	$2,260
Construction	$2,672	$2,230	$3,186
Manufacturing	$2,247	$3,306	$3,324
Trade, Transportation and Utilities	$3,453	$1,554	$3,699
Information	$1,870	$1,087	$2,775
Financial Activities	$2,667	$3,127	$4,196
Professional and Business Services	$2,463	$2,270	$3,099
Education and Health Services	$1,868	$2,623	$2,333
Leisure and Hospitality	$2,171	$2,294	$2,049
Other Services	$3,238	$1,864	$2,003
Government	$4,120	$3,151	$4,992
Average – All Industries	$2,820	$2,478	$3,194

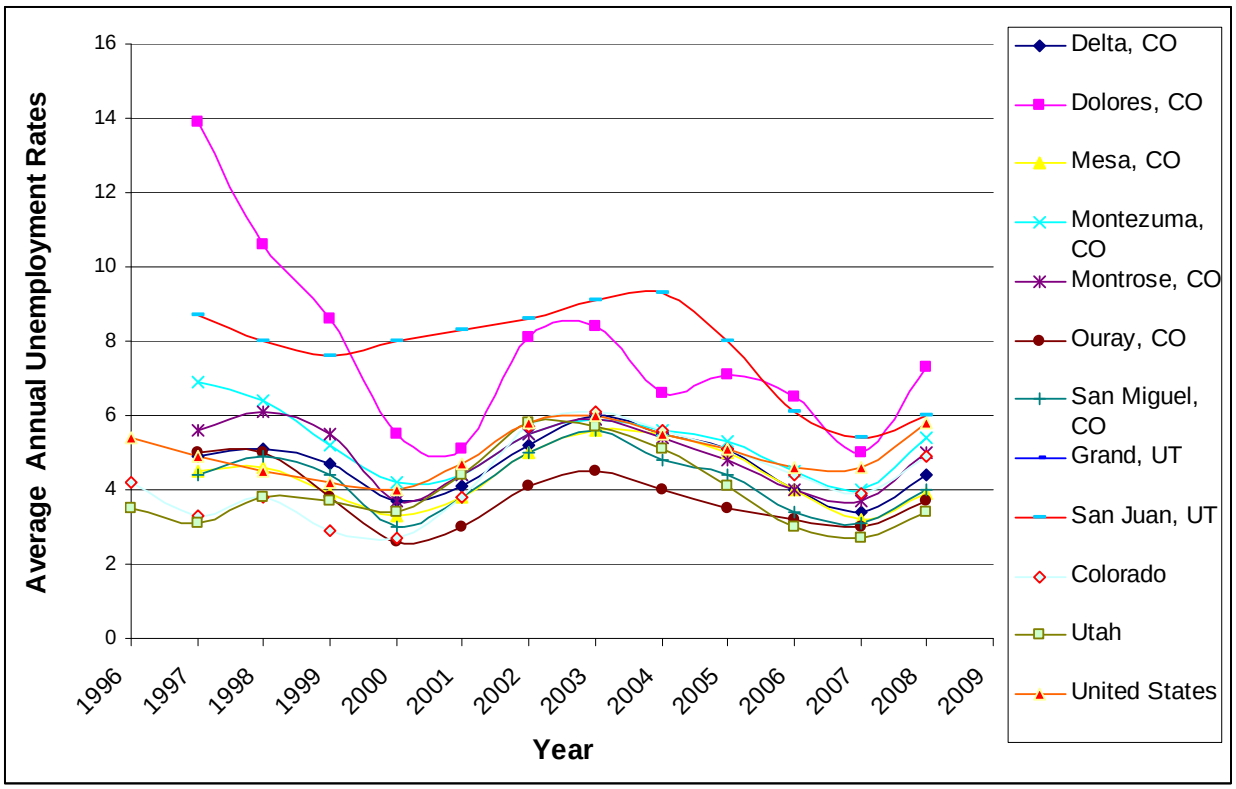
Source: Utah Department of Workforces Services, Workforce Development & Information Division

2.2.3 UNEMPLOYMENT

Trends in unemployment can provide information on the health of the local economy. Annual average unemployment rates for each of the counties in the Study Area, the States of Utah and Colorado and the U.S. between 1998 and 2008 are shown in Figure 6. These data were obtained from the U.S. Department of Labor (U.S. Department of Labor, 2009). Between 1997 and 2000, most of the counties reported unemployment rates that were higher than the state or U.S. averages. For counties such as Dolores, San Juan and Grand, unemployment rates were higher throughout the entire time period than in either the State or the U.S. For years 2000 through 2007, annual unemployment in all counties except Dolores, San Juan and Grand were similar to averages reported in Utah, Colorado and the U.S. In all areas, unemployment trended downward between 2003 and the first half of 2007. The trend changed in the second half of 2007 through 2008 with unemployment increasing in all areas. This increase in unemployment coincides with a downturn in the national economy.

Annual unemployment rates in Montrose County continued to fall through the first half of 2007, which was consistent with unemployment rates in the State of Colorado. However the most recent data available show unemployment increasing throughout Montrose County due to a national recession. Data were not available for towns nearest the Site, but it appears that unemployment is currently increasing in western parts of Montrose County.

Figure 6. Annual Average Unemployment Rates



Source: U.S. Department of Labor, 2009

2.2.4 ECONOMIC BASE

An area's economic base is comprised of industries that are primarily responsible for bringing outside income into the local economy. These industries typically export their goods and services outside the region and in turn support ancillary industries such as retail trade, housing construction and personal services. The location of important industries in certain areas has traditionally been tied to such factors as the natural resource base, cost factors (transportation and labor) and existing transportation infrastructure. Technology has also affected these location factors in recent years.

To assess the importance of certain industries to each of the counties in the study area, location quotients were calculated for 21 industries as summarized in Table 11 and in Table 12. The location quotients were calculated for employment using data from the U.S.BEA on total employment by industry during 2007. The location quotients compare each industry's share of total local employment to the industry's state or national share. This quotient yields a value generally between zero and two, where 1.0 indicates an equal share percentage between the local and state or national economies. Location quotients greater than two indicate a strong industry concentration while those less than 0.50 indicate a weak concentration as compared to state or national economies.

Table 11 (quotients above two have been highlighted for ease of reference) shows that in four of the seven Study Area counties in Colorado, agriculture is a strong basic industry. Montezuma and Montrose counties are heavily dependent on natural resource based industries such as agriculture, forestry and other related industries compared to both Colorado and the U.S. economies. Utilities are also important for these two counties. Mesa County showed high location quotients in agriculture and mining. This is not surprising given recent increases in oil and gas development throughout the area and the continued strength of the agricultural sector in the county. San Miguel County showed high location quotients in construction, real estate and arts and entertainment and demonstrates the influence of Telluride on the economy of the county.

Location quotients for the counties located in Utah are summarized in Table 12. Grand County showed high locations quotients for arts, entertainment and recreation as well as accommodations and food service. This is not surprising given the location of Moab, a major outdoor recreation destination within the county. San Juan has high location quotients in agriculture and government compared to the State of Utah and the U.S.

Table 11. Labor Location Quotients for the Counties in Colorado, 2007

Industry	Delta		Dolores		Mesa		Montezuma		Montrose		Ouray		San Miguel	
	CO	US	CO	US	CO	US	CO	US	CO	US	CO	US	CO	US
Farm employment	6.51	5.6	15.89	13.68	1.69	1.46	4.65	4.00	4.17	3.59	1.96	1.69	1.02	0.88
Forestry, fishing, and related activities	6.18	4.0	na	na	0.95	0.61	3.23	2.08	4.16	2.68	na	na	na	na
Mining	2.96	6.3	na	na	3.36	7.20	0.95	2.03	0.75	1.60	na	na	na	na
Utilities	1.71	1.4	0.00	0.00	1.02	0.84	2.54	2.10	3.50	2.89	na	na	0.66	0.54
Construction	1.24	1.5	1.60	1.97	1.31	1.61	1.34	1.65	1.70	2.09	2.38	2.93	2.14	2.63
Manufacturing	1.04	0.6	0.33	0.21	0.86	0.53	0.78	0.48	1.31	0.81	0.37	0.23	0.38	0.23
Wholesale trade	0.64	0.6	na	na	0.91	0.86	0.45	0.43	0.72	0.68	0.29	0.27	0.16	0.15
Retail trade	1.22	1.2	0.89	0.85	1.23	1.18	1.21	1.16	1.11	1.07	0.87	0.83	0.70	0.67
Transportation and warehousing	0.45	0.4	na	na	1.37	1.14	0.69	0.57	1.20	1.00	na	na	0.32	0.27
Information	0.45	0.6	na	na	0.48	0.67	0.34	0.49	0.41	0.58	0.45	0.64	0.67	0.94
Finance and insurance	0.54	0.6	na	na	0.78	0.87	0.49	0.55	0.53	0.59	0.57	0.63	0.44	0.49
Real estate and rental and leasing	0.93	1.2	na	na	0.96	1.20	0.75	0.94	1.00	1.25	1.63	2.04	2.41	3.02
Professional and technical services	0.51	0.6	0.47	0.60	0.59	0.75	0.51	0.65	0.59	0.75	0.89	1.13	0.75	0.96
Management of companies and enterprises	0.28	0.2	0.00	0.00	0.16	0.14	na	na	0.17	0.15	na	na	0.47	0.41
Administrative and waste services	0.65	0.7	0.36	0.36	0.85	0.86	na	na	0.65	0.65	na	na	0.65	0.66
Educational services	na	na	na	na	0.41	0.33	0.34	0.27	0.29	0.23	na	na	0.82	0.66
Health care and social assistance	na	na	0.28	0.22	1.39	1.13	1.14	0.93	1.03	0.84	na	na	0.37	0.30
Arts, entertainment, and recreation	0.57	0.7	na	na	0.82	1.03	0.55	0.69	0.67	0.85	1.26	1.59	2.69	3.39
Accommodation and food services	0.71	0.8	0.76	0.84	1.00	1.11	1.02	1.12	0.78	0.86	2.25	2.49	1.74	1.93
Other services, except public administration	1.17	1.1	1.16	1.10	1.05	1.00	1.01	0.96	1.21	1.14	0.98	0.93	1.13	1.07
Government and government enterprises	1.17	1.1	1.47	1.44	0.81	0.80	1.60	1.57	0.94	0.93	0.86	0.85	0.73	0.72

Source: Calculated using data from BEA, 2009a

na – Not available from BEA to avoid disclosure of confidential information

Table 12. Labor Location Quotients for the Counties in Utah, 2006

Industry	Grand		San Juan	
	UT	US	UT	US
Farm employment	1.27	0.9	4.25	3.06
Forestry, fishing, and related activities	na	Na	na	na
Mining	na	Na	5.53	3.98
Utilities	na	Na	na	na
Construction	7.45	5.4	6.39	4.59
Manufacturing	1.31	0.9	1.85	1.33
Wholesale trade	1.13	0.8	na	na
Retail trade	12.38	8.9	7.17	5.16
Transportation and warehousing	na	Na	1.86	1.34
Information	0.97	0.7	0.19	0.14
Finance and insurance	1.50	1.1	1.82	1.31
Real estate and rental and leasing	5.61	4.0	1.95	1.40
Professional and technical services	3.91	2.8	na	na
Management of companies and enterprises	na	Na	na	na
Administrative and waste services	na	Na	2.60	1.87
Educational services	1.35	1.0	1.96	1.41
Health care and social assistance	4.98	3.6	7.48	5.38
Arts, entertainment, and recreation	4.97	3.6	na	na
Accommodation and food services	19.10	13.7	na	na
Other services, except public administration	3.80	2.7	4.67	3.36
Government and government enterprises	11.28	8.1	25.70	18.48

Source: Calculated using data from BEA, 2009a
na – Not reported by BEA to avoid disclosure of confidential information

2.3 Demographic Characteristics

2.3.1 POPULATION

In general, the population within the Study Area follows a rural pattern. The 2007 population estimates as published by the Colorado Demography Office and the Utah Governor's Office of Planning and Budget are summarized in Table 13 for counties in the Study Area. The largest populations are within Mesa and Montrose Counties with current census populations of 140,416 and 40,263 respectively. The least populated counties in the Study Area include Dolores, San Miguel and Grand.

Table 14 lists the populations for cities and towns within the Study Area. The towns closest to the site (Naturita, Nucla, Bedrock and Paradox) have a very rural characteristic with populations less than 1,000.

Table 13. Estimated Population for Counties in the Study Area for 2007

County	2007 Population (Est.)	State Population Rank (CO or UT)
Mesa, CO	140,416	11
Montrose, CO	40,263	17
Delta, CO	30,959	18
Montezuma, CO	25,561	21
San Miguel, CO	7,684	44
Ouray, CO	4,510	53
Dolores, CO	1,937	59
Grand, UT	9,125	22
San Juan, UT	14,807	17

Source: Colorado Demography Office, 2009a, Utah Governor's Office Of Planning and Budget, 2009

Table 14. Population Centers in the Study Area

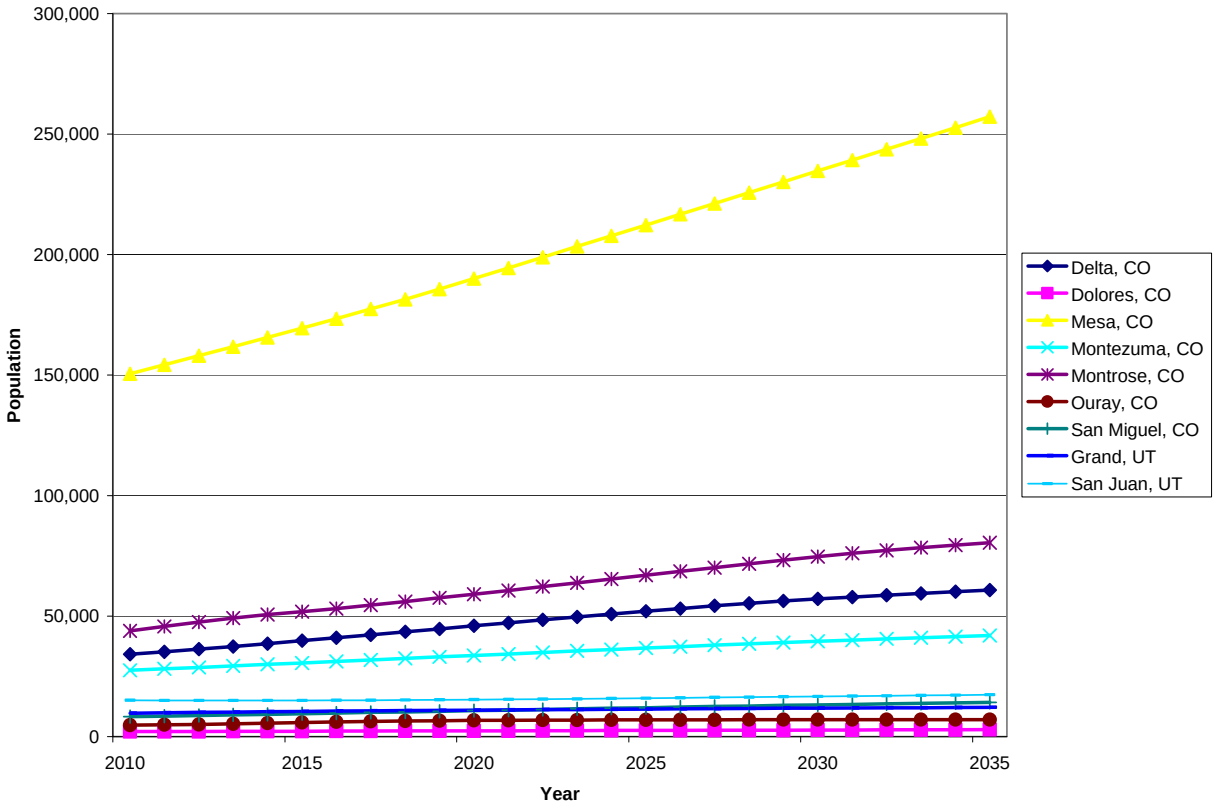
State	County	Population Center	2000 Population	2007 Population (Est.)	Percent Change
Colorado[1]	**Delta**	Delta	6,400	8,021	25.33%
	Dolores	Dove Creek	698	713	2.15%
	Mesa	Grand Junction	41,986	53,662	27.81%
	Montezuma	Pleasant View	Na	5,647	na
	Montrose	Montrose	12,344	17,369	40.71%
		Naturita	635	679	6.93%
		Nucla	734	757	3.13%
		Olathe	1,573	1,789	13.73%
		Bedrock/Paradox	Na	250-300[3]	na
	Ouray	Ouray	813	878	8.00%
	San Miguel	Norwood	438	510	16.44%
		Telluride	2,221	2,429	9.37%
Utah[2]	**Grand**	Moab	4,793	4,868	1.56%
	San Juan	Monticello	1,958	1,956	-0.10%

Sources: 1) Colorado Demography Office, 2009b; 2) U.S. Census Bureau, 2008; 3) White, 2009. na = not available.

Information on the population and distance of these population centers from the Site are provided in Appendix A.

Population forecasts for each of the counties in the study area were obtained from the Colorado Demography Office and the Utah Governor's Office of Budget and Planning and are shown in Figure 7. All the counties are expected to grow over the next 25 years. Mesa County is expected to increase the most in population, adding over 100,000 residents between 2010 and 2035. This is followed by Montrose (36,500) and Delta Counties (26,600) during this period.

Figure 7. Population Forecasts for Counties in the Study Area, 2010-2035



Source: Colorado Demography Office, 2009b, Utah Governor's Office Of Planning and Budget, 2008b

2.3.2 RACE AND POVERTY

Table 15 presents a summary for cities, towns and counties that fall within the Study Area in regards to race and poverty characteristics. Minorities are a small percentage of the population within this region. This is especially true in the towns of Nucla and Naturita, where minorities are less than 6% of the population.[4] The exception in the Study Area is San Juan County, Utah,

[4] Data were not available on race and poverty characteristics for Paradox and Bedrock.

where American Indians represent more than half of the population. The town of La Sal, Utah, has a population that contains 22.1 percent Native Indian, which is the largest minority population within the study area. The town of Sawpit, Colorado, has a minority population of zero, which is the lowest minority population within the study area. On average, the minority population for the counties within the Study Area is 22 percent which is less than the national average (37 percent).

Several of the counties within the Study Area have poverty rates that are higher than state or national averages. For Colorado counties, all are above the state average (9.3 percent) while all but one is above the national average (12.4 percent). The Utah counties report poverty levels that are above both the state (9.4 percent) and national average with San Juan County reporting relatively high percentage of their population living below the poverty level (31.4 percent).

Table 15. Race and Poverty Characteristics of Counties, Cities, and Towns within the Study Area

	Place	Total	White	Black	American Indian and Alaskan Native	Asian	Native Hawaiian or Pacific Islander	Some other race	Two or more races	Hispanic or Latino	Median Household Income	Poverty Levels
Colorado Counties	Delta	27,834	92.6%	0.5%	0.8%	0.3%	0.1%	4.3%	1.8%	11.4%	$32,785	11.76%
	Dolores	1,844	95.3%	0.1%	2.0%	0.4%	0.1%	0.6%	1.7%	3.9%	$32,196	13.07%
	Mesa	116,255	92.3%	0.5%	0.9%	3.6%	0.1%	5.5%	2.4%	10.0%	$35,864	10.02%
	Montezuma	23,830	81.7%	0.1%	11.2%	0.2%	0.1%	4.3%	2.4%	9.5%	$32,083	16.10%
	Montrose	33,432	90.0%	0.3%	1.0%	0.4%	0.1%	5.7%	2.5%	14.9%	$35,234	12.44%
	Ouray	3,742	96.3%	0.1%	0.9%	0.3%	0.1%	0.5%	1.7%	4.1%	$42,019	7.2%
	San Miguel	6,594	93.6%	0.3%	0.8%	0.7%	0.1%	3.4%	1.1%	6.7%	$48,514	10.39%
Utah Counties	Grand	8,485	92.6%	0.2%	3.9%	0.2%	0.0%	1.7%	1.3%	5.6%	$32,387	14.66%
	San Juan	14,413	40.8%	0.1%	55.7%	0.2%	0.0%	1.7%	1.5%	3.7%	$28,137	31.4%
Colorado Places	Delta	6,400	86.3%	0.0%	1.9%	0.0%	0.0%	9.9%	2.3%	22.5%	$27,415	14.25%
	Dove Creek	698	96.3%	0.0%	1.9%	0.0%	0.0%	0.3%	1.6%	3.9%	$27,500	12.3%
	Pleasant View	5,647	97.4%	0.4%	0.0%	0.0%	0.0%	1.7%	0.5%	4.5%	$62,123	2.57%
	Montrose	12,050	89.0%	0.4%	1.0%	0.6%	0.1%	6.5%	2.4%	17.4%	$33,750	14.58%
	Naturita	622	94.0%	0.0%	2.4%	0.2%	0.0%	1.7%	2.0%	5.0%	$28,977	9.98%
	Norwood	438	97.5%	0.0%	1.6%	0.0%	0.0%	0.2%	0.7%	5.5%	$39,375	5.54%
	Nucla	708	94.7%	0.0%	1.1%	0.1%	0.0%	0.5%	3.5%	3.7%	$28,466	17.03%
	Olathe	1,573	74.4%	0.1%	0.7%	0.3%	0.0%	19.7%	3.8%	35.2%	$26,286	20.21%
	Ouray	813	97.5%	0.4%	0.1%	0.6%	0.1%	0.5%	0.7%	6.4%	$36,094	8.1%
	Sawpit	25	100%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	$26,250	0.00%
Utah Places	Moab	4,779	90.4%	0.4%	5.5%	0.3%	0.1%	1.9%	1.6%	6.4%	$32,620	15.7%
	Monticello	1,945	86.0%	0.0%	0.0%	0.0%	0.0%	6.7%	1.8%	13.1%	$35,929	7.87%
	La Sal	339	66.7%	0.0%	22.1%	0.3%	0.0%	4.4%	6.5%	11.2%	$25,926	22.1%

Sources: Minority population data from U.S. Census Bureau, 2008; poverty data from U.S. Census Bureau 2000

2.3.3 HOUSING

Available data on housing stocks for towns within the Study Area were obtained from the U.S. Census Bureau and the Colorado Demography Office and are summarized in Table 16. The data show that the available housing units increased in more populated areas than in less populated areas between 2000 and 2007. The highest vacancy rates in the Study Area occurred in San Miguel County at 43 percent.

Some data were available regarding housing stocks and vacancy rates for communities near the Site. Nucla and Naturita have experienced very little growth in housing stocks between 2000 and 2007 while the vacancy rate percentages declined slightly. This trend appears to be changing with four townhome units under construction that will provide two and three bedroom units. Another 32 townhome units are planned for future development. In addition, the Multi Listing Service for Nucla and Naturita shows a total of fifty homes currently for sale. In addition, there are approximately 20 building lots available and various land owners willing to develop their property (Davis, 2009).

Information on housing for Bedrock and Paradox was collected through interviews (White, 2009). Currently within the jurisdictions of these two communities there are approximately eighty-five homes. There appear to be six habitable vacant houses and a few trailer spaces all of which may be available for rent or sale. There are also several 40-acre type properties for sale in areas surrounding these communities but most of these properties do not include access to water.

Table 16. Housing Units and Vacancy Rates of Surrounding Counties Within Colorado

County	Housing Units [a]			Percent Vacancy [b]	
	2000	2007	Percent Change	2000	2007
Delta	12,418	13,211	6%	10.6	12.0
Dolores	49,073	58,666	20%	34.4	33.0
Mesa	14,303	17,220	20%	5.4	7.0
Montezuma	5,233	6,159	18%	12.4	9.0
Montrose	4,040	4,645	15%	8.2	7.0
Ouray	2,146	2,749	28%	26.56	34.8
San Miguel	5,465	5,753	5%	42.0	43.0
Grand County, Utah	12,418	13,211	6%	Na	na
San Juan County, Utah	1,198	1,285	7%	Na	na

a. U.S. Census Bureau, 2008a and 2008b.
b. Colorado Demography Office, 2009c.
c. na = not available

Data on home values were available for Nucla and Naturita from the Montrose County Assessor as summarized in Table 17. The data show the average and median sales values of single-family home in Nucla and Naturita between 2002 and 2008. For most of this period, the number of sales declined. The exception is 2007 and 2008, which saw an increase in sales of single-family homes. Average and median home values have increased during the six-year period.

Table 17. Average Value of Single-Family Home Sales in Nucla and Naturita

Year	# Sales	Average Sale Value	Median Sale Value
2002	39	$73,000	$47,900
2003	28	$85,600	$87,000
2004	25	$96,600	$96,500
2005	16	$99,825	$88,450
2006	12	$95,687	$74,077
2007	22	$95,137	$92,750
2008	25	$79,975	$69,950
Percent Change (2002 – 2007)	-35%	10%	46%

Source: Montrose County Assessor, 2009a.

2.4 Community Services

The following section discusses the community services available in the Study Area and closest to the Site that would be likely to be affected by mill operations.

2.4.1 Emergency and Health Care Services

Montrose County is served by four fire protection districts: the Montrose Fire Protection District, the Olathe Fire Protection District, the Nucla/Naturita Fire Protection District, and the Paradox Volunteer Fire Department. The Nucla/Naturita Fire Protection District is an all-volunteer unit that provides emergency medical services as well as fire protection services including ambulance service. The Paradox Volunteer Fire Department has sufficient equipment for the present population, but sometimes has trouble attaining enough personnel.

The Basin Clinic, located in Naturita, services an area that has approximately a 160-km (100-mile) radius from the clinic, including five to six rural communities (Wade, 2009). The clinic provides 24-hour emergency care and family care. The clinic employs one full-time provider, one part-time provider and three EMTs. In addition, a medical doctor visits the clinic two days per week. The Basin Clinic serves a population which is up to 50 percent uninsured. In addition, a large number of individuals that come to the clinic are covered by Medicaid or Medicare. These programs cover approximately 40 percent of health care costs. The Basin clinic is heavily subsidized by local sales tax revenue, and Montrose County (Wade, 2009). The next available emergency health services are located in Norwood, 23 km (14 miles) away.

Montrose Memorial Hospital in Montrose, Colorado is a 75 bed Regional Medical Center, approximately 85 road miles from the Site. St. Mary's Hospital in Grand Junction, approximately 115 miles from the Site, has over 350 beds and is also available for medical treatment. Community Hospital, also in Grand Junction (115 miles from the Site) is a full-service, acute care facility with 78 beds available. Allen Memorial hospital in Moab, Utah is a 25-bed critical

care facility, approximately 80 miles from the site that provides a medical care alternative that is not as affected by inclement weather as facilities in Montrose and Grand Junction. .

2.4.2 WATER AND WASTEWATER SERVICES

The Mustang Water Authority currently provides water to the communities of Nucla and Naturita. The current system was built three years ago with a capacity of 1.2 million gallons per day. Average daily use for the system is 300,000 gallons, well below its current capacity. Paradox has a domestic water supply that serves most homes within the city limits (approximately sixty taps). The system includes a spring fed-filtration/chlorination plant and pipeline. This water supply is adequate for the current population. The town of Bedrock and outlying areas are on individual wells. Some of these wells are of good quality and volume; however others have good volume but poor quality. Individuals with poor quality wells haul potable water from Paradox's or Naturita's water supply.

Nucla and Naturita have separate wastewater treatment systems that serve the population. Both have lagoon systems that appear to be presently operating well below capacity. For instance, Naturita can treat up to 200,000 gallons per day but on average treats 60,000 gallons. The same is true for Nucla, which is currently operating below their capacity. However, Naturita is now looking at potentially upgrading their system to address new ammonia standards implemented by the State of Colorado. One option is to reduce the capacity of the facility to 130,000 gallons per day, which would allow the city to meet the standards in the near future but would require an upgrade in the years to come. The small unincorporated communities of Bedrock and Paradox utilize individual septic systems for wastewater disposal.

2.4.3 EDUCATION

West End School District Re-2 – Montrose County, CO

The West End School District of Montrose County currently oversees three campuses: an elementary school in Naturita, a junior/senior high school in Nucla, and a charter school in Paradox. Total enrollment in October 2008 was 335 between these three schools. Student enrollments in the West End RE-2 school district declined by 17 percent between 2004 and 2008 (School Matters, 2009).

Norwood R-2J – San Miguel County, CO

This district in San Miguel County contains only one school, which is pre-K through 12th grade. As of October 2008 enrollment was 300 students. Enrollment has been steady over the past five years. Note that this district, while located primarily in San Miguel County, also serves several students in Montrose County, as the district boundary crosses county lines.

2.5 Transportation

This section describes the major transportation routes in the study area and reports on traffic statistics where available.

2.5.1 MONTROSE COUNTY HIGHWAYS

The major transportation routes in the study are shown in Figure 8. US Highway 550 is the primary north-south highway in the county. It follows the Uncompahgre River northwest from

Red Mountain Pass to the town of Montrose, passing through Ridgway. In Montrose, US 550 comes into town as Townsend Avenue and ends at the intersection with Main Street (US 50/SH 90).

US Highway 50 runs south through downtown Delta and into Montrose County where it is an expressway southeast through Olathe toward the town of Montrose. In Olathe, US 50 follows a bypass to the east of town and old US 50 is marked as a business route through town. In Montrose, US 50 heads southeast into town on Townsend Avenue and into downtown. At the intersection with Main Street, US 50 turns northeast, US 550 goes southeast, and SH 90 goes southwest. As a locally maintained truck route, US 50 provides a bypass around the busiest part of downtown. US 50 then heads east from Montrose to Gunnison, generally following the Gunnison River.

State Highway (SH) 141 enters Montrose County from the south approximately 16 km (10 miles) southwest of Naturita. It extends northeast, reaching SH 145 east of Naturita near the confluence of the Naturita and Maverick Creeks. SH 141 then goes west through Naturita along the San Miguel River northwest to Uravan. To the west of Uravan, SH 141 runs on a very curvy route northwest down the Dolores River canyon exiting Montrose County 24-km (15 miles) south of Gateway. SH 145 enters Montrose County just north of Norwood and runs northwest to Redvale, ending at SH 141 east of Naturita.

SH 90 starts at the Utah border west of Paradox, and has a connection with UT 46. It follows the La Sal Creek east for only a few miles, then turns north and follows a few switchbacks over some ridges before descending into Paradox Valley. SH90 then passes south of the town of Paradox, continuing east through Bedrock past the Site, and terminating at SH 141 near Vancorum, five km (3 miles) west of Naturita. SH 90 is the primary access to the Site.

Numerous unimproved roads constructed on public lands exist around the Site. Many of these roads were constructed by the mining and ranching industries before BLM developed regulations for authorizing road construction and use. Many of these roads are currently maintained by county agencies or the BLM.

Figure 8. Location of Major Transportation Routes in the Study Area



2.5.2 HIGHWAY FATALITIES AND ACCIDENTS

Based upon the Colorado Department of Transportation (CDOT) highway statistics for calendar year 2000 (CDOT 2000), the fatality and injury rates from accidents along all state highways were 0.015 fatalities occurrences per million vehicle miles and 0.63 injury occurrences per million vehicle miles. For total rural state highways, the fatality rate is similar at 0.018 fatalities per million vehicle miles, and the accident rate is approximately half that of total highways (0.36 per million vehicle miles). Information from CDOT and Utah DOT indicate that a majority of accidents occur at intersections and on curved sections of the highways. Primary locations of accidents occurring within the Study Area include (1) intersections on U.S. Highway 50 in Montrose, (2) the intersection of U.S. Highways 191 and 491 in Monticello, (3) steep, curved sections of State Highways 46 and 90 east of La Sal, and (4) the 18-mile section of U.S. Highway 191 immediately south of Monticello.

Table 18 summarizes the number of traffic crashes involving fatal and non-fatal injuries in counties near the proposed Piñon Ridge Mill site for the years 2000 through 2008. Crash data for Colorado counties were obtained from the Colorado State Patrol (CSP), which reports crash data for CSP enforcement activity only. The CSP investigates most of the traffic crashes that occur in western Colorado counties (Allbee, 2009). Crash data for Utah counties reported by the Utah Department of Public Safety include crash reports completed by all law enforcement officers throughout the state.

Table 18. Traffic Crash Injuries and Fatalities for Counties Near the Mill Site, 2000-2008

Year	Injury Type	Mesa CO	Montrose CO	San Miguel CO	Grand UT	San Juan UT
2000	Injury	401	131	58	na	na
	Fatal	14	2	3	na	na
2001	Injury	418	116	40	na	na
	Fatal	21	6	3	na	na
2002	Injury	423	108	37	119	115
	Fatal	18	3	2	8	6
2003	Injury	391	104	41	195	158
	Fatal	6	2	1	7	4
2004	Injury	400	87	48	185	169
	Fatal	14	6	7	11	7
2005	Injury	370	95	32	135	126
	Fatal	11	5	1	8	8
2006	Injury	377	80	41	153	106
	Fatal	16	5	2	8	0
2007	Injury	206	41	30	134	141
	Fatal	20	4	1	5	16
2008	Injury	212	44	15	na	na
	Fatal	8	9	4	na	na

Source: CSP, 2009; Allbee, 2009; and UDPS, 2009.

Table 19 shows highway fatality rates in counties near the proposed mill site. According to CDOT, the 2008 highway fatality rate, expressed as fatalities per million vehicle miles traveled (MVMT), was 0.0114 across the State of Colorado, 0.0452 in Montrose County, 0.0173 in Mesa County, and 0.0521 in San Miguel County (CDOT, 2009c). In 2007, the highway fatality rate in Utah was 0.0111 per MVMT on all highways and 0.0234 on rural roads in the state (National Highway Traffic Safety Administration - NHTSA, 2009). Comparable highway fatality rates are not available for Utah counties.

Table 19. Fatality Rates per Million Vehicle Miles Traveled

Location	2007	2008
Colorado – all roads[1]	0.0114	0.0114
Colorado - rural roads[1]	0.0202	Na
Mesa County[1]	0.0359	0.0173
Montrose County[1]	0.0226	0.0452
San Miguel County[1]	0.023	0.0521
Utah – all roads[2]	0.0111	na
Utah – rural roads[2]	0.0234	na

[1] CDOT, 2009.
[2] NHTSA, 2009.

Access to the proposed Pinon Ridge Uranium Mill would be located near milepost 23 on SH 90, which would serve as the major east-west access road to the site. SH 141, which intersects SH 90 east of the project site, would serve as the major north-south access to the site. Turnkey Consulting completed an evaluation of existing peak-hour traffic volumes at two locations along these routes: 1) Site Access/SH 90; and 2) SH 90/SH 141. The following discussion summarizes the results of this analysis.[5]

Site Access/SH 90

The existing intersection of the Site Access/SH 90 is a four-leg layout. However, the access opposing the site access is a dirt road with little to no observed traffic volume. CDOT reported the Annual Average Daily Traffic (AADT) for this location of 400 vehicles. Hourly estimates for this location are as follows.

- Assuming a 10% peak-to-daily factor, the 2006 peak-hour values would be 40 vph (two-way),
- Assuming a 50% directional factor, each 2006 peak-hour through volume would be 20 vph (one-way),
- Assuming a 3.4% annual growth rate, each 2007 peak-hour through volume would be 21 vph.

SH 90/SH 141

The intersection of SH 90/ SH 141 is a three-leg configuration. Turnkey Consulting conducted a traffic count on October 19, 2007 at this location. Table 20**Error! Reference source not found.** shows the results of the traffic count with an adjustment to account for peak time of year (July).

[5] TurnKey Consulting, LLC, *Final Traffic Assessment*, March 10, 2008.

Table 20. Existing 2007 PM Peak Hour Traffic Volumes at SH 90 and SH 141 (VPH) Montrose County Colorado

	Eastbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R
Raw Field Count	1	Na	13	18	12	na	na	17	1
Adjusted for Peak Season	1	Na	15	21	14	na	na	20	1

na = not applicable
L = Left Hand Turn, T = Straight, R = Right Hand Turn

2.6 Fiscal Conditions

Because the mill would be located on private property, the operation will be subject to property taxation applicable in Montrose County. Several government entities in addition to Montrose County, have authority to levy taxes against properties located in Montrose County. In order to determine the tax districts that would be relevant to the proposed Pinon Ridge Mill, taxing district maps were obtained from the Montrose County Tax Assessor. Table 21 shows the 2008 assessed valuations, mill levies and revenues to each taxing jurisdiction that applies to the mill site.

Table 21. Montrose County Taxing Districts, 2008

District	Assessed Valuation	Gross Levy	Credit Levy	Abatement Levy	Net Levy	Revenue
Montrose County						
General	$578,622,313	21.474	5.524	0.035	15.985	$9,249,278
Road & Bridge	$578,622,313	0.104	0.000	0.000	0.104	$60,177
Social Service	$578,622,313	1.950	0.000	0.000	1.950	$1,128,314
Library Districts						
Montrose County Regional Library District	$568,007,483	3.000	0.000	0.000	3.3000	$1,704,022
Naturita Area Capital Facility District	$28,141,152	0.830	0.000	0.000	0.830	$23,357
School Districts						
West End School District No RE-2	$41,495,458	25.918	0.000	0.000	25918	$1,075,479
Water Conservancy Districts						
San Miguel Water Conservancy District	$12,774,846	0.052	0.000	0.000	0.052	$664
Water Conservation Districts						
Southwestern Water Conservation District	$56,521,179	0.407	0.191	0.000	0.216	$12,209

Source: Montrose County Assessor, 2009b.

3.0 IMPACT ANALYSIS

The socioeconomic impacts of this facility can be examined at different levels. These include the national impacts of providing uranium concentrates to the U.S. nuclear power industry, the regional impacts of providing additional processing capacity in western Colorado and eastern Utah, and the local impacts to nearby communities. .This analysis will focus on analyzing the positive and negative impacts to local communities associated with the new processing facility. The discussion of impacts is separated into two separate phases: construction and operation.

3.1 Construction Phase

The following subsection describes the potential construction phase impacts of the Piñon Ridge Mill on population, housing, employment, public services, utilities, schools and the economic base and fiscal resources of Montrose County and the nearby communities of Nucla, Naturita, Bedrock and Paradox, Norwood in northern San Miguel County, and La Sal in eastern San Juan County.

Project Work Force and Population

The construction of the Piñon Ridge Mill would occur on an 880-acre site in eastern Paradox Valley approximately twelve miles west of Naturita near Highway 90. At the writing of this document, construction is scheduled to start during the third quarter of 2010 and be completed by the fourth quarter of 2011 (Golder Associates, 2009). The processing facility would include the construction of the following major components:

- Mill facility
- Tailings Cells
- Evaporation Ponds
- Ore Stockpile Pads, and
- Surface Water Control Features

Materials and labor needed for the construction of the mill would be procured from a mixture of local and non-local sources. It is expected that all fencing materials, concrete materials and road base and asphalt materials and petroleum products would be obtained from local vendors while larger and more specialized materials would be obtained from regional or national vendors. Local expenditures for construction materials are estimated to be as follows.

- $300,000 – Fencing Materials
- $4,000,000 – Concrete Materials
- $2,000,000 – Road Base and Asphalt Materials

In addition, EFR would require the general contractor for the project to review, qualify and employ as many skilled and unskilled workers as possible from the immediate area. The primary trades required for construction of the proposed mill would include millwrights, welders, pipe

fitters and electricians as well as a number of unskilled laborers. The average quarterly work force that would be needed for mill construction is summarized in Table 22.

Table 22. Average Labor Estimate During Construction of Piñon Ridge Mill

	2010		2011				2012
	Quarter 3	Quarter 4	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 1
Average Number of Laborers	25	45	125	200	200	150	10

Energy Fuels expects that 20 percent of the mill's peak construction workforce would be drawn from western Montrose County and the nearby communities of Norwood in northern San Miguel County and La Sal in eastern San Juan County, Utah. It is likely that the labor requirements generated by additional economic activity occurring as a result of mill construction (e.g. additional retail and services) would be drawn from residents of these communities. Considering local population estimates in these communities and current unemployment rates it is assumed that up to 61 individuals may be available for the construction positions (**Error! Reference source not found.**). This could satisfy the labor requirement headcount during 2010, but would be unable to meet requirements for 2011 when construction workers are likely to come from outside the local area. Additionally, construction workers with specialized trades and skills would generally not be available locally, which would also result in the need for workers from outside the local area.

Table 23. Estimated Available Workforce for Construction
Pinon Ridge Uranium Mill

Employment measure	Nucla CCD	Town of Norwood	La Sal CDP
2008 population[1]	2,812	462	353
Percent of Population 20 to 39 years of age[2]	21.3%	22.4%	29.5%
July 2009 county unemployment rate[3]	8.2%	5.3%	9.6%
Unemployed workers 20 to 39 years of age	49	5	10
Employed workers 20 – 39 years of age	550	98	94
Percent of CCD workers working in other counties[4]	29.1%	7.3%	5.2%
Workers in other counties potentially interested in working at the mill[5]	80	4	2
Prospective applicants at the mill	129	9	12
Potential workers from the local area[6]	52	4	5

[1] 2008 Census population estimate for Norwood (U.S. Census Bureau, 2009b). County growth rate between 2000 and 2008 applied to 2000 Census population for Nucla CCD and La Sal CDP (U.S. Census Bureau, 2000a; CDOLA, 2009a; Utah Governor's Office of Planning & Budget, 2009).
[2] Source: CDOLA, 2009a; Utah Governor's Office of Planning and Budget, 2009.
[3] Source: U.S. Bureau of Labor Statistics, 2009.
[4] Source: U.S. Census Bureau, 2000b.
[5] Assumes that 50 percent of workers commuting outside the county for work would be interested in working at the Mill.
[6] Assumes that 40 percent of applicants possess the relevant job skills and pass drug tests.

It is not anticipated that construction workers would permanently relocate to the nearby communities. This is because construction workers typically commute relatively long distances to their work sites (e.g. up to two hours).[6] Some workers would choose to stay on a temporary basis in the communities closest to the Site.

Economy and Employment

The construction of the mill would lead to additional economic activity in local communities and beyond. Initial construction activities such as building the access roads on site and the well field would likely be done by local firms. However, the mill, tailings cell, evaporation ponds, and administration building would probably be contracted out to larger construction companies, which in turn may subcontract some of the work to smaller firms (both locally and from nearby cities). The larger companies could be from anywhere in the region and they would bring in the majority of their crews from out of the study area, complemented by a few local hires as needed.

Other than concrete, asphalt, aggregate, and routine building materials, most of the materials used in construction (tanks, pipes, equipment, instrumentation, and liners) would be sourced out of large industrial centers throughout the western US with some items possibly sourced offshore.

To gain an understanding of the magnitude of this impact, the average annual labor predictions as well as the estimated local expenditures for materials that are likely to be obtained for the project (fencing materials, concrete materials and road base and asphalt materials) were run through the regional input-output model IMPLAN.

Input-output (IO) modeling is a systematic method used to describe production and consumption sectors within a particular economy through a series of linkages among industries, households, and government. Louis Berger utilized the IMPLAN® economic impact model data and software system as the basic regional economic model (IO) for this analysis. IMPLAN provides certain advantages over other IO modeling systems in that study area data can be upgraded using local data and conditions to more accurately represent the industry economic profiles, providing more accurate multipliers. In addition, IMPLAN gives the user full access to the model for added flexibility, allowing numerous manipulations to be made at any time during the analysis. For this analysis, Louis Berger initially populated IMPLAN Software Version 2.0 with 2006 data sets and structural matrices from the Minnesota IMPLAN Group (MIG). The data set included production functions for 509 industrial sectors for Montrose County in Colorado and San Juan County in Utah.

To estimate the economic impacts of the construction phase of project, the average annual construction labor estimates (Table 22) and the local construction material expenditure estimates were run through the IMPLAN Model. Table 24 provides a summary of the IMPLAN inputs and the industries utilized from the model.

[6] EPRI, 1982.

Table 24. IMPLAN Model Inputs for Construction Phase of Pinon Ridge Mill

Local Material Purchases	Expenditure	IMPLAN Sector	Year of Purchase
Fencing Materials	$300,000	Wholesale Trade (390)	2010
Concrete Materials	$4,000,000	Ready Mix Concrete Manufacturing (192)	2011
Road Base and Asphalt Materials	$2,000,000	Wholesale Trade (390)	2010
Construction Labor	Annual Average	Manufacturing and Industrial Facility Construction (37)	2010 and 2011

The outputs of the IMPLAN model include an estimate of the economic activity generated by the construction of the Piñon Ridge mill in western Montrose County and adjacent areas and are summarized in Table 25. This table summarizes the direct, indirect and induced labor, labor income and output (sales) generated by the construction of the mill. Direct, indirect and induced impacts are defined as follows:

- Direct – represents impacts (e.g. change in employment) from an investment or expenditure made within a specified geographical location
- Indirect – the economic activity associated with the directly impacted industry selling and purchasing goods and services to/from other industries
- Induced – the effects of increased consumer spending resulting from direct and indirect income changes

Labor includes all part-time and full-time jobs that would be supported each year the mill is being constructed. Labor income includes employee compensation[7] and proprietors' income.[8] Output is defined as the direct, indirect and induced sales to businesses within the study area from spending on construction of the mill.

The economic impacts of construction shown in Table 25 consider the additional workforce that would be hired to construct the mill in additional to the materials that would be purchased locally. The labor figures have been annualized and thus show an average throughout each year. So in 2010, it is estimated that the construction of the mill would generate 53 additional jobs (direct, indirect and induced) over that year. The employment increases to 273 jobs in 2011 when construction of the mill would reach its peak.

[7] Employee Compensation is the total wages and salaries of workers who are paid by employers, as well as the value of benefits such as health care and life insurance, retirement payments, and non-cash compensation.

[8] Proprietors' Income consists of payments received by self-employed individuals as income.

Table 25. Economic Impacts from Construction Of Pinon Ridge Uranium Mill

Economic Impact	2010			2011		
	Direct	Indirect and Induced	Total	Direct	Indirect and Induced	Total
Employment	36	17	53	185	88	273
Labor Income	$1,636,654	$552,302	$2,188,956	$8,824,035	$3,271,525	$12,095,560
Output (Sales)	$3,809,783	$1,692,696	$5,502,479	$20,151,512	$9,833,140	$29,984,651

Source: IMPLAN, 2009.

Population

The construction phase of the Piñon Ridge Mill would temporarily increase populations in western Montrose County including Nucla, Naturita, Bedrock, Paradox, and Redvale. Communities outside the county but still within reasonable commuting distance, including Norwood in San Miguel County and La Sal in San Juan County, may also experience a temporary increase in population during construction. The construction work force is expected to consist primarily of crews that follow large contracting firms to job sites, and then relocate to another job site when the mill is completed.

Housing

The demands for temporary housing in communities located nearest the project site are likely to increase with the large construction force, especially during 201l. This includes hotels, available short-term rental units and other housing options (e.g. RV campgrounds). Given the small number of available units in the communities closest to the Site, this could cause a strain on temporary and available housing in these communities.

Public Services

No significant impacts are expected on local public services during construction. Current law enforcement, fire and medical services should be sufficient to handle emergencies at the site. A security fence would be constructed around the construction site with a gated entrance off the main access road near Highway 90. During working hours, a guard would be posted at the main entrance controlling entry to the site. The gate would be locked and the site secured at all other times (Golder Associates, 2009).

Fire and emergency medical services would be provided by the Nucla/Naturita Fire Protection District and the Paradox Volunteer Fire Department, both of which are all-volunteer units. Emergency medical care would be provided by the Basin Clinic, located in Naturita, which provides 24-hour emergency care and family care. The construction companies would be required to prepare health and safety plans for execution of construction activities, planning for emergency needs as necessary during the construction phase.

Utilities

Although the construction of the mill is expected to have a temporary impact on population, there would be some demands on utility services during construction as a result of onsite activities. It is expected that utilities needed on site would include water, electricity, and propane. Water wells installed on and adjacent to the mill location would supply non-potable groundwater for use in mill construction and operations. Prior to mill operations, temporary water storage could be provided in the West Stormwater Pond for dust suppression during construction. Immediately prior to commencement of milling, temporary water storage could also be provided in one of the tailings cells. An electrical distribution line would need to be completed and tested in advance of the scheduled date for energizing the mill (Golder Associates, 2009). Permanent propane tanks would also need to be installed for heating purposes. Sanitary wastes generated during construction would be collected in portable, self-contained toilets and hauled to an appropriate disposal site and would not impact local waste services.

Schools

A large percentage of the construction workforce is expected to commute or locate only temporarily in the area near the proposed mill location. A large number of workers and their families, with school age children are not expected to relocate to the area. In addition, the nearest school to the site is located over 13 miles away and school activities would not be affected by mill construction (e.g. noise, traffic, air emissions). Therefore, construction of the Piñon Ridge Mill is expected to have negligible impacts on local schools.

Fiscal Impacts

The mill's fiscal impacts would occur primarily through property tax and sales and use tax paid by Energy Fuels. Local expenditures for construction materials are estimated to be as follows:

- $300,000 – Fencing Materials
- $4,000,000 – Concrete Materials
- $2,000,000 – Road Base and Asphalt Materials

Sales and use taxes paid on direct and indirect sales related to the Mill would provide revenues to state, county, and local governments. Sales tax applies to goods that are purchased in the taxing area in which they are used, while use tax applies to goods that are purchased outside the taxing area in which they are used. The State of Colorado assesses a 2.9 percent sales tax and a 2.9 percent use tax. Montrose County assesses a 1.75 percent sales tax, 1 percent of which funds the Road and Bridge Department, and 0.75 percent of which funds public safety programs. The county has a 1 percent use tax that applies to purchases of vehicles and building materials. Use taxes on building projects in Montrose County are based on 1 percent of the estimated costs associated with physical structures only and are paid at the time the building permit is issued (White, 2009). The towns of Naturita and Nucla each impose a 4 percent sales tax and the City of Montrose imposes a 3 percent sale tax (Colorado Department of Revenue, 2009).

Over the Mill's 21 month construction period, the sales and use tax revenues associated with construction expenditures would include approximately $2.48 million to the State of Colorado, $286,188 to Montrose County, and $33,769 to each of the towns of Naturita and Nucla (Table

26). These estimates were based on several assumptions, all of which were intended to produce conservative revenue estimates. Estimated sales and use tax revenues to the State of Colorado considered all direct capital expenditures related to construction and a portion of indirect consumer spending of income derived from mill construction. Estimated sales tax from consumer spending was estimated first by adjusting total labor income to remove benefit estimates (28 percent). Total disposable income was determined to be 87 percent of labor income minus benefits and was taken from the IMPLAN model for the area. Disposable income was then adjusted to account for spending on taxable items. Nationally, 37.1 percent of household income is spent on housing and health care, which are not taxable (U.S. Bureau of Labor Statistics, 2007). Therefore, the sales tax revenues estimated in this analysis applied to 62.9 percent of the estimated total disposable income.

Estimated sales and use tax revenues to Montrose County are based on 1 percent of the estimated costs associated with constructing physical structures on the Site, and 0.75 percent of direct purchases made in Montrose County. As detailed at the beginning of this section, Energy Fuels expects that they would spend approximately $6.3 million in Montrose County on construction materials such as fencing, concrete, road base, and asphalt. A sales tax of 0.75 percent would be due on these construction materials at the point of purchase in Montrose County (Barnett, 2009). Estimated sales tax on indirect spending was adjusted to account for consumer spending on taxable items only.

Due to limited commercial and retail outlets in Naturita and Nucla, the analysis assumed that only 10 percent of indirect and induced spending would occur in each of these towns. It is likely that, over time, economic activity associated with the mill would support local business expansion and stimulate local spending. Although the majority of indirect and induced spending associated with construction of the Mill is likely to occur in other municipalities, not enough is known about where this spending would occur to estimate sales tax revenues to other local governments.

Table 26. Estimated Sales and Use Tax Revenues
Construction Phase

Taxing Entity	Estimated Sales and Use Tax
Colorado sales and use tax[1]	$2,483,217
Montrose County sales and use tax[2]	$286,118
Naturita sales tax[3]	$33,769
Nucla sales tax[3]	$33,769

Source: Edge Environmental, 2009
Assumptions:
[1] Includes sales and use taxes on direct mill expenditures and 62.9 percent of indirect expenditures.
[2] Includes 1 percent Montrose County use tax on building materials, 0.75 percent sales tax on in-county purchases, and 62.9 percent of indirect expenditures.
[3] Assumes that 10 percent of indirect spending would occur within town limits.

3.2 Operations

The Piñon Ridge Mill and ancillary facilities would commence operations following full regulatory approval and construction, which is anticipated in late 2011. The mill would process ore and produce both uranium oxide ("U_3O_8") and vanadium oxide ("V_2O_5"). The proposed mill is expected to process ore mined from Energy Fuels mine operations, and ore purchased from nearby mines owned and operated by others. The proposed operating life of the mill is 40 years to 2051 at the planned milling rate of 500 tons per day. However, the operating life could be extended by an additional 10 years or more if economic conditions warrant. The company would commence closure and reclamation activities following the productive life of the mill.

Project Work Force and Population

The Piñon Ridge Mill is expected to create up to 85 new jobs at full capacity. Energy Fuels desires to hire local employees and, using the same analysis as provided under the construction phase section, estimates 80 percent or about 65 people to be local hires. Twenty percent (about 20 people) of the work force would be imports to the area, typically working in the more specialized jobs such as the Radiation Safety Officer, Plant Manager, and specialized maintenance activities. Most of the 20 imports would move permanently to the area along with their families. Some of the 20 may get temporary rentals and commute on weekends until they could make more permanent plans. It is estimated that about 90 percent of the mill employees would choose to live in western Montrose County in or near the towns of Naturita, Nucla, Bedrock, Paradox, and Redvale. Another 5 percent may come from the LaSal area of Utah and the final 5 percent may come from northern San Miguel County (i.e., Norwood). Wages for the new positions would range between $40,000 and $75,000 per year, including benefits (Visus Consulting Group, 2009).

The employment situation with the miners and truck drivers is more complicated. Energy Fuels' Mine Operations Plan identified potential ore feed from Energy Fuels' mines and mines operated by others over a six county area (Montrose, Mesa, and San Miguel in Colorado and San Juan, Grand, and Emery in Utah). Montrose and San Juan counties would see the largest impacts, but some of the miners and truckers would live in the other counties too. Also, the mines feeding the mill would change over time as some are mined out and others come on line. Indirect employment impacts associated with mining are estimated by county to be: Montrose, CO- 50 percent; San Juan, UT- 30 percent; and the other counties in the area – 20 percent.

Economy and Employment

The operation of the Piñon Ridge mill would generate additional economic activity throughout Montrose County. This additional economic activity was estimated similar to construction impacts using the IMPLAN model. For the operation phase, adjustments were made to the industry described as "other basic inorganic chemical manufacturing (Sector 150)"[9] which best represents uranium processing in the model. Adjustments were made to account for specific

[9] The North American Industrial Classification System, utilized by IMPLAN, describes "all basic inorganic chemical manufacturing" to include: "Uranium compounds, not specified elsewhere by process, manufacturing"; "Uranium, enriched, manufacturing"; and "Uranium oxide manufacturing" (NAICS Association, 2009).

study area data including, number of employees, value of production, other property type income and indirect business taxes using data from primary and secondary sources. Once these adjustments were made, the annual employment estimate for operations was run through Sector 150 to get the annual estimated economic impacts of operating the Mill. The results are summarized in Table 27 and show the direct, indirect and induced labor, labor income and output generated by the operation of the mill on an annual basis.[10]

As discussed above, operation of the mill is expected to generate 85 new jobs. In addition, to these direct jobs, the additional economic activity due to mill operation, is expected to generate 230 additional jobs. Based on the results of the IMPLAN modeling, the mill is also expected to generate $18.7 million annually in labor income and $140 million in additional business sales every year that the mill is in operation.

Table 27. Economic Impacts from Operation Of Piñon Ridge Uranium Mill

Economic Impact	Annual Impact (2012$)		
	Direct	Indirect and Induced	Total
Employment	85	230	315
Labor Income	$7,923,652	$10,743,922	$18,667,574
Output (Sales)	$103,911,199	$35,940,826	$139,852,025

Source: IMPLAN, 2009

Population

It is anticipated that the operation of the Piñon Ridge Mill would result in a small increase in the local population of western Montrose County. Most of the operational work force would be drawn from existing populations within the county, and the nearby communities of La Sal in eastern San Juan County and Norwood in northern San Miguel County. Energy Fuels expects that 80 percent of the workforce for the mill would come from local communities closest to the site. Examination of population and demographic data, county unemployment rates and commuting patterns indicate that filling 80 percent of the work force with local hires is possible. Thus, approximately 20 individuals would be hired from outside the local area. These individuals would move to the area permanently with spouses and children, and the population in the area would likely increase by 40 to 70 individuals as a result of the direct hires associated with the mill.[11] However, as discussed above, the mill is expected to generate an additional 284 jobs through additional economic activity. These jobs would be generated at indirect businesses that support the mill (e.g. mining, trucking, vendors) and as a result of additional household spending (e.g. retail). It is uncertain where all these jobs would be located, but they would be spread

[10] Labor includes all part-time and full-time jobs that would be supported each year the mill is in operation. Labor income includes employee compensation and proprietors' income. Output is defined as the direct, indirect and induced sales made to businesses within the study area from the additional spending resulting from the operation of the mill

[11] Based on the assumption that the average household size would be 3.02, similar to other households in Montrose County (U.S. Census, American Fact Finder, 2009)

among the small communities of western Montrose County and adjacent counties in Colorado and Utah.

Housing

Much of the mill workforce is anticipated to be drawn from populations within Montrose County, with 90 percent coming from communities located closest to the site. As discussed above, population is expected to increase in these local areas which would increase the demand for permanent housing by as many as twenty units. The latest information on housing indicated that four townhouses are currently under construction in the Nucla/Naturita area with another 32 units planned, and approximately 50 existing units are for sale. There are also a few units for sale and rent in the Bedrock and Paradox area. It appears at the current time that there is available housing to meet the increasing demands associated with mill workers and their families. If employment related to economic activity associated with the mill's operations led to a substantial increase in local populations, there could be an increase in rental rates and housing prices. It is likely that the housing market would respond relatively quickly to any increase in the demand for housing through the provision of new residential construction.

Public Services

No significant impacts are expected on local public services with operation of the mill. Current law enforcement, fire and medical services should be sufficient to handle emergencies at the site. As with the construction phase, EFR would provide security at the site and control access. In addition, EFR would have trained emergency personnel and equipment that can be first responders if an accident were to occur. Most primary and emergency medical care would be provided by the Basin Clinic, located in Naturita, which provides 24-hour emergency care and family care. The Basin Clinic would benefit if the additional mill staff and their families were to utilize the clinic. This is based on the assumption that these individuals would have health insurance. The addition of insured workers and their families that would access the clinic would help to defray the costs of providing this facility and service in the community which now serves a significant uninsured or underinsured population (Wade, 2009).

Public services may also be impacted with an increase in population to the area, though these impacts are not expected to be significant with the mill. The water and wastewater plants in Nucla/Naturita have adequate capacity to meet increases in population if they were to occur.

Schools

The operation of the mill is likely to increase the population of school age children in communities closest to the mill location. It is not expected that an increase in enrollment would have a significant impact on the RE2-West End School District in western Montrose County as enrollment has been declining over the last several years, and capacity exists for receiving additional school age children. In addition, the nearest school to the site is located over 13 miles away in Naturita and school activities would not be affected by mill operation (e.g. noise, air emissions). Therefore, operation of the Pinon Ridge Mill is expected to have negligible impacts on local schools.

Fiscal Impacts

Once the mill is constructed and in operation, there would be a significant fiscal contribution to various taxing authorities within Montrose County. As shown in Table 27 economic activity associated with the mill is expected to generate $18.7 million in labor income every year that it is in operation. This spending would be associated with annual sales tax revenues of approximately $241,516 million to the State of Colorado, approximately $120,000 to Montrose County, and $58,841 to each of the towns of Naturita and Nucla (Table 28). The analysis assumed that commercial and retail opportunities expand in Naturita and Nucla, and that 20 percent of spending would occur in each of these two towns. Although some household spending associated with income derived from mill operations is likely to occur outside of Montrose County, not enough is known about where this spending would occur to estimate sales tax revenues to other local governments.

Table 28
Estimated Annual Sales Tax Revenues - Operational Phase

Taxing entity	Annual Sales Tax
Colorado sales tax[1]	$241,516
Montrose County sales tax[2]	$120,000
Naturita sales tax[3]	$58,841
Nucla sales tax[3]	$58,841

Source: Edge Environmental, 2009
Assumptions:
[1] Includes direct mill expenditures and 62.9 percent of indirect expenditures.
[2] Assumes that 75 percent of direct spending and 50 percent of indirect spending would occur in Montrose County.
[3] Assumes that 15 percent of indirect spending in Montrose County would occur within town limits.

Property taxes would also be impacted once the Piñon Ridge Mill is in operation. Local governmental taxing entities assess property taxes largely to fund local school operations and local government services.

Table 29 shows the taxing districts that assess property taxes on the proposed mill site and each district's 2008 tax rate (*i.e.* mill levy).

Table 29. Taxing Districts and 2008 Mill Levies Applicable to the Piñon Ridge Mill Site[1, 2]

Taxing District	2008 Mill Levy
Montrose County	18.039
RE-2 West End School District	25.918
Montrose Library District - Naturita	3.83
Southwest Water Conservation District	0.216
San Miguel Water Conservation District	0.052
Total mill levy (Tax Area 25018)	48.055

[1] Source: Montrose County, 2009d.
[2] Source: Montrose County, 2009e.

The annual property taxes that would be paid on the Piñon Ridge Mill are estimated to range between $1.9 million in Year 1 and $1.1 million in Year 10 over the first 10 years of the mill's life (Table 30). These property taxes were estimated by multiplying the property value of the Mill by the assessment rate and then by the 2008 mill levy. Energy Fuels provided information concerning expected real and personal property values at the Mill (Vigil, 2009). This value decreases due to the annual depreciation of personal property. A 29 percent assessment rate applies to all business and industrial property in Colorado.

Table 30
Estimated Property Taxes During First Ten Years of Mill Operation[1]

Tax-Paying Year	Montrose County General[2]	RE 2 West End School District	Montrose Library District – Naturita	Southwest Water Conservation District[2]	San Miguel Water Conservation District[2]	Total Property Taxes
Year 1	$701,375	$1,007,718	$148,914	$8,398	$2,022	$1,868,428
Year 2	$666,647	$957,822	$141,541	$7,982	$1,922	$1,775,913
Year 3	$631,918	$907,925	$134,167	$7,567	$1,822	$1,683,399
Year 4	$597,190	$858,028	$126,794	$7,151	$1,721	$1,590,885
Year 5	$562,462	$808,131	$119,421	$6,735	$1,621	$1,498,370
Year 6	$527,733	$758,235	$112,047	$6,319	$1,521	$1,405,856
Year 7	$493,005	$708,338	$104,674	$5,903	$1,421	$1,313,341
Year 8	$474,236	$681,371	$100,689	$5,679	$1,367	$1,263,341
Year 9	$439,508	$631,474	$93,315	$5,263	$1,267	$1,170,827
Year 10	$404,780	$581,577	$85,942	$4,847	$1,167	$1,078,313

[1] Edge Environmental, 2009.
[2] Tax district is subject to TABOR revenue caps.

It is important to note that these property tax estimates are based on 2008 mill levies, which may change over the life of the project. In particular, taxing districts that are subject to the Colorado Taxpayers' Bill of Rights, also known as the TABOR Amendment, revenue limits are required to adjust their mill levies downward if an increase in assessed valuation causes that tax entity to exceed its TABOR revenue cap. The calculation of TABOR revenue caps takes into account an inflationary cost adjustment, population growth, and new construction. Montrose County, the

Southwest Water Conservation District, and the San Miguel Water Conservation District are subject to TABOR revenue restrictions. Therefore, an increase in assessed valuation that caused the property tax revenues to any of these districts to exceed their TABOR limit would require that the tax district lower its mill levy, thereby lowering the property tax liability of all taxpayers in the district. The RE-2 West End School District and Montrose County Library District have "de-Bruced" and can keep additional tax revenues that would result from increasing assessed valuations (CDOLA, 2009c).

Also, because the proposed project is located in an enterprise zone, Energy Fuels would be eligible for tax credits and incentives that would apply to the company's income tax liability to the State of Colorado. The Colorado Enterprise Zone Program is designed to encourage job creation and capital investment in economically depressed areas by providing tax credits to businesses that promote economic development activities. Montrose County is part of Colorado Enterprise Zone 10 (Colorado Office of Economic Development and International Trade, 2009). Enterprise zone tax credits include:

- A 3 percent investment tax credit on equipment purchased for exclusive use in an enterprise zone.
- A $500 job tax credit on each new employee hired at a new facility located in an enterprise zone.
- A 2-year $200 job tax credit for each new business facility employee who is insured under a qualifying employer-sponsored health insurance program.

Enterprise Zone tax credits do not apply to sales and use tax or property taxes.

Cumulative Impacts

The development of the Piñon Ridge Mill would likely enable more mining in the region. As energy development continues to increase in and around Montrose County and other nearby counties, it is probable that these counties would experience stimulus to regional economies, but services and infrastructure would also be required to accommodate this population, as described in the sections above.

The Uravan Mining District has been mined for radium, then vanadium, and then uranium and vanadium since the early 1900s. This industry has been characterized by boom-bust cycles. During the boom stage, most sectors of the economy gain from development, production and milling activities. However, some sectors find it difficult to compete with rising average earnings, decreased motel and hotel availability for visitors, and other issues. Typically, the bust phase is characterized by decreased economic activity, out-migration of residential and non-residential employees, unemployment, and decreased inflation. These result in reduced labor earnings, housing and rental vacancies, and falling property values within the region.

The proposed Piñon Ridge Mill, viewed from a historical perspective, is a very small project. At the peak of the last cycle, there were four mills processing ore in the Piñon Ridge Mill Study Area. In Utah, the White Mesa Mill at Blanding, the Atlas Mill at Moab, and the Rio Algom Mill at Lisbon Valley, all operated along with the Uravan Mill in Uravan, Colorado. The combined capacity of these four mills was 5,250 tons per day (Kuestermeyer, 1984), more than ten times the capacity of Piñon Ridge. The mill feed for Piñon Ridge would come from approximately five to nine mines at any one time, some employing fewer than 10 people, with

larger mines employing up to 60 people, and spread widely over a six county area. This project is expected to create a broad, regional stimulus centered in western Montrose County, rather than a localized boom.

REFERENCES

Allbee, J. 2009. Statistical Analyst, Colorado State Patrol. 2000 - 2007 Fatal and Injury Crashes as Covered by Colorado State Patrol. Personal Communication and e-mail Correspondence with Edge Environmental, Inc. August 19.

Barnett, S. 2009. Project Manager, Montrose County. Personal Communication with Edge Environmental, Inc. September 21.

Carter, Jack. Mustang Water Authority, Personal Communication, May 2008.

City-Data.com. October 2007. Available on the internet at http://www.city-data.com/

Colorado Department of Labor and Employment. September, 2009. Available on at http://www.coworkforce.com.

Colorado Department of Labor and Employment. LMI Gateway, Quarterly Census of Employment and Wages, Sector (2 digit) data for Colorado, Aggregate of all types, available at http://lmigateway.coworkforce.com/lmigateway/, assessed, May 2009.

Colorado Department of Local Affairs (CDOLA). 2009a. County Population Estimates and Projections. State Demography Office. Available at: http://www.dola.state.co.us/demog.

Colorado Department of Local Affairs, State Demography Office. 2009b. Housing & Households For Colorado Counties & Municipalities. Available at http://www.dola.state.co.us/dlg/demog/housing_colo_estimates.html.

Colorado Department of Local Affairs. 2009c. 5.5% Property Tax Revenue Limit Calculations for Tax Entities in Montrose County as of September 16, 2009. Available at: http://www.dola.state.co.us/dlg/ta/budgeting/5.5_limit/dlg53_entity_montrose.html.

Colorado Department of Natural Resources, Division of Reclamation Mining and Safety, *Uranium Mining in Colorado, Updated 08-25-08,* Available at http://mining.state.co.us

Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division, State Board of Health Rules and Regulations Pertaining to Radiation Control, 6 CCR 1007-1, Part 3 – Licensing of Radioactive Material, effective July 31, 2005.

Colorado Department of Revenue, State of Colorado – Sales Tax Information System, https://www.taxview.state.co.us/QueryTaxrates.aspx?selected=1, accessed August 21, 2009.

Colorado Department of Transportation. 2009c. Highway Safety Statistics. Available at: http://www.dot.state.co.us/Safety/stats.cfm?.

Colorado Geological Survey. *Colorado Mineral and Mineral Fuel Activity, 2003*. November, 2004. Available at http://geosurvey.state.co.us/pubs/mr/MMF-IS-69.pdf

Colorado Geological Survey. *Colorado Mineral and Mineral Fuel Activity, 2004*. November, 2005. Available at http://geosurvey.state.co.us/Default.aspx?tabid=462.

Colorado Geological Survey. *Colorado Mineral and Energy Industry Activities, 2006.* November 15, 2007. Available at http://geosurvey@state.co.us/.

Colorado Geological Survey. *Colorado Mineral and Energy Industry Activities, 2007.* September, 2009. Available at http://geosurvey@state.co.us/.

Colorado Mining Association (CMA. 2008) June 23, 2008. Available on the Internet at : http://www.coloradomining.org/

Colorado Sperling's Best Places. November 05, 2007. Available on the Internet at http://www.bestplaces.net/zip-code/

Colorado State Patrol. 2009. 2008 Fatal and Injury Crashes as Covered by Colorado State Patrol. Available at: http://csp.state.co.us.

Colorado Office of Economic Development and International Trade. 2009. Information on the Colorado Enterprise Zone Program. Available at: http://www.AdvanceColorado.com/EnterpriseZone.

Davis, Nora. Vista Realty. Personal Communication, June, 2009.

Denison Mines Corporation. May 13, 2009. "Denison Mines Corporation Reports First Quarter Earnings". Toronto, Ontario, Canada.

Electric Power Research Institute (EPRI), Socioeconomic Impacts of Power Plants, February, 1982.

Finley, Bruce, *Cotter Lays Plans for Tainted Plant*, Denver Post, May 3, 2009.

Golder Associates, Inc, Construction Plan Piñon Ridge Project, Montrose County, Colorado, July, 2009.

Kuestermeyer, Alva 1984. Capital and Operating Cost Estimation for Milling of Uranium Ores in United States. Colorado School of Mines Quarterly Vol. 79 no. 4.

IMPLAN, 2009. Regional Economic Impact Model for Montrose County, Colorado and San Juan County, Utah, Utilizing 2006 Data Set, Run in September 2009.

Mesa County Valley School District 51 Department of Assessment, Curriculum, and Instruction. 2008. Achievement Profile. Accessed May 8, 2008: http://www2.mesa.k12.co.us/assessment/achieveprofilenew/Indexoriginal.cfm

Montrose County Workforce. November 01, 2007. Available on the Internet at http://www.westerncoloradobuisness.org/montrosecounty/workforce.html.

Montrose County School District. 2007. Winter 2007 State of the District. Report. Accessed May 8, 2008: http://www.mcsd.org/district/districtReports.cfm

Montrose County Tax Assessor. 2009a, Montrose County Land Use Records. Available at http://eagleweb.montrosecounty.net/eagleassessor/web/splash.jsp, Accessed September, 2009. .

Montrose County Assessor, 2009b, *Abstract of Assessment and Levies, Montrose County Colorado 2008.*

National Highway Traffic Safety Administration (NHTSA). 2009. Traffic Safety Facts for Colorado and Utah, 2000 – 2008. Available at: http://www.nrd-nhtsa.dot.gov.

NACIS Association, 2009. "The North American Industrial Classification System", Available at: http://www.naics.com/search.htm, accessed November, 2009.

Reams, Diana. President of Nucla/Naturita Chamber of Commerce. Personal Communication, May 2008.

San Juan School District. 2008. San Juan School District Enrollment Survey. Document.

School Matters, West End RE-2 Enrollment, Available at http://www.schoolmatters.com, accessed October, 2009.

Tradetech, Uranium Spot Price Indicator, Available at tradetech.com. Accessed September, 2009.

TurnKey Consulting, LLC., *Final Traffic Assessment*, March 10, 2008, Grand Junction, Colorado.

U.S. Bureau of Economic Analysis. April 2009a. Regional Economic Information System, Table CA25 (NAICS). Available at http://www.bea.gov/regional/reis

U.S. Bureau of Economic Analysis. April 2009b. Regional Economic Information System, Table CA05 (NAICS). Available at http://www.bea.gov/regional/reis

U. S. Bureau of Labor Statistics. 2007. Household Income Before Taxes: Shares of Average Annual Expenditures and Sources of Income (Table 46). Consumer Expenditure Survey, 2007. Available at: http://www.bls.gov/cex/2007/share/income.pdf.

U.S. Bureau of Land Management, Surface Management Series. Available at http://www.blm.gov/ut/st/en/prog/more/geographic_information/gis_data_and_maps.html http://www.blm.gov/co/st/en/BLM_Programs/geographical_sciences/gis/metadata.html; accessed September, 2009.

U.S. Census Bureau, 2000a. Census 2000, Summary Tape File 3. Data on commuting patterns accessed through Colorado Department of Labor and Employment, Labor Market Information. Available at: http://lmigateway.coworkforce.com/lmigateway.

U.S. Census Bureau. 2000b. Census 2000, Summary Tape File 3. Available at: http://www.census.gov.

U.S. Census Bureau, American Fact Finder Website, http://factfinder.census.gov, accessed February 2008.

U.S. Census Bureau, American Fact Finder Website, http://factfinder.census.gov, accessed September 2009.

U.S. Census Bureau, Population Division, August 2008a. Table 4: Annual Estimates of Housing Units for Counties in Colorado: April 1, 2000 to July 1, 2007 (HU-EST2007-04-49). Available at http://www.census.gov/popest/housing/HU-EST2007-4.html.

U.S. Census Bureau, Population Division, August 2008b. Table 4: Annual Estimates of Housing Units for Counties in Utah: April 1, 2000 to July 1, 2007 (HU-EST2007-04-49). Available at http://www.census.gov/popest/housing/HU-EST2007-4.html.

U.S. Census Bureau, Population Division. 2007. Subcounty Population Estimates: April 1, 2000 to July 1, 2007. Available at http://www.census.gov/popest/datasets.html.

U.S. Census Bureau, Population Estimates Program, Population Division. 2000, Population Estimates for Places: July 1, 1999, and Population Change: April 1, 1990 to July 1, 1999. Available at http://www.census.gov/popest/archives/1990s/#city

U.S. Department of Agriculture. 2004. 2002 Census of Agriculture. Available on the Internet at http://www.agcensus.usda.gov/Publications/2002/index.asp, accessed July 2008.

U. S. Department of Energy. 2007. *Uranium Leasing Program Environmental Assessment*. U. S. Department of Energy Office of Legacy Management. Doc. No. Y0011700.

U.S. Department of Energy. 2008. *Uranium Purchased by Owners and Operators of U.S. Civilian Nuclear Power Reactors.* May 18, 2008. Available at http://www.eia.doe.gov/cneaf/nuclear/umar/summarytable1.html.

U.S Department of Energy, Energy Information Administration, 2008. Form EIA-851A and Form EIA-851Q, *Domestic Uranium Production Report*.

U.S. Environmental Projection Agency, Office of Environmental Justice; 2004. "Toolkit for Assessing Potential Allegations of Environmental Justice", EPA 300-R-04-002.

U.S. Department of Labor, Bureau of Labor Statistics. Local Area Unemployment Statistics. Available at http://www.bls.gov/lau/#tables. Accessed, September 2009.

U.S. Nuclear Regulatory Commission. 2003. Environmental Review Guidance for Licensing Actions Associated with NMSS Programs, NUREG-1748.

Utah Department of Workforce Services. 2007. County Data, 2007. Accessed online, September 25, 2009. Available: http://jobs.utah.gov/opencms/wi/pubs/em/annualreport/07annual/

Utah Governor's Office of Planning and Budget. 2009. The State of Utah and Counties, 1940-2008. April 30, 2009. Available at http://www.governor.utah.gov/dea/popestimates.html.

Utah Governor's Office of Planning and Budget, Utah Population Estimates Committee. July 1, 2008a. Total Population by County, 1940-2007. Available at http://www.governor.utah.gov/dea/popestimates.html

Utah Governor's Office of Planning and Budget. 2008b. Population Area and Components of Change. Available at http://www.governor.utah.gov/dea/projections.html

Utah Department of Public Safety (UDPS). 2009. Highway Safety Office. Utah Crash Summaries. Available at: http://publicsafety.utah.gov/highwaysafety/1997-2005.html.

Vigil, J. 2009. Chief Financial Officer, Energy Fuels Resources. Personal Communication and E-mail Correspondence with Edge Environmental, Inc. September 22.

Visus Consulting Group, Inc., Special Use Permit Application Pinon Ridge Mill Facility, Montrose County, Colorado, April 2009.

Wade, Lance, Basin Clinic Board Member, Naturita Colorado, Personal Communication, August 2009.

West End School District. Personal Communication May 8, 2008.

White, Dick. Energy Fuels Resources. Personal Communication April, 2009.

APPENDIX A

Population and Distance of Area Population Centers

Table A-1. Population of Areas Within a 50-mile (80 kilometer) Radius

County	City/Town	Population	Direction from Site	Distance From Site						
				10Km/6.21mi	20Km/12.43mi	30Km/18.64mi	40Km/24.85mi	50Km/31.07mi	60Km/37.28mi	70Km/43.50mi
Colorado										
Delta		27,834	NE							
	Delta	6,400	NE							X
Dolores		1,844	S							
	Cahone (81320 Zip)*	318	S						X	
	Dove Creek	698	SSW					X		
	Pleasant View	3,932	S							X
Mesa		134,189	N							
	Gateway	200	NW						X	
Montezuma		23,830	E							
Montrose		33,432	---							
	Bedrock/Paradox*	200-300	WNW	X						
	Montrose	12,344	ENE							X
	Naturita	635	ESE	X						
	Nucla	734	E	X						
	Olathe	1,573	ENE							X
	Redvale (81431 Zip)*	381	ESE		X					
San Miguel		6,594	S							
	Dunton	0 (ghost town)	SE							X
	Egnar (81325 Zip)*	129	SW				X			
	Norwood	438	ESE				X			
	Placerville (81430 Zip)*	93	ESE						X	
	Sawpit	25	ESE							X
Utah										
Grand		8,485	WNW							
	Moab	4,779	WNW							X
San Juan		14,413	W							
	La Sal	339	W					X		
	Monticello	1,958	WSW						X	

U.S Census Bureau 2007

* City-Data.com 2007

SOIL SURVEY

Rev. 0 **Date: 01/29/09**

OF THE
ENVIRONMENTAL REPORT
IN SUPPORT OF THE APPLICATION FOR
LICENSE FOR SOURCE MATERIAL MILLING

PIÑON RIDGE URANIUM MILL
Montrose County, Colorado

Submitted to:

Radiation Management Unit
Colorado Department of Public Health and Environment

Prepared for:



Energy Fuels Resources
44 Union Blvd., Suite 600
Lakewood, Colorado 80228

Prepared by:

Kleinfelder
8300 Jefferson NE, Suite B
Albuquerque, NM 87113

Project No. 83088
DCN 83088.5.E6-ALB08RP001

SOIL SURVEY

REV. 0

OF THE

ENVIRONMENTAL REPORT

IN SUPPORT OF THE APPLICATION FOR A
LICENSE FOR SOURCE MATERIAL MILLING

PIÑON RIDGE URANIUM MILL

Montrose County, Colorado

Submitted to:

Radiation Management Unit
Colorado Department of Public Health and Environment

Prepared for: Energy Fuels Resources
Lakewood, Colorado

Prepared by: Kleinfelder
Albuquerque, New Mexico

Author: Louis Bridges by AK Kuhn
Louis Bridges, Principal Professional

Approved: Alan K. Kuhn
Alan K. Kuhn, Project Manager

Project No. 83088

DCN 83088.5.E6-ALB08RP001
Date: 01/29/09

Copyright 2009 Kleinfelder

TABLE OF CONTENTS

SECTION ..... PAGE
1.0 INTRODUCTION 1
1.1 Site Location 1
1.2 Site Description 1
2.0 PURPOSE AND SCOPE 2
3.0 METHODS 2
3.1 USDA Web Soils Data 2
3.2 Field Methodology 2
4.0 RESULTS 3
4.1 USDA Web Soils Data 3
4.1.1 Barx Series 3
4.1.2 Vananda Series 3
4.1.3 Begay Series 3
4.1.4 Mikim Series 3
4.1.5 Paradox Series 4
4.1.6 Gypsiorthids Series 4
4.2 Field Observations 4
5.0 CONCLUSIONS 5
6.0 LIMITATIONS 5
7.0 REFERENCES 5

FIGURES

Figure 1 Site Location
Figure 2 NRCS Soils Data Map
Figure 3 Sample Point Location Map

ATTACHMENTS

Attachment A Photographs
Attachment B USACE Wetland Delineation Forms

1.0 INTRODUCTION

Energy Fuels Resources Corporation (EFR) proposes to license, construct, and operate a conventional acid leach uranium and vanadium mill at the Piñon Ridge Mill site (the Site) in western Montrose County, Colorado. Site facilities will include an administration building, a 17-acre mill, tailing ponds totaling 90 acres, an 80-acre evaporation pond, a 5-acre ore storage pad, and an access road. The mill will process ore produced from mines within a reasonable truck-hauling distance. The mill will process up to 500 tons of ore per day but is designed to accommodate subsequent expanded production capacity of up to 1,000 tons per day. The expected operating life of the mill is 20 to 40 years.

The Piñon Ridge Mill is subject to regulation by the State of Colorado, and the mill license (Radioactive Source Material License) will be issued and administered by the Colorado Department of Public Health and Environment (CDPHE). The activities described in this document were performed as part of the baseline characterization required for the Environmental Report in accordance with Section 3.8.8, Part 3, 6 CCR 1007-1. This report presents the results of the soil survey conducted by Kleinfelder for EFR in support of the mill license application.

1.1 Site Location

The proposed Piñon Ridge Mill (Site) is located in the Paradox Valley at 16910 Highway 90, approximately 14 miles west of Naturita in Montrose County, Colorado. The Site's legal description is the Southwest ¼ of the Southeast ¼ of Section 5, all of Section 8, the North ¼ of Section 17, and the Southeast ¼ of the Northwest ¼ of Section 17, Township 46 North, Range 17 West, of the New Mexico Principal Base and Meridian. The Site is located on both the Davis Mesa Quadrangle (1994) and Bull Canyon Quadrangle (1994) 1:24,000 United States Geological Survey (USGS) topographic/geologic maps. The Site location with respect to major topographic features is shown in Figure 1.

1.2 Site Description

The Paradox Valley is formed by a collapsed salt anticline creating bluffs reaching 1,500 feet above the valley floor on both the north and south sides (Cater 1954). The Paradox Valley obtains its name from the anomaly that the Dolores River crosses perpendicular to the valley floor, although there is no river coursing through the valley (Cater, 1955b). The valley floor is approximately 5,300 feet above mean sea level (AMSL), while the bluffs reach to approximately 6,800 feet AMSL in the immediate area (Cater, 1955a). The Paradox Valley graben is on the crest of a salt-cored anticline near the Utah-Colorado border (Cater, 1954, 1955a, 1955b). Kelley (1955) refers to this region as the Paradox fold and fault belt. Formation of the salt-cored anticline is believed to be controlled by major subsurface faults that displace bedrock beneath the evaporitic Paradox Formation (Cater, 1970). The graben is a collapse feature that formed in response to salt migration and dissolution from beneath the area (Cater, 1954, 1955a, 1955b). Faults in this area are generally high-angle normal and downthrown towards the interior of the graben, although some faults are antithetic. More detailed description of the geology of the Site is contained in The Kleinfelder Geologic Report (Revised 01/22/09).

Copyright 2009 Kleinfelder

2.0 PURPOSE AND SCOPE

As part of the mill licensing process, a soil survey is required by Section 5.3.3 of NUREG 1748, *Environmental Guidance for Licensing Actions with NMSS Programs* (NRC, 2003), to characterize geological environmental impacts, including soil compaction, soil erosion, subsidence, landslides, and disruption of natural drainage patterns prior to construction and permitting of the mill facility. The purpose of this survey was to characterize the soils at the Site and, in particular, determine whether or not hydric soils occur within the proposed area of construction. Hydric soils are those soils formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the soil horizon. Hydric soils are indicators of potential jurisdictional U.S. Army Corps of Engineers (USACE) water features.

Kleinfelder biologists collected field data to compare with information from the Natural Resources Conservation Service (NRCS) Web Soil Survey (USDA, 2008) and soils data in concurrence with the USACE jurisdictional "waters of the U.S." (WoUS) (USACE, 2006). The purpose of the data collection was to properly and efficiently characterize the baseline conditions (pre-development conditions) of the Site for inclusion in the Environmental Report in accordance with CDPHE and Federal guidance (NRC, 2003).

Field investigations were conducted in accordance with applicable Kleinfelder standard operating procedures (SOP), Quality Procedures (QP), and the work plan.

3.0 METHODS

3.1 USDA Web Soils Data

A database search was completed using the NRCS Web Soil Survey (USDA, 2008; accessed August 20, 2008). The Web Soil Survey provides soil data and information produced by the National Cooperative Soil Survey and provides access to the largest natural resource information system in the world. NRCS has soil maps and data available online for more than 95 percent of the nation's counties and anticipates having 100 percent in the near future. The site is updated and maintained online as the single authoritative source of soil survey information.

A review of the literature (USDA, 2008) indicated that the soils at the Site are classified as Barx, Vananda, Begay, Mikim, Gypsiorthids, and Paradox (Figure 2). The USDA (2008) and USACE (2006) literature did not identify hydric soils as being present at the Site.

3.2 Field Methodology

Soils at sample plots within the potential wetlands were evaluated by digging 12-inch soil pits (Figure 3). Soils sample locations were selected based on drainage features located on the Site and areas of potential ponding or inundation. Ponded or inundated areas were identified as areas where earthen berms were previously constructed to retain seasonal surface water flows related to storm events or snowmelt. Soils along the drainage features (Figure 1) were also evaluated to determine whether hydric soils were present.

Methods used to determine if hydric soils were located on the Site were in accordance with the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE, 2006). All drainage features, ponded and inundated areas were observed and evaluated for soil types and characterized based on USACE WoUS Final Wetland Delineation guidance (Meyer, 2008). The sample points (SP) were dug to the depth needed to document a

Copyright 2009 Kleinfelder

hydric indicator, or to confirm the absence of hydric indicators (USACE, 2006). Soils were compared to the Munsell® Soil Color Charts (MacBeth, 2000) to evaluate the color, hue, and chroma of representative soils. Soils were also observed for oxygen reduction reactions (redox) features associated with anaerobic conditions. Redox features were also characterized by their size, distinction, and frequency of occurrence.

4.0 RESULTS

4.1 USDA Web Soils Data

The Site soils are listed by the NRCS Web Soil Survey (USDA, 2008) as Barx, Vananda, Begay, Mikim, and Paradox (Figure 2). The majority of the soils (71.6 percent) are classified as fine sandy loam (USDA, 2008). The soils are derived from alluvium from the surrounding sandstone and shale bluffs to the north and south of the valley. Soils within the Site were observed to be well drained. The water capacity is variable between the different soil types (USDA, 2008). The water table is more than 80 inches below the ground surface (bgs) (USDA, 2008). The soil profiles at the Site were observed to have little or no soil horizon differentiation in the upper 24 inches. Rock outcropping accounts for 4.3 percent of the Site, located in the southwest corner. According to NRCS, none of the soils within the study area are classified as hydric (USDA, 2008).

4.1.1 Barx Series

The Barx series consists of very deep, well-drained soils that form in alluvium and reworked eolian material derived from sandstone. Barx soils are on alluvial fans, terraces, hills, and mesas. Slopes range from 0 to 15 percent. The Barx series typically occurs between 4,400 to 7,800 feet AMSL. Mean annual precipitation is between 8 and 14 inches and the mean annual temperature is between 45° and 55° Fahrenheit (F). These soils form under a frost-free period of 100 to 175 days a year (USDA, 2008).

4.1.2 Vananda Series

Typically, Vananda series soils have fragile, massive, vesicular, clear silt-coated surface crust and have indistinct gradation below this crust in grayish-brown grading to olive gray slightly calcareous clay (USDA, 2008). The continuous surface crust is 1/8 to 1/2 inch thick under sparse grass cover. The climate is cool semiarid with mean annual temperature of 45 to 47° F, mean summer temperature more than 60° F, and mean winter temperature between 18 and 28° F. Mean annual precipitation is from 10 to 14 inches (USDA, 2008).

4.1.3 Begay Series

Usually occurring at elevations between 4,700 to 7,400 feet AMSL, the Begay series consists of very deep, well-drained, moderately to rapidly permeable soils that form in eolian deposits and alluvium derived mainly from sandstone. Begay soils are on structural benches, broad mesas, and fan remnants, and have slopes of 0 to 30 percent (USDA, 2008). The average annual precipitation is between 8 and 14 inches, and the mean annual air temperature is between 44° and 55° F (USDA, 2008).

4.1.4 Mikim Series

The Mikim series consists of very deep, well-drained soils that form in alluvium derived from sandstone and shale. Mikim soils are on alluvial fans and in drainage ways and valleys. Slopes

Copyright 2009 Kleinfelder

range from 0 to 15 percent. Mean annual precipitation is between 10 and 13 inches and the mean annual temperature is between 50° and 52° F (USDA, 2008).

This series of soils is found between the elevations of 5,400 and 6,200 feet AMSL. These soils are used primarily for range; however, they are used as dryland or irrigated cropland in some locations (USDA, 2008).

4.1.5 Paradox Series

The Paradox series consists of deep, well-drained soils that form in alluvium derived from red sandstone and shale. Paradox soils are on nearly level to gently sloping broad alluvial fans and old alluvial valley floors. Slopes are from 1 to 25 percent. The mean annual precipitation is about 11 inches and the mean annual temperature is between 44° and 49° F (USDA, 2008).

Paradox soils are in a climatic setting that receives the annual precipitation uniformly distributed throughout the year with over 50 percent coming as snow. Elevations are 4,900 to 5,200 feet AMSL. These soils are utilized as rangeland and irrigated cropland (USDA, 2008).

4.1.6 Gypsiorthids Series

The Gypsiorthids soils consist of deep, well drained soils that form on valley floors and terraces. These soils consist of residium weathered from gypsum. Gypsiorthids soils are found on slopes that range from three to 25 percent. The mean annual precipitation ranges from 10 to 12 inches and the mean annual temperature is between 46° and 49°F (USDA, 2008).

Gypsiorthids soils are in a climatic setting that receives the annual precipitation uniformly distributed throughout the year with over 50 percent coming as snow. Elevations are 4,900 to 6,600 feet AMSL. These soils are utilized as rangeland (USDA, 2008).

4.2 Field Observations

The soils observed in the northern portion of the Site tended to be sandy loam to fine sandy loam with typical hues in the 5YR range (MacBeth, 2000). Kleinfelder water resources professionals observed that water from rain and snow melt events takes some time to infiltrate past the first few inches. The soil appeared to be dry under approximately six inches of saturated soil during the winter and spring surveys.

Drainage features across the Site were characterized as discontinuous ephemeral streams (Meyer, 2008). In addition, the six USDA soil series identified by the NRCS Web Soil Survey (Barx, Vananda, Begay, Mikim, Paradox and Gypsiorthids) were recognized at the Site (Figure 2).

Biological soil crusts, also known as cryptogamic, microbiotic, cryptobiotic, and microphytic crusts (Belnap and Lange, 2001), were observed sporadically at the Site. Biological soil crusts were observed to cover less than five percent of the area, with the highest concentrations located under big sage (*Artemisia tridentata*). Biological soil crusts are made up primarily of cyanobacteria (formerly blue-green algae), green and brown algae, microfungi, mosses, liverworts, and lichens (Rosentreter et al., 2007). The organisms on the soil increase soil stability, contribute carbon to the underlying soil, convert atmospheric nitrogen into bio-available nitrogen, and retain water (Belnap and Lange, 2001).

The locations of the two soil sample points are shown in Figure 3. Sample Point 1 (SP1) is an atypical soil profile of the site. The presence of organic material is indicative of above normal soil moisture. The soil profile consisted of the top 4 inches of clay loam with approximately 10 percent organic material (Attachment A, Photograph 1). The color of the top 4 inches was dark brown (7.5YR3/4) (MacBeth, 2000). From 4 to 12 inches bgs, the profile changed to a sandy loam with a yellowish-red color (5YR4/6) (MacBeth, 2000). The soil profile did not exhibit hydric characteristics under the guidelines within the Pocket Guide to Hydric Soil Field Indicators (WTI, 2006).

Sample Point (SP2) was a typical soil profile for the Site. The soil profile consisted of the top 2 inches of loam with plates of clay that restrict water infiltration (strictures), and flake off at the touch (Attachment A, Photograph 2). The color of the top 2 inches was brown (7.5YR4/4) (MacBeth, 2000). From 2 to 12 inches bgs, the profile changed to a sandy loam with a yellowish-red color (5YR4/6) (MacBeth, 2000). The soil profile did not exhibit hydric characteristics under the guidelines within the Pocket Guide to Hydric Soil Field Indicators (WTI, 2006).

5.0 CONCLUSIONS

The soils identified during the field observations at the Site are consistent with the USDA and NRCS Web Soil Survey (USDA, 2008) literature review. The listed USDA soil series observed at the Site included the Barx, Vananda, Begay, Mikim, and Paradox. Additionally, no hydric soils were observed or identified within the ponded areas or within or near any of the Site's drainage features. Biological soil crust-like structures were observed under the big sage habitat. Biological soil crusts were observed to make up less than five percent of the ground cover on the Site.

6.0 LIMITATIONS

Kleinfelder prepared this report in accordance with generally accepted standards of care that exist in Montrose County, Colorado at this time. This report may be used only by Energy Fuels Resources Corporation and only for the purposes stated. All information gathered by Kleinfelder is considered confidential and will be released only upon written authorization by Energy Fuels Resources Corporation or as required by law. Non-compliance with these requirements by Energy Fuels Resources Corporation or anyone else, unless specifically agreed to in advance by Kleinfelder in writing, will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party and Energy Fuels Resources Corporation agrees to defend, indemnify, and hold harmless Kleinfelder from any claim or liability associated with such unauthorized use or non-compliance.

7.0 REFERENCES

Belnap, J., and O.L. Lange (eds.), 2001, Biological Soil Crusts: Structure, Function, and Management, Vol. 150, pp. 1-503, Springer-Verlag, Berlin.

Cater, F.W., Jr., 1954, Geology of the Bull Canyon Quadrangle, Colorado, U.S. Geological Survey Geologic Quadrangle Map GQ-33, scale 1:24,000.

Copyright 2009 Kleinfelder

----- 1955a, Geology of the Naturita NW Quadrangle, Colorado, U.S. Geological Survey Geologic Quadrangle Map GQ-65, scale 1:24,000.

----- 1955b, Geology of the Davis Mesa Quadrangle, Colorado, U.S. Geological Survey Geologic Quadrangle Map GQ-71, scale 1:24,000.

----- 1970, Geology of the Salt Anticline Region in Southwestern Colorado, U.S. Geological Survey Professional Paper 637, p. 80.

Kelley, V.C., 1955, Tectonics of the Four Corners region. In Geology of Parts of Paradox, Black Mesa, and San Juan Basins, Four Corners Geological Society, Field Conference Guidebook, p. 108-117.

MacBeth, 2000, Munsell Soil Color Charts (revised washable edition 2000), New Windsor, New York, MacBeth Division of the Kollmorgen Corporation.

Meyer, J. J., 2008, USACE WoUS Final Wetland Delineation, Kleinfelder West, Inc., Doc. Control Number DEN8R058.

Rosentreter, R., M. Bowker, and J. Belnap, 2007, A Field Guide to Biological Soil Crusts of Western U.S. Drylands, U.S. Government Printing Office, Denver, Colorado.

U.S. Army Corps of Engineers (USACE), 2006, *Interim regional supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region*. Eds. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-06-16. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

U.S. Department of Agriculture (USDA). Accessed: August 20, 2008. http://websoilsurvey.nrcs.usda.gov/app/.

U.S. Nuclear Regulatory Commission (NRC), 1982, Preparation of Environmental Reports for Uranium Mills, Regulatory Guide 3.8, Revision 2, dated October 1982, U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, Washington, DC.

U.S. Nuclear Regulatory Commission (NRC), 2003, Environmental Review Guidance for Licensing Actions Associated with NMSS Programs, NUREG 1748, U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, DC.

Wetland Training Institute, Inc (WTI), 2006. Pocket Guide to Hydric Soil Field Indicators, V. 6.0., R. J. Pierce (ed.), Wetland Training Institute, Inc., Glenwood, NM, WTI 2006-1, 152 p.

ATTACHMENT A

PHOTOGRAPHS



Photograph 1 – Wetland Sampling Point 1 (SP1). Soil Profile.



Photograph 2 – Wetland Sampling Point 2 (SP2). Soil Profile.

KLEINFELDER *Bright People. Right Solutions.* Project Number: 83088.1.8.2 Photos Taken: 4/08/08	Energy Fuels Resources Piñon Ridge Mill Site Naturita, Colorado	**Photographs**	**Attachment A**

ATTACHMENT B

USACE WETLAND DELINEATION FORMS

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: PINION RIDGE URANIUM MILL City/County: NATURITA/MONTROSE Sampling Date: 4/08/08

Applicant/Owner: _____ State: CO Sampling Point: SP1

Investigator(s): J. MEYER R. JONES Section, Township, Range: SEC 17, T46N, R17W, NMPM

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): CONCAVE Slope (%): 4%

Subregion (LRR): SALE DESERTS AND SEDIMENTARY BASINS Lat: N 38°14'38.9" Long: W 108°46'15.1" Datum: NAD83

Soil Map Unit Name: NA NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	Is the Sampled Area within a Wetland? Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes X	No _____	

Remarks: HYDROLOGY IS DISTURBED BY A MANMADE EARTHEN BERM

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1. POPULUS DELTOIDES	15	NO	FACW*
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. —			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. XANTHIUM STRUMARIUM	40	YES	FAC
2. MELILOTUS ANNUUS	40	YES	FACU
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover:	80		
Woody Vine Stratum			
1. —			
2.			
Total Cover:	—		

% Bare Ground in Herb Stratum 15% % Cover of Biotic Crust Ø

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species —	x 1 = —
FACW species 5	x 2 = 10
FAC species 40	x 3 = 120
FACU species 40	x 4 = 160
UPL species —	x 5 = —
Column Totals: 85 (A)	290 (B)

Prevalence Index = B/A = 3.41

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes _____ No X

Remarks:

SOIL

Sampling Point: SP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	7.5YR 3/4		—				CLAY LOAM	10% OM, BLOCKY STRUCTURE
4-12	5YR 4/6		—				SANDY LOAM	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ___ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ✓ Surface Soil Cracks (B6)
- ✓ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 0

Water Table Present? Yes ___ No X Depth (inches): —

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0-2in

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: PINON RIDGE URANIUM MILL City/County: MONTROSE Sampling Date: _____

Applicant/Owner: _____ State: _____ Sampling Point: SP2

Investigator(s): J. MEYER, R. JONES Section, Township, Range: SEC 17, T46N, R17W, NMPM

Landform (hillslope, terrace, etc.): HILL SLOPE Local relief (concave, convex, none): NONE Slope (%): 30%

Subregion (LRR): SHALE DESERTS AND SEDIMENTARY BASINS Lat: N38° 14' 38.9" Long: W108° 46' 15.1" Datum: NAD 83

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____ No X	Is the Sampled Area within a Wetland? Yes _____ No X
Hydric Soil Present?	Yes _____ No X	
Wetland Hydrology Present?	Yes _____ No X	

Remarks:

VEGETATION

Tree Stratum (Use scientific names.)	Absolute % Cover	Dominant Species?	Indicator Status
1. —			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. ERICAMERIA NAUSEOSA	7%	NO	UPL
2. ATRIPLEX CANESCENS	5%	NO	UPL
3.			
4.			
5.			
Total Cover: 12%			
Herb Stratum			
1. GUTIERREZIA SAROTHRAE	10	NO	UPL
2. CENTAUREA DIFFUSA	<5	NO	UPL
3.			
4.			
5.			
6.			
7.			
8.			
Total Cover: 15%			
Woody Vine Stratum			
1. —			
2.			
Total Cover:			

% Bare Ground in Herb Stratum 70% % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 0 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species 27	x 5 =	135
Column Totals: 27 (A)		135 (B)

Prevalence Index = B/A = 5

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes _____ No X

Remarks:

SOIL

Sampling Point: SP2

Profile Description: (Describe to the depth needed to document the Indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	7.5 YR 4/4		~				LOAM	TOPSOIL - FINE, PLENTY STRUCTURE.
2-12	5 YR 4-6		~				SANDY LOAM	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: NA

Depth (inches): ___

Hydric Soil Present? Yes ___ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

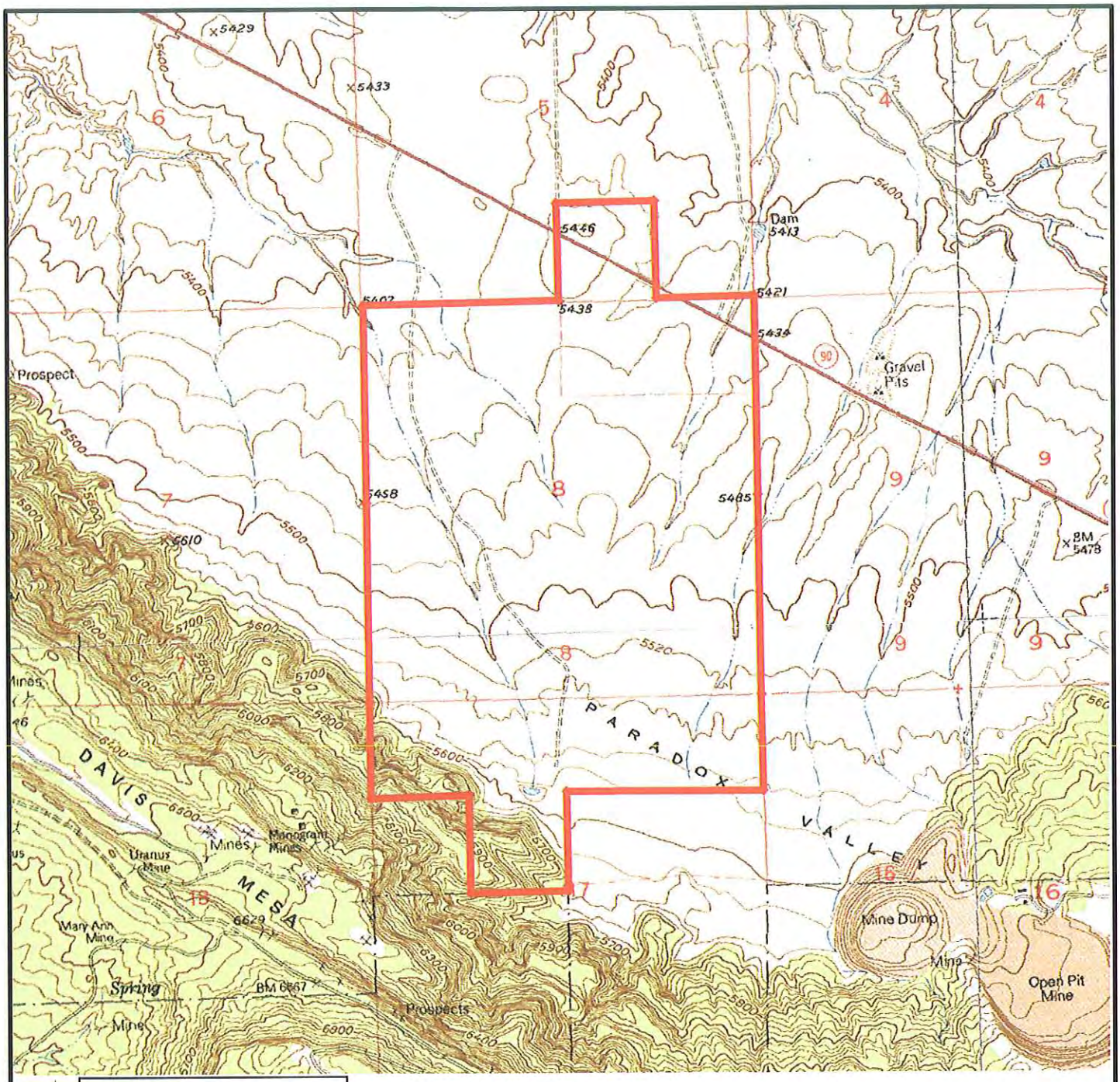
Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

NONE OBSERVED

FIGURES



The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.

DNC No. 83088.5.E6-ALB08RP001

KLEINFELDER
Bright People. Right Solutions.

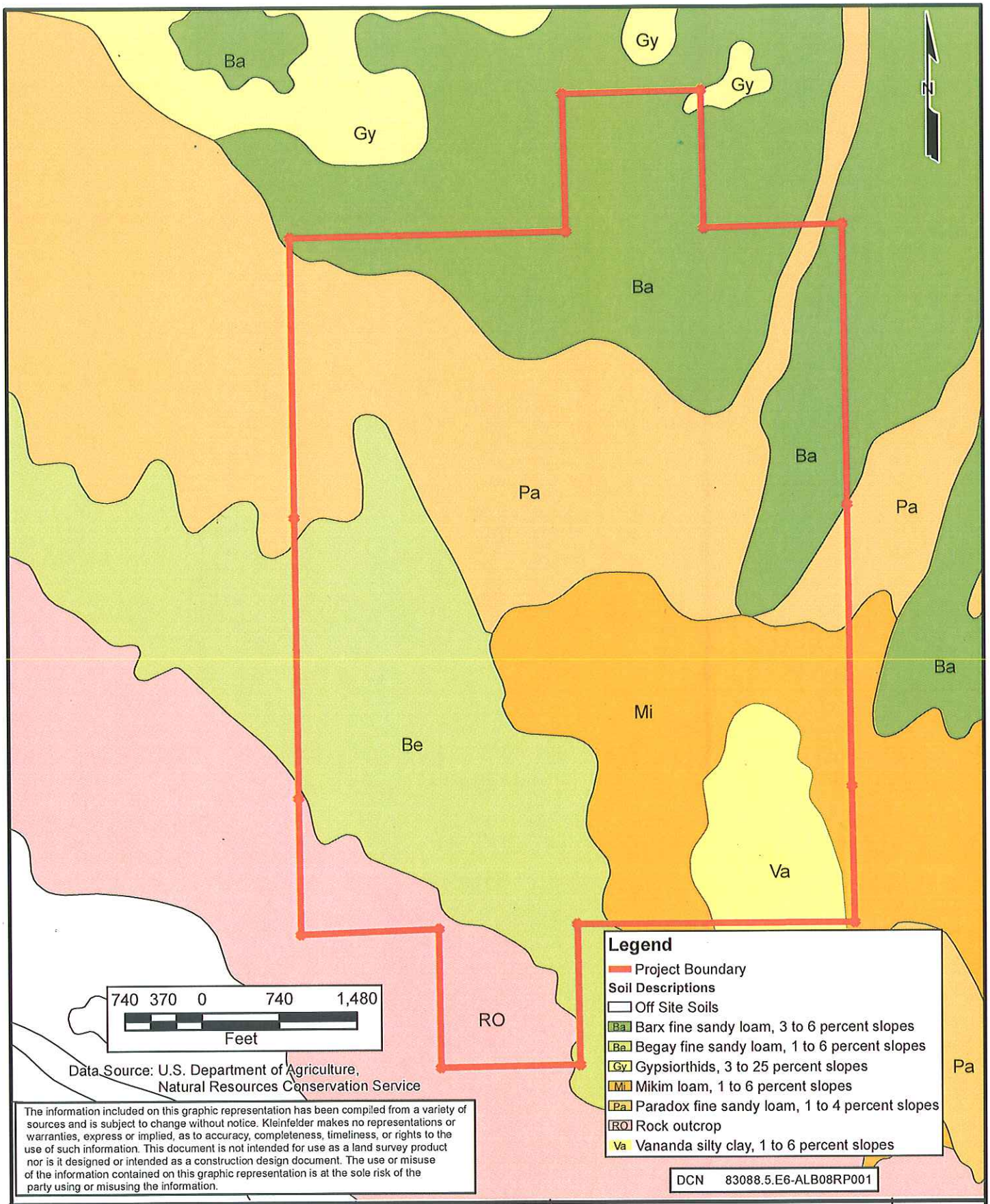
PROJECT NO.	83088
DRAWN:	8/20/08
DRAWN BY:	JJ Meyer
CHECKED BY:	C Jarvis
FILE NAME:	E61_110708

Site Location

ENERGY FUELS RESOURCES
PINON RIDGE MILL SITE
MONTROSE COUNTY, COLORADO

ORIGINATOR:	JJ Meyer
APPROVED BY:	C Jarvis

FIGURE
1



Data Source: U.S. Department of Agriculture, Natural Resources Conservation Service

The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.

DCN 83088.5.E6-ALB08RP001

KLEINFELDER
Bright People. Right Solutions.

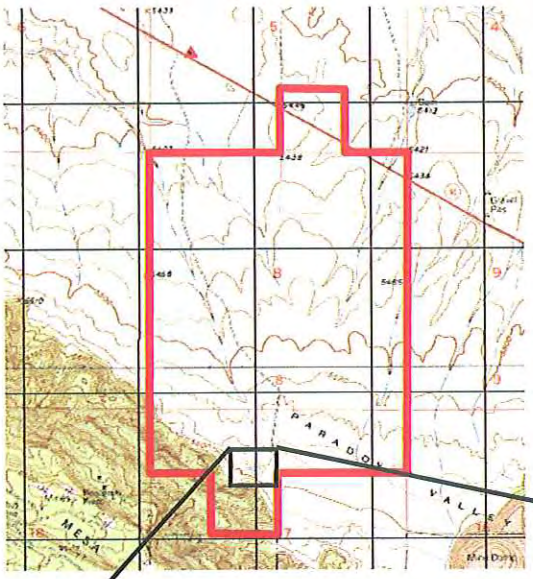
PROJECT NO.	83088
DRAWN:	8/20/08
DRAWN BY:	JJ Meyer
CHECKED BY:	C Jarvis
FILE NAME:	E62_110708

NRCS Soils Data Map

ENERGY FUELS RESOURCES
PINON RIDGE MILL SITE
MONTROSE COUNTY, COLORADO

ORIGINATOR: JJ Meyer
APPROVED BY: C Jarvis

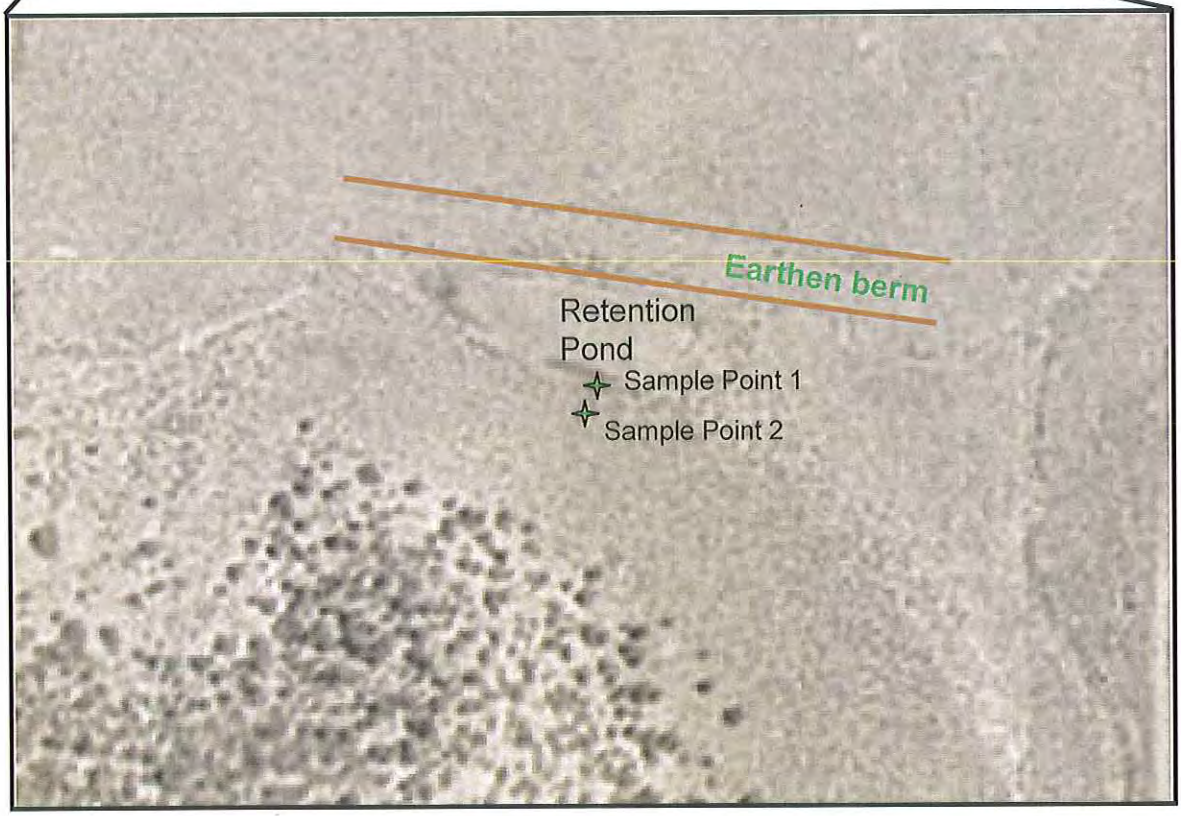
FIGURE
2



BASE MAP:
Davis Mesa and Bull Canyon
U.S.G.S. 7.5 MINUTE QUADRANGLE
1965, Rev.1994

USGS

N



Aerial Photograph
Courtesy of :
MAPTECH

DNC No. 83088.5.E6-ALB08RP001

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.	83088
DRAWN:	8/20/08
DRAWN BY:	JJ Meyer
CHECKED BY:	C Jarvis
FILE NAME:	E63_110708

Sample Point Location Map

ENERGY FUELS RESOURCES
PIÑON RIDGE MILL SITE
MONTROSE COUNTY, COLORADO

ORIGINATOR:	JJ Meyer
APPROVED BY:	C Jarvis

FIGURE
3

VEGETATION SURVEY

Rev. 1 **Date:** 02/09/09

OF THE

ENVIRONMENTAL REPORT

IN SUPPORT OF THE APPLICATION FOR LICENSE FOR SOURCE MATERIAL MILLING

PIÑON RIDGE URANIUM MILL

Montrose County, Colorado

Submitted to:

Radiation Management Unit
Colorado Department of Public Health and Environment

Prepared for:



Energy Fuels Resources
44 Union Blvd., Suite 600
Lakewood, Colorado 80228

Prepared by:

Kleinfelder
8300 Jefferson NE, Suite B
Albuquerque, NM 87113

Project No. 83088
DCN 83088.5.J-ALB08RP001

VEGETATION SURVEY

Rev. 1

OF THE

ENVIRONMENTAL REPORT

IN SUPPORT OF THE APPLICATION FOR A LICENSE FOR SOURCE MATERIAL MILLING

PIÑON RIDGE URANIUM MILL

Montrose County, Colorado

Submitted to:

Radiation Management Unit
Colorado Department of Public Health and Environment

Prepared for: **Energy Fuels Resources**
Lakewood, Colorado

Prepared by: **Kleinfelder**
Albuquerque, New Mexico

Author: Louis Bridges by AKK
Louis J. Bridges, Principal Professional

Approved: Alan K. Kuhn
Alan K. Kuhn, Project Manager

Project No. 83088
DCN 83088.5.J-ALB08RP001
Date: 02/09/09

TABLE OF CONTENTS

SECTION ..... PAGE

1.0 INTRODUCTION 1

1.1 Site Location 1
1.2 Ecological Setting 1
1.2.2 Semiarid Benchlands and Canyonlands 3
1.3 Habitat Ecotones 3
1.3.1 Piñon-Juniper Habitat 3
1.3.2 Big Sage Habitat 4
1.3.3 Grassland Habitat 5
1.4 Threatened and Endangered Species 6

2.0 PURPOSE AND SCOPE 11

3.0 METHODS 11

3.1 Vegetation 12
3.2 Summer Site Observations 12
3.3 Fall Site Observations 12
3.4 Winter Site Observations 13
3.5 Spring Site Observations 13
3.6 Arroyo Observations 13

4.0 RESULTS 13

5.0 CONCLUSIONS 16

5.1 Threatened and Endangered Species 16
5.2 Piñon-Juniper Habitat 16
5.3 Big Sage Habitat 16
5.4 Grassland Habitat 17
5.5 Noxious Weeds 17
5.6 Summary 17

6.0 LIMITATIONS 17

7.0 REFERENCES 18

Copyright 2009 Kleinfelder

TABLES

Table 1	Sensitive Federal, State, and CNHP Plant Species in the Uncompahgre Area
Table 2	Identified Plants at the 60 Sample Points
Table 3	Ecotone Characteristics
Table 4	Ecotone Dominant Plants

FIGURES

Figure 1	Site Location
Figure 2	Level III Ecoregions of the Four Corners Area
Figure 3	Level IV Ecoregions of Southwest Colorado
Figure 4	Ecotone Map
Figure 5	Habitat Assessment Sample Points
Figure 6	Arroyo Location Map

APPENDICES

Appendix A	Habitat Observations
Appendix B	Habitat Assessment Data Forms
Appendix C	Photographs

Copyright 2009 Kleinfelder

1.0 INTRODUCTION

Energy Fuels Resources Corporation (EFR) proposes to license, construct, and operate a conventional acid leach uranium and vanadium mill at the Piñon Ridge Mill site (the Site) in western Montrose County, Colorado. Site facilities will include an administration building, a 17-acre mill, tailing ponds totaling 90 acres, an 80-acre evaporation pond, a 5-acre ore storage pad, and an access road. The mill will process ore produced from mines within a reasonable truck-hauling distance. The mill will process up to 500 tons of ore per day but is designed to accommodate subsequent expanded production capacity of up to 1,000 tons per day. The expected operating life of the mill is 20 to 40 years.

The Piñon Ridge Mill is subject to regulation by the State of Colorado, and the mill license (Radioactive Source Material License) will be issued and administered by the Colorado Department of Public Health and Environment (CDPHE). The activities described in this document were performed as part of the baseline characterization required for the Environmental Report (ER) in accordance with Section 3.8.8, Part 3, 6 CCR 1007-1. This report presents the results of the vegetation surveys conducted by Kleinfelder for EFR in support of the license application.

1.1 Site Location

The proposed Piñon Ridge Mill is located in the Paradox Valley at 16910 Highway 90, approximately 14 miles west of Naturita, in Montrose County, Colorado. The Site's legal description is the Southwest ¼ of the Southeast ¼ of Section 5, all of Section 8, the North ¼ of Section 17, and the Southeast ¼ of the Northwest ¼ of Section 17, Township 46 North, Range 17 West, of the New Mexico Principal Base and Meridian. The Site is located on both the Davis Mesa Quadrangle and Bull Canyon Quadrangle 1:24,000 United States Geological Survey (USGS) topographic/geologic maps. The Site location with respect to major topographic features is shown in Figure 1.

1.2 Ecological Setting

The United States Forest Service (USFS) has developed a mapping framework to help understand the hierarchical order of all ecosystems. This framework is called the National Hierarchical Framework of Ecological Units (ECOMAP, 1993; Cleland et al., 1997). All ecosystems are recognized by differences in climatic regime. Therefore, parts of the same geographic areas may be located in different ecosystems due to differences in climatic regime. The underlying premise is that climate, as a source of energy and moisture, acts as the primary control for the ecosystem. The Site lies within the Colorado Plateau Ecoregion as shown in Figure 2.

The Colorado Plateau Ecoregion (Colorado Plateau) is a (Level III) ecoregion. The Colorado Plateau is a physiographic province encompassing 130,000 square miles or 83.2 million acres of the Four Corners states, including Utah's southeastern quarter (Chapman et al., 1997) Figure 2. The Colorado Plateau is a complex of badlands, sheer-walled canyons, buttes, mesas, plains, dunes, and isolated mountain ranges. It is characterized by its high elevation and arid to semi-arid climate. The Colorado Plateau has developed great relief through the erosive action of high-gradient, swift-flowing rivers that have down-cut and incised the plateau. Approximately 90 percent of the plateau is drained by the Colorado River and its tributaries. The Colorado, Little

Copyright 2009 Kleinfelder

Colorado, San Juan, and Escalante Rivers carve large canyons as they pass through the Plateau.

The Colorado Plateau contains mostly public and tribal lands. Elevations range from 1,200 feet above Mean Sea Level (MSL) within the Grand Canyon to 12,700 feet above MSL in the La Sal Mountains. This wide range of elevations produces diverse habitats. The Plateau is bounded on the east by the southern Rocky Mountains, on the north by the central Rocky Mountains, and on the south and west by the Basin and Range Province (Chapman, 2006).

The more prevalent habitats are piñon-juniper/juniper savanna, riparian, big sagebrush shrublands, steppe, and grasslands. The region has conspicuous but irregular vegetation zones. The woodland zone is the most extensive, dominated by what is often called a pygmy forest of piñon pine (*Pinus edulis*) and several species of juniper (*Juniperus* spp.). Between the trees, the ground is sparsely covered by gramma (*Bouteloua* spp.), other grasses, herbs, and various shrubs, such as big sagebrush (*Artemisia tridentata*) and mountain mahogany (*Cercocarpus montanus*) (Tuhy et al., 2002).

The mountain zone extends over broad areas on the high plateaus and mountains, but is actually much smaller than the piñon-juniper zone. The vegetation varies considerably, from ponderosa pine (*Pinus ponderosa*) in the south to lodgepole pine (*P. contorta* var. *latifolia*) and aspen (*Populus tremuloides*) farther north. Northern Arizona contains four distinct Douglas-fir (*Pseudotsuga menziesii*) habitat types (Hermann, 1982).

The lowest zone by elevation has arid grasslands but with many bare areas, as well as xeric shrubs and sagebrush. Several kinds of cacti and yucca are common at low elevations in the south.

The climate of the Colorado Plateau is often described as “desert” because annual precipitation averages less than 10 inches. Most of precipitation occurs in the winter as snow and subsequently infiltrates the soil (Tuhy et al., 2002). Contribution to streamflow within the sagebrush semi-desert comes from the rapid melting of snow over frozen surface soil or intense rainfall (West, 1983).

1.2.1 Shale Deserts and Sedimentary Basins

The Site is located in Shale Deserts and Sedimentary Basin (Level IV) ecoregion, a sub-region within the Colorado Plateau that encompasses 1,870,720 acres. Elevations range from 4,900 feet above MSL to 8,000 feet above MSL (Chapman et al., 2006). The Shale Deserts and Sedimentary Basins prevalent physiography is nearly level to rolling plains and basins with benches, low rounded hills, and badlands (Chapman et al., 2006) Figure 3.

Climate for the Shale Deserts and Sedimentary Basins includes a mean annual precipitation of 8 to 15 inches. The mean temperature in degree Fahrenheit (˚F) in January is 6/36 (min/max) and in July the mean temperature ˚F is 48/92 (min/max). This ecoregion has a mean annual 90 to 120 frost free days (Chapman et al., 2006).

The more prevalent vegetation community in the Shale Deserts and Sedimentary Basins is a sparse cover of mat saltbrush, shrubland, and salt desert scrub: shadscale (*Atriplex confertifolia*), Nuttall’s saltbrush (*A. nuttallii*), fourwing saltbrush (*A. canescens*), blackbrush (*Coleogyne ramosissima*), Wyoming big sagebrush *(Artemisia tridentata ssp. wyomingensis*), desert trumpet (*Eriogonum inflatum*), galleta grass (*Pleuraphis rigida*), and other associated

Copyright 2009 Kleinfelder

grasses. Floodplain areas support greasewood or creosotebush (*Larrea tridentata*), alkali sacaton (*Sporobolus airoides*), seepweed (*Suaeda suffrutescens*), and shadscale. Badland areas have little to no vegetation cover (Chapman et al., 2006).

Land uses and land cover include shrubland, rangeland, and areas of dryland and irrigated cropland with winter wheat, small grains, forage crops, and pinto beans. Orchards of apples, peaches, pears, and apricots line the Gunnison and Colorado River valleys. Shrublands provide important winter habitat for wildlife (Cleland et al., 2006). According to the CDOW (2008) the Site is located within the critical winter range for the wildlife species. Additionally, the Site habitat is considered potentially suitable habitat for the Gunnison's sage grouse (CDOW, 2008). Refer to the Wildlife Survey Kleinfelder, 2009) for additional wildlife information.

1.2.2 Semiarid Benchlands and Canyonlands

The Semiarid Benchlands and Canyonlands (Level IV) ecoregion as a sub-region within the Colorado Plateau that encompasses 5,810,560 acres within the Colorado Plateau. Elevations range from 5,400 feet above MSL to 9,200 feet above MSL (Cleland et al., 2006). The Semiarid Benchlands and Canyonlands prevalent physiography is benches, mesas, cuestas, alluvial fans, hillsides, cliffs, arches, and canyons with a few isolated peaks. The areas of low relief alternate with the areas of high relief (Chapman et al., 2006) Figure 3. The southern portion of the Site; has representative features that are prevalent to this sub-region of the Colorado Plateau. The features of this sub-region exhibited on the Site, are benches, mesas, alluvial fans cliffs, and areas of low relief that alternate with areas of high relief.

Climate for the ecoregion includes a mean annual precipitation of 10 to 18 inches with 20 to 25 inches at the highest elevations. The mean temperature ˚F in January is 8/40 (min/max) and in July the mean temperature ˚F is 48/88 (min/max). This ecoregion has a mean annual 60 to 120 frost free days (Chapman et al., 2006).

The more prevalent vegetation community is the piñon/juniper woodland, Gambel oak woodland, and sagebrush steppe with black sagebrush (*Artemsia nova*), winterfat (*Kraschenninnikovia lanata*), Mormon tea (*Ephedra virdis*), four-wing saltbrush, shadscale, galleta grass, and blue gramma (*Bouteloua gracilis*) (Chapman et al., 2006).

Land uses and land cover include woodland and shrubland, rangeland, recreation, coal mining, oil and gas production, and oil shale extraction (Chapman et al., 2006).

1.3 Habitat Ecotones

Three ecotones (areas where two distinctly different habitats converge) are relevant to the ecology of the Site (Figure 4). These ecotones include a piñon-juniper habitat along the bluffs in the southwest portion of the Site; a joining, narrow strip of big sage habitat; a native grassland habitat abuts both big sage habitats throughout the central portion of the site extending from the northwest corner of the site centrally to the southeast portion of the Site; and, another big sage habitat covers the northeast half of the Site.

1.3.1 Piñon-Juniper Habitat

Piñon-juniper habitat extends over large areas in western Colorado (Tueller et al., 1979). In Colorado, there are approximately five million acres of piñon-juniper habitat (Brown, 1994).

Copyright 2009 Kleinfelder

Seventy percent of Colorado's piñon-juniper woodland is located within the Colorado Plateau (Colorado Partners in Flight, 2008).

The piñon-juniper habitat type is a cold-adapted evergreen woodland situated above desert or grassland vegetation habitat and below mountain shrub habitat (Pieper, 1977); elevations range from 4,500 feet above MSL to 7,500 feet above MSL (Brown, 1994). Colorado piñon or two-needle piñon occurs in the eastern two-thirds of the piñon pine range. Several species of juniper are dominant or co-dominant, including Rocky Mountain juniper (*Juniperus scopulorum*), Utah juniper (*J. osteosperma*), one-seed juniper (*J. monosperma*), alligator juniper (*J. deppeana*), California juniper (*J. californica*), and redberry juniper (*J. coahuilensis*) (Colorado Partners in Flight, 2008).

Proportions of juniper and piñon within the habitat vary greatly, and pure stands of either tree may occur. Typically, as elevation increases, piñon dominance increases, juniper density decreases, total tree density increases, and trees become larger (Pieper, 1977; LaRue, 1994). Piñon pines drop out completely at the lowest elevations. Depending on site variables, piñon-juniper may range from an openly spaced savanna to a closed forest. Piñon-juniper understories vary from completely open to quite dense, the densest understories occurring in open canopy woodland/sagebrush communities and where Gambel oak (*Quercus gambelii*) is encroaching (Colorado Partners in Flight, 2008).

Soils underlying piñon-juniper often are shallow, rocky, and low in fertility (Pieper, 1977). The relative resistance to fire of these soil types favors piñon-juniper growth. Deep soil sites that are burned tend to revert to open "parks," often sagebrush, and resist returning to piñon-juniper cover (Colorado Partners in Flight, 2008).

Human activities have affected the distribution of piñon-juniper habitat. Wide-scale programs designed to convert piñon-juniper woodlands to grasslands for grazing began in earnest after World War II (Colorado Partners in Flight, 2008). In spite of these conversions, human activity has generally increased piñon-juniper coverage. Fire suppression in grasslands adjacent to piñon-juniper woodland has allowed the woodlands to advance by out-competing grasses (Little, 1977). Today, human activities in piñon-juniper woodlands are diverse and increasing. Big game hunting and firewood, fence post, and pine nut harvesting are currently stabilized; however, recreational pursuits are burgeoning (Pieper, 1977; LaRue, 1994). Many of these pursuits include all-terrain vehicles, which can rapidly turn paths and trails into roads. Oil and gas development has also increased the quantity and quality of roads in the piñon-juniper zone (Colorado Partners in Flight, 2008).

1.3.2 Big Sage Habitat

Within the Colorado Plateau, sagebrush is found at elevations of approximately 4,000 feet above MSL to 10,000 feet above MSL. On moist sites the sagebrush may reach 10 feet tall, but more typically it is less than five feet (Colorado Partners in Flight, 2008). It exists in a variety of climatic conditions, including low-elevation, semi-desert habitats and moist, cool, mountainous areas. Sagebrush species common in Colorado include big sagebrush and mountain sagebrush (*Artemisia tridentata ssp. vaseyana*) (Colorado Partners in Flight, 2008). Plants found in association with sagebrush habitats include rabbitbrush (*Ericameria nauseosa*), bitterbrush (*Purshia* spp.), snowberry (*Symphoricarpos albus*), mountain mahogany, piñon pine, juniper, and aspen (*Populus tremuloides*). Grasses, especially bunchgrasses, are common components of sagebrush habitats, including wheatgrass species (*Pseudoroegneria* spp.), junegrass

Copyright 2009 Kleinfelder

(*Koeleria macrantha*), Arizona fescue (*Festuca arizonica*), and Idaho fescue (*F. idahoensis*) (Colorado Partners in Flight, 2008).

Immense stands of sagebrush, interspersed with small openings of native bunchgrasses, formerly covered hundreds of thousands of acres in the West (Vale, 1975). Little is known about the natural disturbance regimes that shaped this ecosystem, although pre-settlement sagebrush habitat probably experienced at least occasional wildfires (Colorado Partners in Flight, 2008). Given the slow recovery rate of sagebrush (it will not re-sprout after fire, but must come back from seed, a process that can take 15 to 30 years), these wildfires probably sculpted a landscape mosaic of sagebrush stands of varying age interspersed with grassy open areas on the scale of tens to thousands of hectares (Colorado Partners in Flight, 2008).

The primary use of sagebrush habitats by humans has been for livestock grazing. Historically, sagebrush was cleared to increase forage and to allow a higher stocking rate of domestic animals or to support more grazing wildlife (Colorado Partners in Flight, 2008). Where little or no sagebrush removal has occurred, heavy grazing sometimes leads to the elimination of native perennial grasses, which are replaced by exotic annual grasses. In some cases, the herbaceous cover is lost entirely and is replaced by shrubs, which prompts land managers to remove the shrub cover through plowing, burning, chaining, or herbicide treatment (Colorado Partners in Flight, 2008).

Sagebrush habitats that are converted to another cover type have limited potential to revert to sagebrush. Instead, they are usually maintained in those other cover types via increased frequency of fire, distance to seed sources, loss of symbiotic mycorrhizal fungi, and competitive exclusion by other plants (Colorado Partners in Flight, 2008). Large acreages of sagebrush have been removed in the interest of improving forage productivity on grazing lands. Perhaps 30 percent of Colorado's sagebrush had received some treatment between 1900 and 1974 (Braun et al., 1976). Other factors compromising the ecological integrity of sagebrush habitat include invasion by exotic (e.g., cheatgrass) or native (e.g., piñon-juniper) plant species, conversion to agricultural, residential, and other developed land types, and changes in natural fire regimes (Colorado Partners in Flight, 2008).

1.3.3 Grassland Habitat

Grasslands in Western Colorado are areas dominated by grasses and forbs, and have few or no trees. Grazing and roaming animals occur in abundance across these grasslands. Originally the grasses were perennial bunchgrasses but grazing has encouraged the increased growth of sod grasses on areas with deep soil and heavy to moderate rainfall (Colorado Partners in Flight, 2008). The bunchgrasses have been replaced by annual grasses in areas with low precipitation. In some areas with deep soils and well protected from erosion, bunchgrasses still cover large areas in association with a few shrubs and cacti. However, there are areas where grass cover has been reduced as a result of woody plant and cacti colonization (Paysen et al., 2000).

Within the grassland habitat, trees and large shrubs are largely absent. Seasonal drought, occasional fires, and grazing by large mammals all prevent woody shrubs and trees from becoming established. A few trees such as cottonwoods (*Populus deltoides*), oaks (*Quercus* spp.), and willows (*Salix* spp.) grow near rivers and streams, and hundreds of species of flowers grow among the grasses (Colorado Partners in Flight, 2008).

Typical species of grasses found within the grassland habitat include bent-grass (*Agrostis palustris*), blue gramma, downy brome (*Bromus tectorum*), galleta-grass, and fox-tailed barley

Copyright 2009 Kleinfelder

(*Hordeum jubatum*) (Colorado Division of Wildlife, 2008). Flowers include asters (*Aster* spp.), blazing stars (*Liatris spicata*), sunflowers (*Helianthus annuus*), clovers (*Trifolium* spp.), and plains wild indigo (*Baptisia bracteata*).

Grasslands have hot summers and cold winters. Summer temperatures can be well over 100 ˚F, while winter temperatures can be as low as minus 40˚ F (Colorado Partners in Flight, 2008). Annual precipitation is typically between 10 to 35 inches per year with much of the precipitation occurring in the late spring and early summer. Snow often serves as a reservoir of moisture for the beginning of the growing season. Seasonal drought and occasional fires help maintain these grasslands.

Drought plays a large role in keeping trees from taking over the grasslands. Some years receive less rain than others, just as certain seasons receive significantly less rain than others (Colorado Partners in Flight, 2008). Trees generally cannot withstand the lack of water as easily as grasses, and thus, grasses remain dominant.

Overgrazing by livestock and plowing are the two greatest threats to grasslands (Colorado Partners in Flight, 2008). Since the development of the steel plow, much of these grasslands have been converted to agricultural lands because of their rich soil. Large amounts of grasslands have been converted to agriculture or urban development (Colorado Division of Wildlife, 2003). Lack of fire and fragmentation are also threats. Fire plays a big role in this biome, preserving biodiversity and keeping trees from overtaking the grasses. Lightning from large storms rolling over the grasslands ignites large grass fires (Colorado Partners in Flight, 2008). These fires help certain plants by germinating seeds, clearing ground cover to allow rare plants a chance, and by nourishing the soil with freshly burnt vegetation.

1.4 Threatened and Endangered Species

The United States Fish and Wildlife Service (FWS) currently lists 13 species of plants as federally threatened or endangered in the State of Colorado (Bureau of Land Management, 2008). Of these 13 federally listed plant species, only the clay-loving buckwheat (*Eriogonum pelinophilum*) is listed in the United States Department of Agriculture (USDA) database to occur in Montrose County, Colorado (USDA, 2008).

The clay-loving buckwheat is a federally listed endangered species with designated critical habitat. It is known to occur in the Mancos Shale hills within Delta and Montrose counties, Colorado. Much of the former habitat in the Montrose, Colorado area has been destroyed since the species was listed in 1984 (Flora of North America, 2008). The habitat associated with the clay-loving buckwheat in Delta County was largely destroyed in 2001 by off-road vehicle activities in the designated critical habitat. A small population of clay-loving buckwheat is preserved at the Fairview Natural Area east of Montrose (Flora of North America, 2008).

The clay-loving buckwheat is similar to the Comb Wash buckwheat (*Eriogonum clavellatum*), although the two are well-separated geographically. It is a smaller plant than Comb Wash buckwheat in habit. The flowers of Comb Wash buckwheat lack the pronounced, rounded, greenish-red to brownish-red base of the perianth seen in clay-loving buckwheat, and the tepals are distinctly dimorphic in Comb Wash buckwheat whereas they are essentially monomorphic in clay-loving buckwheat. Ants actively pollinate the flower. Some 50 additional species of insects are found to visit the flowers, but none were confirmed as a pollinator (Bowlin et al., 1993).

Copyright 2009 Kleinfelder

1.5 Sensitive Species

Of the approximately 3,200 flowering plant species in Colorado, there are 172 plants species found within Colorado that are recognized as "sensitive species". Of the 172 plant species that are recognized as “sensitive species”, there are 26 plant species (see Table 1) in Colorado that are of special concern to the Colorado Natural Heritage Program (CNHP) in the Uncompahgre area of Montrose County. The following table is a list of those “sensitive species” known to occur in the Uncompahgre area (UPP, 2009). Due to historic human and agricultural practices that have occurred within, on, or near the site, no Federal or State plants, Species of Concern, or Sensitive Species were observed or are expected to occur at the Site.

Table 1 Sensitive Federal, State, and CNHP Plant Species in the Uncompahgre Area*

Common Name	Scientific Name	Occurrence**
Southern maiden-hair fern	*Adiantum capillus-veneris*	Not observed
Grand Junction milkvetch	*Astragalus linifolius*	Not observed
Naturita milkvetch	*Astragalus naturitensis*	Not observed
San Rafael milkvetch	*Astragalus rafaelensis*	Not observed
Sandstone milkvetch	*Astragalus sesquiflorus*	Not observed
Wetherill milkvetch	*Astragalus wetherillii*	Not observed
Rocky Mountain thistle	*Cirsium perplexan*	Not observed
Mountain whitlow-grass	*Draba rectifructa*	Not observed
Showy draba	*Draba spectabilis var oxyloba*	Not observed
Giant helleborine	*Epipactis gigantea*	Not observed
Wild hollyhock	*Iliamna grandiflora*	Not observed
Minute rush	*Juncus bryoides*	Not observed
Colorado desert parsley	*Lomatium coninnum*	Not observed
Good-neighbor bladderpod	*Lesquerella vicina*	Not observed
Paradox Valley lupine	*Lupinus crassus*	Not observed
Dolores skeleton plant	*Lygodesmia doloresensis*	Not observed
Eastwood monkey-flower	*Mimulus eastwoodiae*	Not observed
Western mouse-tail	*Myosurus cupulatus sensu lato*	Not observed
Long-flower cat's-eye	*Oreocarya [Cryptantha] longiflora*	Not observed
Paradox breadroot	*Pediomelum aromaticum*	Not observed
Little penstemon	*Penstemon breviculus*	Not observed
Abajo penstemon	*Penstemon lentus*	Not observed
Grand Mesa penstemon	*Penstemon mensarum*	Not observed
Canyon bog-orchid	*Platanthera sparsiflora var. ensifolia*	Not observed
Uinta basin hookless cactus	*Sclerocactus glaucus*	Not observed
King clover	*Trifolium kingii subsp. kingii*	Not observed

*Data from Colorado Natural Heritage Program, November 2000 (BLM) and September 2001 (FS)
**Not observed at the Site during the vegetation survey

Copyright 2009 Kleinfelder

A summary of each of these species follows.

Southern Maidenhair Fern: The southern maidenhair fern (*Adiantum capillus-veneris*) is a delicate fern that is widespread in the world and found in the United States across the southern tier of states from California to the Carolinas. Fan-shaped leaves descend from purple to black stems in a patchwork of green. The habitat for the southern maidenhair fern is moist ledges, crevices, and boulders along streams, rivers, and springs. There is no suitable habitat on the Site for southern maidenhair fern.

Grand Junction Milkvetch: The Grand Junction milkvetch (*Astragalus linifolius*) is identified by its extremely reduced foliage, few flowered racemes, and sessile, upright pods. This species is endemic to the gullied hills of sandstone areas along the lower Gunnison and Grand Rivers in west central Colorado and possibly in extreme eastern Utah. There is suitable habitat on the Site, but no Grand Junction milkvetch was observed on the Site.

Naturita Milkvetch: The Naturita milkvetch (*Astragalus naturitensis*) flowers during late April and May. Its habitat is generally sand filled pockets of sandstone slickrock and rimrock pavement along canyons in the piñon-juniper habitat. Known populations occur from 5,000 to 7,000 feet above MSL. The current distribution of this plant includes McKinley and San Juan Counties, NM, southwestern Colorado and adjacent Utah. There is suitable habitat on the Site, but no Naturita milkvetch was observed on the Site.

San Rafael Milkvetch: The San Rafael milkvetch (*Astragalus rafaelensis)* forms local colonies on gullied hills and washes in seleniferous soils derived from shale or sandstone formations of the San Rafael Swell in Emery County, Utah and Montrose County in west central Colorado. There is suitable habitat on the Site, but no San Rafael milkvetch was observed on the Site.

Sandstone milkvetch*:* The Sandstone milkvetch (*Astragalus sesquiflorus)* is found on sandstone ledges, talus and sandy washes at elevations from 5,000 to 5,500 feet above MSL. There is suitable habitat on the Site, but no Sandstone milkvetch was observed.

Wetherwill Milkvetch: The Wetherwill milkvetch (*Astragalus wetherwillii*) flowers during early May to late June. The habitat for the plant is steep slopes, canyon benches, and talus under cliffs, in sandy clay soils derived from shale or sandstone. The Wetherwill milkvetch grows with sagebrush and juniper at an elevation from 5,250 to 7,400 feet above MSL. There is suitable habitat on the Site, but no Wetherwill milkvetch was observed on the Site.

Rocky Mountain Thistle: Rocky Mountain thistle (*Cirsium perplexans)* is a member of the sunflower family (Asteraceae, or Compositae). The global distribution of Rocky Mountain thistle is limited to western Colorado, within the Colorado and Gunnison river valleys (Weber and Wittman, 2001). Rocky Mountain thistle tends to grow in dry, sparsely vegetated or disturbed areas. This thistle has been described as occurring adjacent to drainages and dry arroyos along roadsides. There is suitable habitat on the Site, but no Rocky Mountain thistle was observed on the Site.

Mountain Whitlow-Grass: Mountain whitlow-grass (*Draba rectifructa*) is found in the mountains, often on gravely soil. Harrington (1954) indicates that the distribution of this species is scattered over the western half of Colorado, except at the extreme northern part of the state, at an elevation of 7,500 to 10,000 feet above MSL. There no suitable habitat on the Site for mountain whitlow-grass.

Copyright 2009 Kleinfelder

Showy Draba: Showy draba (*Draba spectabilis* var. *oxyloba*) habitat is found in moist montane meadows, spruce-fir forests, and in willow thickets at an elevation of 8,300 feet (Rollins, 1993; Hitchcock, 1941; Dorn, 1992). There is no suitable habitat on the Site for showy draba.

Giant Helleborine: Giant helleborine (*Epipactis gigantea*) is, like most orchids, a herbaceous perennial. Giant helleborine grows all over the west from Texas to British Columbia to South Dakota, always in distinct locations, not in uniform distribution. The orchid flowers are pale yellow-brown to yellow with purple veins. This particular species is a terrestrial orchid, rather than an epiphytic one having air roots. It grows near streams, creeks, seeps on sandstone cliffs and hillsides, springs, and sometimes hot springs. The giant helleborine can be found at an elevation between 4,800 to 8,000 feet above MSL. There is no suitable habitat for the giant helleborine on the Site.

Wild Hollyhock: Wild hollyhock (*Iliamna grandiflora*) flowers in July and August. Wild hollyhock can be found in damp montane meadows and stream courses at elevations between 7,000 to 11,000 feet above MSL. Wild hollyhock can be found in Garfield, Mesa, Montezuma, Ouray, Pitkin, and Routt counties in Colorado. There is no suitable habitat on the Site for wild hollyhock.

Minute Rush: Minute rush (*Juncus bryoides*) is a small rush measuring approximately 10-45 mm in height. It is red in color. Weber and Wittman (1996) refer to it as “rare or overlooked”, flowering in early spring on seepy sandstone ledges in the Ponderosa pine habitat. Minute rush is easily mistaken for a moss. It has been identified within the Grand Mesa, Uncompahgre, and Gunnison National Forests. There is no suitable habitat on the Site for minute rush.

Colorado Desert Parsley: The Colorado desert parsley (*Lomatium coninnum)* is found in rocky soils derived from Mancos shale. The plant occurs in shrub communities from 5,500 to 7,000 feet above MSL. There is no suitable habitat on the Site.

Good-neighbor Bladderpod: The good-neighbor bladderpod (*Lesquerella vicina*) is a perennial plant found on sandy-gravel soils consisting of sandstone fragments over Mancos Shale within piñon-juniper habitat. It is also associated with the ecotone between piñon-juniper habitat and salt desert scrub lands in Montrose and Ouray counties, Colorado. The typical elevation where this species occurs is between 5,800 to 7,500 feet above MSL. This plant flowers from late March to mid June and remains in fruit into July. There is suitable habitat on the Site, but no good-neighbor bladderpod was observed on the Site.

Paradox Valley Lupine: The Paradox Valley lupine (*Lupinus crassus*) habitat is characterized by piñon-juniper habitat, or clay barrens derived from Chinle or Mancos Formation shales. It grows in draws and washes with sparse vegetation. The Paradox Valley lupine is found at elevations between 5,000 and 5,800 feet above MSL. There is suitable habitat on the Site, but no Paradox Valley lupine was observed on the Site.

Dolores Skeleton Plant: The foot-tall Dolores skeleton plant (*Lygodesmia doloresensis*) is found in mixed juniper-desert shrub and juniper-grassland communities on alluvial soils at elevations of 4,400 to 4,800 feet above MSL (Atwood 1991). Soils are derived from sandstone outcrops associated with the undivided lower portion of the Cutler Group. This species is known to occur along the Dolores River Canyon in Mesa County, Colorado and along the Colorado River Canyon in Grand County, Utah. There was no suitable habitat on the Site for the Dolores skeleton plant.

Copyright 2009 Kleinfelder

Eastwood Monkey-Flower: The Eastwood monkey-flower (*Mimulus eastwoodiae*) is endemic to the Canyon Lands of southeastern Utah and adjacent lands of Colorado, Arizona, and New Mexico. The Eastwood monkey-flower occurs in moist seeps and hanging garden communities in sandstone cliffs in the Canyonlands. Approximately 25 occurrences have been mapped, with additional occurrences documented on the Navajo Nation. Threats, such as disturbance by livestock and humans, are considered relatively minor because many sites have low accessibility. There is no suitable habitat for the Eastwood monkey-flower on the Site.

Western Mouse-Tail: Western mouse-tail (*Myosurus nitidus*) was first discovered in Montezuma County under sagebrush by Alice Eastwood, and is the only known collection in Colorado at this time. According to Harrington (1954) this species is reported in northern Arizona, northern New Mexico, and southwestern Colorado. There is suitable habitat on the Site, but no western mouse-tail was observed on the Site.

Long-Flower Cat's-Eye: Long-flower cat's-eye (*Oreocarya [Cryptantha] longiflora*) is typically called "longflower cryptantha" which is part of the Boraginaceae plant family. This plant is found on plains and on mesas in Colorado and Utah. Long-flowers cat's-eye can be found at elevations between 4,500 to 8,000 feet above MSL. The duration of the long-flowers cat's-eye plant is biennial and perennial. There is no suitable long-flower cat's-eye habitat located on the Site.

Paradox Breadroot: The Paradox breadroot (*Pediomelum aromaticum*) is a member of the pea family (Fabacea). The plant is a perennial herb. The plant prefers open piñon-juniper habitat, in sandy soils or adobe hills. The Paradox breadroot grows at an elevation of 4,800 to 5,700 feet above MSL. There is suitable habitat at the Site, but no Paradox breadroot was observed on the Site.

Little Penstemon: The little penstemon (*Penstemon breviculus*) is a perennial flower that flowers from May and June. The habitat for the little penstemon is sandy or clay soils of the Ojo Alamo Sandstone or Nacimiento Formation. The plant also has sagebrush and piñon-juniper associations at elevations of 4,800 to 6,000 feet above MSL. There is suitable habitat at the Site due to the sagebrush and piñon-juniper association, but no little penstemon was observed on the Site.

Abajo Penstemon: The Abajo penstemon (*Penstemon lentus*) is a perennial herb which flowers in May and June. The Abajo penstemon is a Four Corners endemic plant that is much more abundant in Utah than in Colorado, New Mexico or Arizona. New Mexico has four specimen records, Arizona has seven specimen records, Colorado has 39 specimen records and Utah has 56 specimen records collected. Its total range is about 160 miles. Abajo penstemon can be found in sagebrush, piñon-juniper, Gambel oak, and ponderosa pine communities at elevations of 4,500 to 7,500 feet above MSL. There is suitable habitat at the Site, but no Abajo penstemon was observed on the Site.

Grand Mesa Penstemon: The Grand Mesa penstemon (*Penstemon mensarum*) grows easily in well-drained soil in hot, sunny locations, and it is cold hardy in USDA zones 4-8. It is endemic to Colorado, and is known from approximately 30 occurrences in Garfield, Mesa, Delta, and Gunnison Counties. A vast majority of occurrences are documented on or near Forest Service land. This plant occurs among oaks and in meadows and colonizes roadcuts (Harrington, 1954). This species also occurs in deep clayey loam soils. The Grand Mesa penstemon can be found

at elevations of 7,100 to 9,350 feet above MSL. Habitat for the Grand Mesa penstemon was not observed on the Site.

Canyon Bog-Orchid: The canyon bog-orchid (*Platanthera sparsiflora* var. *ensifolia*) inhabits open, wet areas, seeps and bogs. Elevations range from 800 to 5,200 feet above MSL. The canyon bog-orchid is identified as a facultative wetland species (FWS, 1988). The small number of occurrences and the low population numbers contribute to the species' status in Colorado. There was no suitable habitat observed on the Site.

Uinta Basin Hookless Cactus: The Uinta basin hookless cactus (*Sclerocactus glaucus*) occurs in the Uinta Basin in Duchesne and Uintah counties, Utah, and in Delta, Garfield, Mesa, and Montrose counties, Colorado. Uinta Basin hookless cactus is found on river benches, valley slopes, and rolling hills of the Duchesne River, Green River, and Mancos formations. It is found in xeric, fine textured soils overlain with cobbles and pebbles, growing in salt desert shrub and piñon-juniper communities at elevations ranging from 4,100 to 6,200 feet above MSL. There is suitable habitat on the Site, but no Uinta hookless cactus was observed at the Site.

King Clover: No data are available on the king clover (*Trifolium kingii* subsp. *kingii*).

2.0 PURPOSE AND SCOPE

The vegetation study addressed by this report is intended to provide data and preliminary analysis for the baseline characterization of the environmental conditions present on the Site. This characterization will be used to establish potential environmental impacts caused by the construction, operation, and decommissioning of the uranium mill facility at the Site, and to provide a baseline for the current, pre-operational conditions of the Site.

Data were collected by Kleinfelder biologists during a four-season ecological survey to characterize the baseline conditions of the Site for inclusion in the Environmental Report (ER) in accordance with CDPHE guidance. The ER is required to be submitted in support of the license application to the CDPHE. Field investigations were conducted in general accordance with applicable Kleinfelder standard operating procedures (SOP) and Quality Procedures (QP) outlined in the work plan (Kleinfelder, 2007).

3.0 METHODS

Kleinfelder biologists used the line-transect method to collect site-specific vegetation data. Johnson and Routledge (1985) state that the line-transect method is the preferred method for assessing medium to large sites. Kleinfelder biologists conducted field studies on a seasonal frequency equating to a four-season survey. All transects were observed during each of the four seasons. Those seasons include Summer 2007, Fall 2007, Winter 2007/08, and Spring 2008. During the Summer 2007 and Winter 2007/08 season, odd-numbered sample points were observed and field data were collected concurrently for vegetation, wildlife, wildlife habitat, and bird point count surveys. Wildlife survey results are reported separately in the Wildlife Survey report dated January 2009. During the Fall 2007 season, even-numbered sample points were observed and data were collected for vegetation, wildlife, wildlife habitat, and bird point count surveys. During the Spring 2008 season, all even- and odd-numbered sample points (totaling 60) were evaluated to identify seasonal variations.

Copyright 2009 Kleinfelder

Refer to Appendix B for the habitat assessment forms completed during the field surveys for each season and Appendix C for photographs of the Site.

3.1 Vegetation

A line-transect method modified from Buckland et al. (2007) with selective observation points was utilized. Seven transects were systematically established north to south approximately 300 yards apart from east to west (Figure 5). Sample points were positioned every 300 yards on each transect using dead reckoning techniques with a compass and rangefinder. A total of 60 sample points make up the sampling grid. Sample points were marked with yellow flagging and their locations established using a global positioning system (GPS) device.

The vegetation data collected included: date, time, location, general site description, the presence of wildlife and/or sign, and vegetation information (Appendix A). Vegetation information collected consisted of canopy height, diameter at breast height (DBH) of the closest three trees, DBH maximum, DBH mean, percent ground cover, percent debris cover, and the five most dominant plant species in descending order. Vegetation types were recorded and compared against Colorado State and FWS Federal Threatened and Endangered (T&E) Species Lists.

One plant that is listed as a federally endangered species that is known to occur in Montrose County is the clay-loving wild buckwheat (*Eriogonum pelinophilum)*. Sensitive plants known to occur in Montrose County by Federal, State, or CNHP can be found in Table 1 and Section 1.5 of this report.

Representative samples for plants that were not identified in the field, due to time constraints and identification keys, were placed in an 8 ½ inch by 11 inch plant press. Samples were dried in the press for at least five days. Identification was completed using a regional dichotomous key in conjunction with a dissecting stereo microscope.

3.2 Summer Site Observations

From August 20, 2007 through August 24, 2007, Kleinfelder biologists were on the Site to conduct a general walk-through and establish the survey transect methodology. Kleinfelder representatives walked the southwestern bluff observing available habitats for the Site (Meyer, 2008, Page 5). Upon establishment of the sampling grid (Figure 5), the Kleinfelder biologists began the vegetation, wildlife, wildlife habitat, and point count bird surveys. Vegetation, wildlife, wildlife habitat, and point count bird surveys were completed concurrently on odd-numbered sample points for each of the seven transects (Figure 5) (Meyer, 2008, Page 8).

3.3 Fall Site Observations

On September 18 and 19, 2007, Kleinfelder biologists completed vegetation, wildlife, wildlife habitat, and point count bird surveys. Vegetation, wildlife, wildlife habitat, and point count bird surveys were completed concurrently on even-numbered sample points (Figure 5) (Meyer, 2008, Page 13).

Copyright 2009 Kleinfelder

3.4 Winter Site Observations

On January 16 and 17, 2008, Kleinfelder biologists completed a second duplicate vegetation, wildlife, wildlife habitat, and point count bird surveys on odd-numbered sample points (Figure 5) (Meyer, 2008, Page 15).

3.5 Spring Site Observations

On May 19 and 20, 2008, Kleinfelder biologists completed duplicate vegetation, wildlife, wildlife habitat, and point count bird surveys on all even- and odd-numbered sample points (Figure 5) (Meyer, 2008, Pages 20-23) to evaluate seasonal changes and determine if additional surveys were required.

3.6 Arroyo Observations

A vegetation assessment of the arroyos was completed in the Fall of 2007 and again in the Spring of 2008 to identify seasonal vegetation variations. The arroyo assessment consisted of a visual vegetation assessment. Refer to Kleinfelder (2008) for a detailed description of the arroyo's located on site.

4.0 RESULTS

Three distinct ecotones were identified within the Site (Figure 4) These ecotones include a piñon-juniper habitat along the bluffs in the southwest portion of the Site; a joining, narrow strip of big sage habitat; a native grassland habitat abuts both the big sage habitats throughout the central portion of the Site extending from the northwest corner of the Site to the southeast portion of the Site; and, another big sage habitat that covers the northeast half of the Site. The plants identified at the Site during the four season vegetation surveys are listed in Table 2.

Copyright 2009 Kleinfelder

Table 2
Identified Plants at the 60 Sample Points

Flora	
Common Name	**Scientific Name**
Trees	
Colorado ash	*Fraxinus anomala*
one-seeded juniper	*Juniperus monosperma*
piñon pine	*Pinus edulis*
Shrubs	
Utah serviceberry	*Amelanchier utahensis* var. *utahensis*
big sage	*Artemisia tridentata*
four-winged saltbrush	*Atriplex canescens*
mountain mahogany	*Cercocarpus montanus*
Mormon tea	*Ephedra virdis* var**.** *virdis*
rabbitbrush	*Ericameria nauseosa*
cliff fendler-bush	*Fendlera rupicola*
Forbs	
curveseed butterwort	*Ceratocephala testiculata*
herb sophia**	*Descurainia sophia*
redstem stork's bill	*Erodium cicutarium*
broom snakeweed**	*Gutierrezia sarothrae*
prickly pear	*Opuntia* spp**.**
Russian thistle**	*Salsola iberica*
mustard	Family Brassicaceae
Grasses	
bent-grass	*Agrostis palustris*
blue grama	*Bouteloua gracilis*
downy brome	*Bromus tectorum*
galleta-grass	*Hilaria jamesii*
fox-tailed barley	*Hordeum jubatum*
witchgrass	*Panicum capillare*
sixweeks fescue	*Vulpia octoflora*

** Noxious Weeds

Copyright 2009 Kleinfelder

Table 3 provides the canopy heights, canopy cover, diameter breast heights (DBH), percent ground cover, and percent debris cover for each of the three ecotones. Table 4 provides the five dominant plants for each of three ecotones. Some of the above listed categories are not applicable to certain ecotones as they have no trees, and are identified as Not Applicable (N/A).

Table 3
Ecotone Characteristics

Ecotone	Mean Canopy Height (Feet)	Mean Canopy Cover	DBH (Max inches)	DBH (Mean inches)	Mean Ground Cover	Mean Debris Cover
Piñon/Juniper	15	10.0%	8.0	5.1	28.7%	15.0%
Big Sage	N/A	N/A	N/A	N/A	46.4%	10.6%
Grassland	N/A	N/A	N/A	N/A	51.0%	10.9%

Table 4
Ecotone Dominant Plants

Ecotone	**Species 1	Species 2	Species 3	Species 4	Species 5
Piñon/Juniper	piñon pine	one-seeded juniper	bent-grass	Colorado ash	mountain mahogany
Big Sage	big sage	broom snakeweed	downy brome	sixweeks fescue	fox-tailed barley
Grassland	downy brome	four-winged saltbrush	redstem stork's bill	prickly pear	big sage

**Species 1 most dominant. Dominance decreases numerically with Species Number.

Arroyos were initially assessed throughout the site by visual inspection during the fall field survey (Figure 6). Vegetation within arroyos consisted of upland species such as four-winged saltbrush, big sage, and Russian thistle. The arroyos located on the Site were evaluated and classified as discontinuous ephemeral streams according to guidance from the *Review of Ordinary High Water Mark Indicators for Delineating Arid Streams in the Southwestern United States* (Lichvar and Wakeley, 2004).

Vegetation of the arroyos was consistent with the specific ecotone in which it lies. The observed difference in vegetation with arroyos versus outside of arroyos was the increase in growth habit due to increased available moisture within the arroyo channels. Vegetation in the arroyos was upwards of three times the size of surrounding vegetation. In addition, this increase in vegetation results in an increase in the wildlife habitat, as it supplies increased cover and forage.

Copyright 2009 Kleinfelder

5.0 CONCLUSIONS

5.1 Threatened and Endangered Species

The FWS currently has 13 species of plants federally listed as threatened or endangered in the State of Colorado (Bureau of Land Management, 2008). Of these 13 species, only the clay-loving buckwheat is federally listed by the USDA to occur in Montrose County, Colorado (USDA, 2008).

The soils on the Site are atypical of the critical habitat soils known for the clay-loving buckwheat. Due to this critical habitat being absent, Kleinfelder believes that the clay-loving buckwheat does not occur on Site. No clay-loving buckwheat was observed during the point count surveys.

In addition, 26 sensitive plants are listed to occur in the Uncompahgre Plateau area (refer to Table 1 and Section 1.5) A database and literature search was completed to identify potentially occurring sensitive plants prior to the field surveys to determine if any Federal, State, or Non-governmental Organization (NGO) listed plants could be present or observed on the Site. No Federal, State, or NGO listed species were observed on the Site.

The CDOW (2008) indicated that the Site is located in critical winter range for wildlife species. The CDOW goes on to provide that the Site provides potentially suitable habitat for the Gunnison's sage grouse. Refer to Kleinfelder (2009) Wildlife Survey Report for further information.

5.2 Piñon-Juniper Habitat

The bluffs along the southwest portion of the Site were investigated for vegetation species of concern and for vegetation health. The bluffs contain the piñon-juniper habitat. Vegetation included piñon pine, one-seeded juniper, single leaf ash, mountain mahogany, cliff fendler-bush, Mormon tea, Utah serviceberry, and various forbs and grasses. No species of concern were observed.

5.3 Big Sage Habitat

The big sage habitat on the Site consists of big sage, four-winged saltbrush, rabbitbrush, and various grasses including, but not limited to, bent-grass, blue grama, downy brome, galleta-grass, and fox-tailed barley.

No plant species of concern were observed, although disturbance of the big sage habitat has the potential to impact the Gunnison sage grouse habitat and critical winter range for wildlife species. The Gunnison sage grouse is not federally listed as threatened or endangered, but it is a Colorado state species of concern. There was no evidence that the big sage habitat on the Site was being utilized by the Gunnison sage grouse. However, the Site is located within the historic range of the Gunnison sage grouse (Bureau of Land Management, 2008). Additionally, according to the CDOW (2008) the Site has potentially suitable big sage habitat that could be utilized by the Gunnison sage grouse. Refer to Kleinfelder (2009) Wildlife Survey Report for further information.

Copyright 2009 Kleinfelder

5.4 Grassland Habitat

Interspersed throughout the grassland habitat on the Site was fox-tailed barley, bent-grass, downy brome, galleta-grass, prickly pear, blue gramma, and herb sophia. No species of concern were observed.

5.5 Noxious Weeds

Noxious weeds were present throughout the Site due to disturbed habitat from present and historic agricultural activities including cattle grazing. The observed noxious weeds (Table 2) are successional plants associated with current land management practices. Observed noxious weeds at the Site include Russian thistle, broom snakeweed, and herb sophia.

5.6 Summary

Overall, it is concluded that the Site has been impacted by past human activities. The vegetation found within the specific habitats on the Site is consistent with published literature. The Site is located within identified potential Gunnison sage grouse habitat according to the Colorado Division of Wildlife. The vegetation habitat utilized by the Gunnison sage grouse although limited, does exist within the Site boundaries. In general, the habitat on the Site is of low to average quality due to the past and present human and agricultural practices that have occurred.

Lastly, no Federal or State plant or animal species of concern were observed on the Site.

6.0 LIMITATIONS

Kleinfelder prepared this report in accordance with generally accepted standards of care that exist in Montrose County, Colorado at this time. This report may be used only by Energy Fuels Resources Corporation and only for the purposes stated. All information gathered by Kleinfelder is considered confidential and will be released only upon written authorization by Energy Fuels Resources Corporation or as required by law. Non-compliance with these requirements by Energy Fuels Resources Corporation or anyone else, unless specifically agreed to in advance by Kleinfelder in writing, will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party and Energy Fuels Resources Corporation agrees to defend, indemnify, and hold harmless Kleinfelder from any claim or liability associated with such unauthorized use or non-compliance.

Copyright 2009 Kleinfelder

7.0 REFERENCES

Atwood, D.N.; Holland, J; Bolander, R; Franklin, B.; House, D.E.; Armstrong, L.A.; Thorne, K; England, L, 1991, Utah Threatened, Endangered and Sensitive Plant Guide, U.S. Forest Service Intermountain Region, National Park Service, Bureau of Land Management, Utah Natural Heritage Program, U.S. Fish and Wildlife Service, Environmental Protection Agency, Navajo Nation and Skull Valley Goshute Tribe.

Bureau of Land Management (BLM), Gunnison Sage Grouse Conservation Plan, August 28, 2008, from http://www.blm.gov/co/st/en/fo/gfo/sage_grouse.html.

Bowlin, W. R., V. J. Tepedino, and T. L. Griswold, 1993, The Reproductive Biology of Eriogonum pelinophilum (Polygonaceae). In R. C. Sivinski and K. Lightfoot, eds., 1993, Southwestern Rare and Endangered Plants, Proceedings of the Conference, Santa Fe, pp. 296-300.

Braun, C.E., M. F. Baker, R. L. Eng, J. S. Gashwiler, and M. H. Schroeder, 1976, Conservation Committee Report on Effects of Alteration of Sagebrush Communities on the Associated Avifauna/A, Wilson Bulletin 88:165-171.

Brown, D. E. (editor), 1994, Biotic Communities Southwestern United States and Northwestern Mexico, University of Utah Press, Salt Lake City, Utah.

Buckland, S. T., D. L. Borchers, A. Johnston, P. A. Henrys, T. A. Marques, 2007, Line Transect Methods for Plant Surveys, Biometrics 63: 989-996.

Chapman, S.S., Griffith, G.E., Omernik, J.M., Price, A.B., Freeouf, J., and Schrupp, D.L., 2006, Ecoregions of Colorado (color poster with map, descriptive text, summary tables, and photographs), Reston, Virginia, U.S. Geological Survey (map scale 1:1,200,000).

Cleland, D.T., P.E. Avers, W.H. Mcnab, M.E. Jensen, R.G. Bailey, T. King, and W.W. Russell, 1997, National Hierarchical Framework of Ecological Units. In M.S. Boyce and A. Haney (eds.), Ecosystem Management: Applications for Sustainable Forest and Wildlife Resources, New Haven, CT, Yale University Press, pp. 181-200.

Colorado Division of Wildlife (CDOW), 2008, Letter correspondence, Mr. Renzo DelPiccolo (CDOW) to Mr. Steve White, Land Use Director, Montrose County, August 15, 2008.

Colorado Partners in Flight, 2008, Land Bird Conservation Plan-Physiographic Area 87, http://www.rmbo.org/pif/bcp/phy87/pj.html.

Department of Agriculture, Forest Service, Rocky Mountain Research Station, Ogden, Pieper, R., 1977, The Southwestern Piñon-Juniper Ecosystem, In Ecology, Use and Management of Piñon-Juniper Woodlands, Proceedings of the Workshop (E. F. Aldon and T. J. Loring, eds.), U.S. Forest Service General Technical Report RM-39, pp 1-2.

Dorn, R.D., 1992, Vascular Plants of Wyoming, second edition. Mountain West Publishing, Cheyenne, WY.

Copyright 2009 Kleinfelder

ECOMAP, 1993, National Hierarchical Framework of Ecological Units, Washington, DC, USDA Forest Service, 20 p.

Flora of North America, “Eriogonum pelinophilum”, August 22, 2008 from http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=250060457.

Harrington, H.D., 1954, Manual of the Plants of Colorado. Sage Books, Denver, CO.

Hermann, R. K., 1982, The Genus *Pseudotsugar* Historical Records and Nomenclature, Corvallis, Oregon, Forest Research Laboratory.

Hitchcock, C.L., 1941, A revision of the *Drabas* of western North America, University of Washington Publ. Biology 11:1-132.

Johnson, E. G. and R. D. Routledge, 1985, The Line Transect Method: A Nonparametric Estimator Based on Shape Restrictions, Biometrics 41:669-679.

Kleinfelder, 2007. Work Plan: Ecological Baseline Site Characterization, Albuquerque, New Mexico, August 15, 2007.

Kleinfelder, 2008, Preliminary Wetland Delineation and Jurisdiction Determination: Energy Fuels Resources Corporation, 19610 State Highway 90, Bedrock, Montrose County, Colorado.

Kleinfelder, 2009, Wildlife Survey Report: Ecological Baseline Site Characterization. Albuquerque, New Mexico, February 2009.

LaRue, C.T., 1994, Birds of Northern Black Mesa, Navajo County, Arizona, Great Basin Naturalist 54(1), pp. 1-63.

Lichvar, R. W., J. S. Wakeley, eds., 2004, Review of Ordinary High Water Mark Indicators for Delineating Arid Streams in the Southwestern United States, U.S. Corps of Engineers Technical Report.

Little, E. L., 1977, Research in the Piñon-Juniper Woodland. In Proceedings of Ecology, Uses and Management of Piñon-Juniper Woodlands; In Ecology, Use and Management of Piñon-Juniper Woodlands, Proceedings of the Workshop (E. F. Alson and T. J. Loring, eds.), U.S. Forest Service General Technical Report RM-39, pp 8-19.

Meyer, J.J., 2008, Kleinfelder Log Book, Energy Fuels Resources Habitat Assessment, 26 p.

Paysen, T.E., R.J. Ansley, J.K. Brown, G.J. Gottfried, S.M. Haase, M.G. Harrington, M.G. Naroag, S.S. Sackett and R.C. Wilson, 2000, Fire in Western Shrubland, Woodland, and Grassland Ecosystems; In J.K. Brown and J.K. Smith (eds.), Wildland Fire in Ecosystems: Effects of Fire on Flora, General Technical Report RMRSGTR- 42, Volume 2, pp. 121-159.

Rollins, R.C. 1993, The Cruciferae of Continental North America, Systematic of the Mustard Family from the Arctic to Panama. Stanford Univ. Press, Stanford, CA.

Copyright 2009 Kleinfelder

Rydberg, P.A, 1905, Studies on the Rocky Mountain Flora-XIV, Contributions from the New York Botanical Garden 32:132-133.

Tueller, P. T., C. D. Beeson, R. J. Tausch, N. E. West, and K. H. Rea., 1979, Piñon-juniper Woodlands of the Great Basin: Distribution, Flora, Vegetal Cover, U.S. Forest Service Research Publication INT-229.

Tuhy, J.S., P. Comer, D. Dorfman, M. Lammert, J. Humke, B. Cholvin, G. Bell, B.Neely, S. Silbert, L. Whitham, and B. Baker, 2002, A Conservation Assessment of the Colorado Plateau Ecoregion, The Nature Conservancy, Moab, Utah, 110 p.

Uncompahgre Plateau Project (UPP), 2009, Accessed January 23, 2009, from www.upproject.org/publications/pdfs/upplan_app.pdf.

United States Department of Agriculture (USDA), Natural Resources Conservation Service "Plants Profile: Eriogonum pelinophilum.", Accessed August 27, 2008, from http://plants.usda.gov/java/profile?symbol=ERPE10.

United States Fish and Wildlife Services (USFWS), 2008, Mountain-Prairie Region, Colorado, Species List by County, Accessed September 11, 2008, from http://www.fws.gov/mountain-prairie/endspp/countylists/colorado.pdf.

Vale, T. R., 1975, Presettlement Vegetation in the Sagebrush-Grass Area of the Intermountain West, Journal of Range Management 28, pp. 32-36.

Weber, W.A. and R.C. Wittman. 1996, Colorado Flora – Western Slope, second edition, University Press of Colorado, Niwot, CO.

Weber, W.A. and R.C. Wittman. 2001, Colorado Flora: Western Slope, Third. Edition, University Press of Colorado, Niwot, CO.

West, N. E., 1983, Great Basin - Colorado Plateau Sagebrush Semi-desert; In N. E. West (ed.), Ecosystems of the World 5: Temperate Deserts and Semi-deserts, Sussex, UK, Elsevier Scientific Publication Ltd., pp 331-349.

Copyright 2009 Kleinfelder

APPENDIX A

HABITAT OBSERVATIONS

Piñon Ridge Uranium Mill
Project # 83088-1.8.2

										Vegetation Information						Dominant Plant Species				
Season	Date	Time	Site Location	Biological Assessors	General Site Description	Aspect	WX Conditions	Signs of Wildlife Observed	Bird Survey	Canopy Height	Canopy Cover	DBH (in) (maximum)	DBH (in) (mean)	Ground Cover (%)	Debris Cover (% estimated)	Species 1	Species 2	Species 3	Species 4	Species 5
Summer	8/24/2007	0818	T1-3	JM,SB	PJ on steep slope	East	Clear, Calm, 80F	Passerine birds	Yes	18ft	15%	6.3	4.9	18%	<5%	*Juniperus monosperma*	*Pinus edulis*	*Gutierrezia sarothae*	*Panicum capillare*	*Agrostis palustris*
Summer	8/23/2007	1653	T1-5	JM,SB	Native Grassland	Northeast	Clear, Wind 8-12mph, 90F	Rabbit scat, small burrows	Yes	NA	None	NA	NA	83%	60%	*Agrostis palustris*	*Salsola iberica*	*Artemesia tridentata*		
Summer	8/23/2007	1319	T1-7	JM,SB	Native Grassland	East-Southeast	Clear, Wind 3-5mph, 87F	Rabbit burrows	Yes	NA	None	NA	NA	33%	0%	*Agrostis palustris*	*Hilaria jamesii*	*Bouteloua gracilis*	*Panicum capillare*	
Summer	8/23/2007	1158	T1-9	JM,SB	Native Grassland	West-Southwest	Clear, Wind 5-8mph, 85F	None	Yes	NA	None	NA	NA	33%	20%	*Agrostis palustris*	*Hilaria jamesii*	*Bouteloua gracilis*	*Salsola iberica*	*Gutierrezia sarothrae*
Summer	8/24/2007	0849	T2-3	JM,SB	Native Grassland	Northeast	Clear, Calm, 82F	Rabbit scat, Sparrows	No	NA	None	NA	NA	67%	85%	*Opuntia* spp.	*Agrostis palustris*	Brassicaceae	*Bromus tectorum*	*Atriplex canescens*
Summer	8/23/2007	1627	T2-5	JM,SB	Native Grassland	North	Clear, Calm, 90F	Cow dung	No	NA	None	NA	NA	83%	30%	*Salsola iberica*	*Agrostis palustris*	*Hilaria jamesii*	*Opuntia* spp.	
Summer	8/23/2007	1325	T2-7	JM,SB	Disturbed Grassland	East	Partly cloudy, Wind 8-12mph, 80F	None	No	NA	None	NA	NA	67%	5%	*Agrostis palustris*	*Hilaria jamesii*	*Bouteloua gracilis*	*Gutierrezia sarothae*	*Salsola iberica*
Summer	8/23/2007	1135	T2-9	JM,SB	Big Sage	West-Southwest	Clear, Wind 5-8mph, 85F	Rabbit scat, small burrows	No	NA	None	NA	NA	33%	35%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Agrostis palustris*	*Hilaria jamesii*	*Panicum capillare*
Summer	8/24/2007	1107	T3-1	JM,SB	PJ on steep slope	Northeast	Clear, Calm, 82F	Eastern Fence lizzard, Mountain bluebird	Yes	20ft	30%	7.0	5.4	18%	35%	*Pinus edulis*	*Juniperus monosperma*	*Cercocarpus montanus*	*Fendlera rupicola*	*Agrostis palustris*
Summer	8/24/2007	0910	T3-3	JM,SB	Native Grassland	Northwest	Clear, Calm, 88F	Rabbit scat, passerine birds	Yes	NA	None	NA	NA	50%	35%	*Agrostis palustris*	*Bouteloua gracilis*	*Salsola iberica*	*Opuntia spp.*	*Artemesia tridentata*
Summer	8/23/2007	1621	T3-5	JM,SB	Native Grassland	Northeast	Clear, Calm, 82F	Rabbit scat, passerine birds	Yes	NA	None	NA	NA	100%	35%	*Gutierrezia sarothrae*	*Artemesia tridentata*	*Bromus tectorum*		
Summer	8/23/2007	1344	T3-7	JM,SB	Disturbed Big Sage	East-Northeast	Partly cloudy, Wind 4-8mph, 85F	Rabbit scat, Butterfly, Sparrow	Yes	NA	None	NA	NA	18%	12%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Opuntia* spp.	*Biological soil crust*	
Summer	8/23/2007	1116	T3-9	JM,SB,LB	Disturbed Big Sage	South-Southwest	Clear, Wind 8-12mph, 85F	Eastern fence lizzard	Yes	NA	None	NA	NA	33%	7%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Agrostis palustris*	*Hilaria jamesii*	Brassicaceae
Summer	8/24/2007	1051	T4-1	JM,SB	Big Sage	Northeast	Clear, Calm, 85F	Blue-tailed skink, Dusky Flycatcher	No	NA	None	NA	NA	50%	60%	*Artemesia tridentata*	*Opuntia* spp.	*Gutierrezia sarothae*	*Bromus tectorum*	
Summer	8/24/2007	0922	T4-3	JM,SB	Native Grassland	Northeast	Clear, Calm, 82F	Rabbit scat, passerine birds	No	NA	None	NA	NA	18%		*Agrostis palustris*	*Hilaria jamesii*	*Opuntia* spp.	*Atriplex canescens*	*Salsola iberica*
Summer	8/23/2007	1601	T4-5	JM,SB	Disturbed Big Sage	North	Partly cloudy, Wind 3-5mph, 90F	Rabbit Scat	No	NA	None	NA	NA	50%	50%	*Gutierrezia sarothrae*	*Atriplex canescens*	*Artemesia tridentata*	*Bromus tectorum*	*Salsola iberica*
Summer	8/23/2007	1357	T4-7	JM,SB	Disturbed Big Sage	South-Southwest	Partly cloudy, Wind 4-8mph, 85F	Rabbit scat, squrell bones	No	NA	None	NA	NA	83%	25%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Agrostis palustris*	*Hilaria jamesii*	*Bouteloua gracilis*
Summer	8/23/2007	1051	T4-9	JM,SB,LB	Disturbed Big Sage	West	Clear, Wind 8-15mph, 85F	Cow dung, swallow	No	NA	None	NA	NA	33%		*Agrostis palustris*	*Hilaria jamesii*	*Bouteloua gracilis*	Brassicaceae	
Summer	8/24/2007	1055	T5-3	JM,SB	Native Grassland	Northwest	Clear, Calm, 82F	Horned lizzard, rabbit scat	Yes	NA	None	NA	NA	33%	70%	*Salsola iberica*	*Atriplex canescens*	*Agrostis palustris*	*Hilaria jamesii*	
Summer	8/23/2007	1554	T5-5	JM,SB	Big Sage	North-Northeast	Partly cloudy, Calm, 87F	Blacktailled Jackrabbit, cottontail, Passerine birds, Burrows	Yes	NA	None	NA	NA	33%	40%	*Artemesia tridentata*	Brassicaceae			
Summer	8/23/2007	1419	T5-7	JM,SB	Disturbed Big Sage	North-Northeast	Partly cloudy, Wind 3-5mph, 85F	Rabbit scat	Yes	NA	None	NA	NA	50%		*Artemesia tridentata*	*Gutierrezia sarothrae*	*Agrostis palustris*		
Summer	8/23/2007	1037	T5-9	JM,SB,LB	Disturbed Big Sage	East	Clear, Wind 8-15mph, 85F	Eastern fence lizzard, swallow	Yes	NA	None	NA	NA	83%	15%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Agrostis palustris*		
Summer	8/24/2007	1012	T6-3	JM,SB	Disturbed Grassland	South-Southwest	Clear, Calm, 85F	Rabbit scat	No	NA	None	NA	NA	33%	12%	*Atriplex canescens*	*Artemesia tridentata*	*Salsola iberica*		
Summer	8/23/2007	1533	T6-5	JM,SB	Disturbed Big Sage	South	Clear, Calm, 82F	Rabbit burrows, cow dung, rabbit scat, blacktailed jackrabbit, sparrow	No	NA	None	NA	NA	66%		*Gutierrezia sarothrae*	*Salsola iberica*	*Artemesia tridentata*	*Bromus tectorum*	
Summer	8/23/2007	1429	T6-7	JM,SB	Disturbed Big Sage	East	Partly cloudy, Wind 3-5mph, 85F	red harvester ants, rabbit scat, an unidentified butterfly	No	NA	None	NA	NA	67%	13%	*Gutierrezia sarothrae*	*Artemesia tridentata*	Biological Soil Crusts		
Summer	8/23/2007	1010	T6-9	JM,SB,LB	Disturbed Big Sage	Northwest	Clear, Wind 5-8mph, 85F	None	No	NA	None	NA	NA	67%	5%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Agrostis palustris*	*Bromus tectorum*	

Piñon Ridge Uranium Mill
Project # 83088-1.8.2

										Vegetation Information						Dominant Plant Species				
Season	Date	Time	Site Location	Biological Assessors	General Site Description	Aspect	WX Conditions	Signs of Wildlife Observed	Bird Survey	Canopy Height	Canopy Cover	DBH (in) (maximum)	DBH (in) (mean)	Ground Cover (%)	Debris Cover (% estimated)	Species 1	Species 2	Species 3	Species 4	Species 5
Summer	8/24/2007	1031	T7-3	JM,SB	Native Grassland	Northeast	Clear, Calm, 83F	Passerine birds, rabbit scat	Yes	NA	None	NA	NA	18%	80%	*Agrostis palustris*	*Bouteloua gracilis*	*Bromus tectorum*	*Salsola iberica*	*Atriplex canescens*
Summer	8/23/2007	1524	T7-5	JM,SB	Disturbed Grassland	South	Partly cloudy, Calm, 87F	Passerine birds, rabbit scat	Yes	NA	None	NA	NA	18%	30%	*Salsola iberica*	*Bromus tectorum*			
Summer	8/23/2007	1500	T7-7	JM,SB	Disturbed Big Sage	Southeast	Partly cloudy, Calm, 87F	Passerine birds	Yes	NA	None	NA	NA	33%	30%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Hordeum jubatum*	*Agrostis palustris*	*Bouteloua gracilis*
Summer	8/23/2007	0949	T7-9	JM,SB,LB	Disturbed Big Sage	West-Southwest	Clear, Calm, 85F	Five-lined skink, sparrow	Yes	NA	None	NA	NA	50%	5%	*Gutierrezia sarothrae*	*Agrostis palustris*	*Bromus tectorum*	*Artemesia tridentata*	*Opuntia* spp.
Fall	9/19/2007	0923	T1-2	JM,MZ	PJ on steep slope	North	Clear, Calm, 77˚F	None	No	15ft	15%	8.65in	3.16in	50%	5%	*Agrostis palustris*	*Ephedra*	*Pinus edulis*	*Fraxinus anomala*	*Juniperous monosperma*
Fall	9/18/2007	1256	T1-4	JM,MZ	Native Grassland	North	Clear, Calm, 87˚F	Rabbit Scat	No	NA	None	NA	NA	67%	5%	*Agrostis palustris*	*Bromus tectorum*	*Opuntia* spp.	*Salsola iberica*	
Fall	9/18/2007	1243	T1-6	JM,MZ	Native Grassland	North	Clear, Calm, 87˚F	Rabbit scat	No	NA	None	NA	NA	18%	5%	*Agrostis palustris*	*Bromus tectorum*	*Artemesia tridentata*	*Atriplex canescens*	
Fall	9/18/2007	0817	T1-8	JM,MZ	Native Grassland	North	Clear, Calm, 77˚F	Crow, Rabbit burrows, ground squirrel burrows	No	NA	None	NA	NA	18%	5%	*Agrostis palustris*	*Bromus tectorum*	*Bouteloua gracilis*	*Salsola iberica*	*Atriplex canescens*
Fall	9/18/2007	1519	T2-2	JM,MZ	Big Sage adjacent to PJ Zone	North-Northeast	Clear, Wind 3-5mph, 87F	Eastern cottontail	Yes	15ft	20%	6.0in	6.0in	67%	35%	*Artemesia tridentata*	*Bromus tectorum*	*Juniperus monosperma*	*Opuntia* spp.	
Fall	9/18/2007	1306	T2-4	JM,MZ	Native Grassland	North	Clear, Calm, 87˚F	Rabbit scat	Yes	NA	None	NA	NA	83%	23%	*Agrostis palustris*	*Opuntia* spp.	*Salsola iberica*	*Bromus tectorum*	
Fall	9/18/2007	1226	T2-6	JM,MZ	Native Grassland	North-Northeast	Clear, Calm, 70F	Rabbit scat/tracks	Yes	NA	None	NA	NA	50%	10%	*Agrostis palustris*	*Opuntia* spp.	*Artemesia tridentata*	*Salsola iberica*	
Fall	9/18/2007	0827	T2-8	JM,MZ	Big Sage	Northwest	Clear, Calm, 70F	None	Yes	NA	None	NA	NA	50%	25%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Bromus tectorum*		
Fall	9/18/2007	1502	T3-2	JM,MZ	Native Grassland	North-Northeast	Clear, Calm, 87˚F	None	No	NA	None	NA	NA	50%	15%	*Agrostis palustris*	*Opuntia* spp.	*Gutierrezia sarothae*	*Bromus tectorum*	
Fall	9/18/2007	1322	T3-4	JM,MZ	Native Grassland	North	Clear, Calm, 87˚F	Rabbit scat	No	NA	None	NA	NA	83%	35%	*Salsola iberica*	*Artemesia tridentata*	*Agrostis palustris*	*Bromus tectorum*	*Bouteloua gracilis*
Fall	9/18/2007	1217	T3-6	JM,MZ	Native Grassland	North	Clear, Calm, 87˚F	Rabbit Scat	No	NA	None	NA	NA	50%	5%	*Bromus tectorum*	*Bouteloua gracilis*	*Opuntia* spp.		
Fall	9/18/2007	0849	T3-8	JM,MZ	Big Sage	Northeast	Clear, Calm, 80F	Red harvester ant pile and could hear sparrows	No	NA	None	NA	NA	50%	5%	*Salsola iberica*	*Artemesia tridentata*	*Agrostis palustris*	*Bromus tectorum*	*Bouteloua gracilis*
Fall	9/18/2007	1454	T4-2	JM,MZ	Native Grassland	North	Clear, Wind 3-5mph, 87F	None	Yes	NA	None	NA	NA	67%	25%	*Agrostis palustris*	*Bromus tectorum*	*Salsola iberica*		
Fall	9/18/2007	1331	T4-4	JM,MZ	Native Grassland	North	Clear, Calm, 87˚F	Rabbit scat	Yes	NA	None	NA	NA	50%	15%	*Bromus tectorum*	*Salsola iberica*	*Atriplex canescens*		
Fall	9/18/2007	1200	T4-6	JM,MZ	Disturbed Big Sage	North	Clear, Calm, 87˚F	Rabbit scat, passerine birds	Yes	NA	None	NA	NA	18%	40%	*Gutierrezia sarothrae*	*Artemesia tridentata*	*Bromus tectorum*	*Bouteloua gracilis*	
Fall	9/18/2007	0900	T4-8	JM,MZ	Big Sage	West	Clear, Calm, 80F	Rabbit scat	Yes	NA	None	NA	NA	50%	5%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Opuntia* spp.		
Fall	9/18/2007	0925	T4-10	JM,MZ	US90 ROW	South	Clear, Calm, 80F	None	Yes	NA	None	NA	NA	18%	5%	*Ericameria nauseosa*	*Agrostis palustris*	*Bromus tectorum*		
Fall	9/18/2007	1446	T5-2	JM,MZ	Disturbed Grassland	North	Clear, Wind 5-7mph, 82F	Rabbit scat	No	NA	None	NA	NA	18%	40%	*Agrostis palustris*	*Salsola iberica*	*Bromus tectorum*		
Fall	9/18/2007	1347	T5-4	JM,MZ	Native Grassland	North	Clear, Calm, 88F	Rabbit scat	No	NA	None	NA	NA	18%	10%	*Salsola iberica*	*Atriplex canescens*	*Bromus tectorum*		
Fall	9/18/2007	1150	T5-6	JM,MZ	Big Sage	North	Clear, Calm, 85F	Rabbit scat, cliff swallow	No	NA	None	NA	NA	50%	30%	*Artemesia tridentata*	*Agrostis palustris*	*Bromus tectorum*	*Hilaria jamesii*	
Fall	9/18/2007	1011	T5-8	JM,MZ	Big Sage	Southeast	Clear, Calm, 85F	Sage Sparrows, rabbit scat	No	NA	None	NA	NA	33%	12%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Bromus tectorum*	*Agrostis palustris*	*Bouteloua gracilis*
Fall	9/18/2007	0950	T5-10	JM,MZ	Big Sage	Northeast	Clear, Calm, 83F	None	No	NA	None	NA	NA	18%	5%	*Agrostis palustris*	*Artemesia tridentata*	*Gutierrezia sarothae*	*Bouteloua gracilis*	
Fall	9/18/2007	1429	T6-2	JM,MZ	Native Grassland	North-Northeast	Partly Cloudy, Calm, 84F	Rabbit scat	Yes	NA	None	NA	NA	33%	40%	*Bromus tectorum*	*Salsola iberica*	*Atriplex canescens*		
Fall	9/18/2007	1356	T6-4	JM,MZ	Native Grassland	North	Clear, Wind 1-3mph, 87F	Rabbit scat	Yes	NA	None	NA	NA	50%	5%	*Bromus tectorum*	*Salsola iberica*	*Atriplex canescens*		
Fall	9/18/2007	1128	T6-6	JM,MZ	Big Sage	North-Northwest	Clear, Calm, 85F	Rabbit Scat	Yes	NA	None	NA	NA	67%	5%	*Artemesia tridentata*	*Gutierrezia sarothrae*			
Fall	9/18/2007	1023	T6-8	JM,MZ	Big Sage	North-Northeast	Clear, Calm, 85F	Rabbit scat, banded Argiope spider	Yes	NA	None	NA	NA	50%	21%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Bromus tectorum*		
Fall	9/18/2007	1420	T7-2	JM,MZ	Disturbed Grassland	Northeast	Clear, Wind 3-7mph, 85F	None	No	NA	None	NA	NA	17%	30%	*Atriplex canescens*	*Bromus tectorum*			

Piñon Ridge Uranium Mill
Project # 83088-1.8.2

										Vegetation Information						Dominant Plant Species				
Season	Date	Time	Site Location	Biological Assessors	General Site Description	Aspect	WX Conditions	Signs of Wildlife Observed	Bird Survey	Canopy Height	Canopy Cover	DBH (in) (maximum)	DBH (in) (mean)	Ground Cover (%)	Debris Cover (% estimated)	Species 1	Species 2	Species 3	Species 4	Species 5
Fall	9/18/2007	1410	T7-4	JM,MZ	Disturbed Grassland	North	Clear, Calm, 89F	Rabbit scat	No	NA	None	NA	NA	50%	10%	*Salsola iberica*	*Atriplex canescens*	*Bromus tectorum*		
Fall	9/18/2007	1101	T7-6	JM,MZ	Disturbed Big Sage	North	Clear, Calm, 85F	Rabbit scat	No	NA	None	NA	NA	17%	20%	*Atriplex canescens*	*Salsola iberica*			
Fall	9/18/2007	1046	T7-8	JM,MZ	Disturbed Big Sage	North	Clear, Calm, 85F	ground squirrel burrows	No	NA	None	NA	NA	33%	5%	*Artemesia tridentata*	*Agrostis palustris*	*Bouteloua gracilis*		
Winter	1/16/2008	0840	T1-3	JM,MZ	PJ on steep slope	East	Clear, Calm, 15F, 3" snow	Coyote tracks, elk tracks	Yes	18ft	15%	6.3	4.9	18%	<5%	*Juniperus monosperma*	*Pinus edulis*	*Gutierrezia sarothae*	*Panicum capillare*	*Agrostis palustris*
Winter	1/16/2008	1229	T1-5	JM,MZ,LB	Native Grassland	Northeast	Clear, Wind 8-10mph, 15F, 3" snow	None	Yes	NA	None	NA	NA	83%	60%	*Agrostis palustris*	*Salsola iberica*	*Artemesia tridentata*		
Winter	1/16/2008	1245	T1-7	JM,MZ,LB	Native Grassland	East-Southeast	Clear, Wind 3-5mph, 20F, 3" snow	Rabbit tracks	Yes	NA	None	NA	NA	33%	0%	*Agrostis palustris*	*Hilaria jamesii*	*Bouteloua gracilis*	*Panicum capillare*	
Winter	1/16/2008	1529	T1-9	JM,MZ	Native Grassland	West-Southwest	Clear, Wind 10mph, 20F, 2" snow	Rabbit tracks/scat	Yes	NA	None	NA	NA	33%	20%	*Agrostis palustris*	*Hilaria jamesii*	*Bouteloua gracilis*	*Salsola iberica*	*Gutierrezia sarothrae*
Winter	1/16/2008	0855	T2-3	JM,MZ	Native Grassland	Northeast	Clear, Calm, 15F, 4" snow	None	No	NA	None	NA	NA	67%	85%	*Opuntia* spp.	*Agrostis palustris*	Brassicaceae	*Bromus tectorum*	*Atriplex canescens*
Winter	1/16/2008	1142	T2-5	JM,MZ,LB	Native Grassland	North	Clear, wind 10-12mph, 17F, 3" snow	None	No	NA	None	NA	NA	83%	30%	*Salsola iberica*	*Agrostis palustris*	*Hilaria jamesii*	*Opuntia* spp.	
Winter	1/16/2008	1259	T2-7	JM,MZ,LB	Disturbed Grassland	East	Clear, Wind 3-5mph, 20F, 3" snow	Rabbit tracks, mouse tracks	No	NA	None	NA	NA	67%	5%	*Agrostis palustris*	*Hilaria jamesii*	*Bouteloua gracilis*	*Gutierrezia sarothae*	*Salsola iberica*
Winter	1/16/2008	1523	T2-9	JM,MZ,LB	Big Sage	West-Southwest	Clear, Wind 6-8mph, 20F, 3" snow	Rabbit tracks	No	NA	None	NA	NA	33%	35%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Agrostis palustris*	*Hilaria jamesii*	*Panicum capillare*
Winter	1/16/2008	0925	T3-1	JM,MZ	PJ on steep slope	Northeast	Clear, Calm, 12F, 4" snow	Rabbit tracks	Yes	20ft	30%	7.0	5.4	18%	35%	*Pinus edulis*	*Juniperus monosperma*	*Cercocarpus montanus*	*Fendlera rupicola*	*Agrostis palustris*
Winter	1/16/2008	0902	T3-3	JM,MZ	Native Grassland	Northwest	Clear, Calm, 17F, 4" snow	Mouse tracks, coyote tracks	Yes	NA	None	NA	NA	50%	35%	*Agrostis palustris*	*Bouteloua gracilis*	*Salsola iberica*	*Opuntia spp.*	*Artemesia tridentata*
Winter	1/16/2008	1129	T3-5	JM,MZ	Native Grassland	Northeast	Clear, Wind 8-10mph, 15F, 3" snow	Rabbit tracks	Yes	NA	None	NA	NA	100%	35%	*Gutierrezia sarothrae*	*Artemesia tridentata*	*Bromus tectorum*		
Winter	1/16/2008	1307	T3-7	JM,MZ,LB	Disturbed Big Sage	East-Northeast	Clearf, Calm, 20F, 3" snow	Rabbit tracks	Yes	NA	None	NA	NA	18%	12%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Opuntia* spp.	*Biological soil crust*	
Winter	1/16/2008	1511	T3-9	JM,MZ,LB	Disturbed Big Sage	South-Southwest	Clear, Wind 3-5mph, 20F, 3" snow	Rabbit tracks	Yes	NA	None	NA	NA	33%	7%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Agrostis palustris*	*Hilaria jamesii*	Brassicaceae
Winter	1/16/2008	0945	T4-1	JM,MZ	Big Sage	Northeast	Clear, Calm, 15F, 3" snow	Rabbit tracks, Elk tracks	No	NA	None	NA	NA	50%	60%	*Artemesia tridentata*	*Opuntia* spp.	*Gutierrezia sarothae*	*Bromus tectorum*	
Winter	1/16/2008	0957	T4-3	JM,MZ	Native Grassland	Northeast	Clear, wind 5mph, 15F, 3" snow	None	No	NA	None	NA	NA	18%		*Agrostis palustris*	*Hilaria jamesii*	*Opuntia* spp.	*Atriplex canescens*	*Salsola iberica*
Winter	1/16/2008	1120	T4-5	JM,MZ	Disturbed Big Sage	North	Clear, Wind 8-10mph, 20F, 3" snow	Rabbit tracks	No	NA	None	NA	NA	50%	50%	*Gutierrezia sarothrae*	*Atriplex canescens*	*Artemesia tridentata*	*Bromus tectorum*	*Salsola iberica*
Winter	1/16/2008	1324	T4-7	JM,MZ,LB	Disturbed Big Sage	South-Southwest	Clear, Calm, 20F, 3" snow	Rabbit tracks	No	NA	None	NA	NA	83%	25%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Agrostis palustris*	*Hilaria jamesii*	*Bouteloua gracilis*
Winter	1/16/2008	1501	T4-9	JM,MZ,LB	Disturbed Big Sage	West	Clear, Calm, 20F, 3" snow	Rabbit tracks	No	NA	None	NA	NA	33%		*Agrostis palustris*	*Hilaria jamesii*	*Bouteloua gracilis*	Brassicaceae	
Winter	1/16/2008	1004	T5-3	JM,MZ	Native Grassland	Northwest	Clear, wind 10mph, 15F, 4" snow	Rabbit tracks	Yes	NA	None	NA	NA	33%	70%	*Salsola iberica*	*Atriplex canescens*	*Agrostis palustris*	*Hilaria jamesii*	
Winter	1/16/2008	1105	T5-5	JM,MZ	Big Sage	North-Northeast	Clear, Calm, 15F, 3" snow	Blacktailled jackrabbit	Yes	NA	None	NA	NA	33%	40%	*Artemesia tridentata*	Brassicaceae			
Winter	1/16/2008	1332	T5-7	JM,MZ,LB	Disturbed Big Sage	North-Northeast	Clear, Wind 3-5mph, 20F, 3" snow	Rabbit tracks	Yes	NA	None	NA	NA	50%		*Artemesia tridentata*	*Gutierrezia sarothrae*	*Agrostis palustris*		
Winter	1/16/2008	1443	T5-9	JM,MZ,LB	Disturbed Big Sage	East	Clear, Wind 3-5mph, 20F, 3" snow	Rabbit tracks	Yes	NA	None	NA	NA	83%	15%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Agrostis palustris*		
Winter	1/16/2008	1019	T6-3	JM,MZ	Disturbed Grassland	South-Southwest	Clear, wind 5mph, 15F, 3" snow	Rabbit tracks, Elk tracks, Deer tracks	Yes	NA	None	NA	NA	33%	12%	*Atriplex canescens*	*Artemesia tridentata*	*Salsola iberica*		

Piñon Ridge Uranium Mill
Project # 83088-1.8.2

										Vegetation Information						Dominant Plant Species				
Season	Date	Time	Site Location	Biological Assessors	General Site Description	Aspect	WX Conditions	Signs of Wildlife Observed	Bird Survey	Canopy Height	Canopy Cover	DBH (in) (maximum)	DBH (in) (mean)	Ground Cover (%)	Debris Cover (% estimated)	Species 1	Species 2	Species 3	Species 4	Species 5
Winter	1/16/2008	1055	T6-5	JM,MZ	Disturbed Big Sage	South	Clear, Wind 4-6mph, 15F, 3" snow	Rabbit tracks	No	NA	None	NA	NA	66%		*Gutierrezia sarothrae*	*Salsola iberica*	*Artemesia tridentata*	*Bromus tectorum*	
Winter	1/16/2008	1347	T6-7	JM,MZ,LB	Disturbed Big Sage	East	Clear, Calm, 20F, 3" snow	Rabbit tracks	No	NA	None	NA	NA	67%	13%	*Gutierrezia sarothrae*	*Artemesia tridentata*	Biological Soil Crusts		
Winter	1/16/2008	1432	T6-9	JM,MZ,LB	Disturbed Big Sage	Northwest	Clear, Wind 3-5mph, 20F, 3" snow	Rabbit tracks	No	NA	None	NA	NA	67%	5%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Agrostis palustris*	*Bromus tectorum*	
Winter	1/16/2008	1025	T7-3	JM,MZ	Disturbed Grassland	Northeast	Clear, Wind 5-7mph, 15F, 4" snow	Rabbit tracks	Yes	NA	None	NA	NA	18%	80%	*Agrostis palustris*	*Bouteloua gracilis*	*Bromus tectorum*	*Salsola iberica*	*Atriplex canescens*
Winter	1/16/2008	1039	T7-5	JM,MZ	Disturbed Grassland	South	Clear, Wind 8-10mph, 15F, 3" snow	Rabbit tracks	Yes	NA	None	NA	NA	18%	30%	*Salsola iberica*	*Bromus tectorum*			
Winter	1/16/2008	1357	T7-7	JM,MZ,LB	Disturbed Big Sage	Southeast	Clear, Wind 3-5mph, 20F, 3" snow	Rabbit tracks	Yes	NA	None	NA	NA	33%	30%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Hordeum jubatum*	*Agrostis palustris*	*Bouteloua gracilis*
Winter	1/16/2008	1417	T7-9	JM,MZ,LB	Disturbed Big Sage	West-Southwest	Clear, Wind 3-5mph, 20F, 2.5" snow	Rabbit tracks	Yes	NA	None	NA	NA	50%	5%	*Gutierrezia sarothrae*	*Agrostis palustris*	*Bromus tectorum*	*Artemesia tridentata*	*Opuntia* spp.
Spring	5/19/2008	0807	T1-2	JM,RJ	PJ on steep slope	North	Clear, Calm, 90F	None	No	12ft	5%	8.65in	3.16in	50%	<10%	*Agrostis palustris*	*Ephedra*	*Pinus edulis*	*Fraxinus anomala*	*Juniperous monosperma*
Spring	5/19/2008	1204	T1-3	JM,RJ	PJ on steep slope	East	Clear, Calm, 85F	Bird call, deer scat	Yes	18ft	15%	8.7	6.6	18%	<10%	*Juniperus monosperma*	*Pinus edulis*	*Gutierrezia sarothae*	*Panicum capillare*	*Bromus tectorum*
Spring	5/19/2008	1248	T1-4	JM,RJ	Native Grassland	North	Clear, Calm, 90F	Cow scat	No	NA	None	NA	NA	67%	5%	*Agrostis palustris*	*Bromus tectorum*	*Opuntia* spp.	*Salsola iberica*	
Spring	5/19/2008	1517	T1-5	JM,RJ	Native Grassland	Northeast	Clear, Wind 3-5mph, 90F	Cow scat	Yes	NA	None	NA	NA	36%	10%	*Bromus tectorum*	*Atriplex canescens*	*Opuntia spp.*		
Spring	5/19/2008	1534	T1-6	JM,RJ	Native Grassland	North	Clear, Wind 3-5mph, 90F	None	No	NA	None	NA	NA	55%	5%	*Vulpia octoflora*	*Bromus tectorum*	*Artemesia tridentata*	*Atriplex canescens*	*Opuntia spp.*
Spring	5/19/2008	1803	T1-7	JM,RJ	Native Grassland	East-Southeast	Clear, Calm, 80F	Rabbit scat, Cow scat	Yes	NA	None	NA	NA	55%	<10%	*Hilaria jamesii*	*Vulpia octoflora*			
Spring	5/20/2008	0755	T1-8	JM,RJ	Native Grassland	North	Clear, Calm, 78F	None	No	NA	None	NA	NA	65%	15%	*Hilaria jamesii*	*Erodium cicutarium*	*Vulpia octoflora*		
Spring	5/20/2008	1119	T1-9	JM,RJ	Native Grassland	West-Southwest	Clear, Calm, 87˚F	None	Yes	NA	None	NA	NA	65%	25%	*Bromus tectorum*	*Gutierrezia sarothrae*	*Erodium cicutarium*	*Vulpia octoflora*	
Spring	5/19/2008	0830	T2-2	JM,RJ	Big Sage adjacent to PJ Zone	North-Northeast	Clear, Calm, 65F	Lark sparrow sight/call	Yes	15ft	<10%	5.8	3.8	67%	20%	*Artemesia tridentata*	*Bromus tectorum*	*Juniperus monosperma*	*Opuntia* spp.	
Spring	5/19/2008	1156	T2-3	JM,RJ	Native Grassland	Northeast	Clear, Calm, 80F	Lark sparrow call	No	NA	None	NA	NA	67%	<10%	*Bromus tectorum*	*Opuntia* spp.	Atriplex canescens	*Erodium cicutarium*	
Spring	5/19/2008	1257	T2-4	JM,RJ	Native Grassland	North	Clear, Calm, 90F	Cow scat	Yes	NA	None	NA	NA	50%	<10%	*Agrostis palustris*	*Opuntia* spp.	*Salsola iberica*	*Bromus tectorum*	*Atriplex canescens*
Spring	5/19/2008	1505	T2-5	JM,RJ	Native Grassland	North	Clear, Wind 3-5mph, 90F	Lark sparrow call	No	NA	None	NA	NA	60%	<10%	*Salsola iberica*	*Agrostis palustris*	*Hilaria jamesii*	*Opuntia* spp.	*Bromus tectorum*
Spring	5/19/2008	1540	T2-6	JM,RJ	Native Grassland	North-Northeast	Clear, Wind 3-5mph, 87F	Lark sparrow call	Yes	NA	None	NA	NA	50%	10%	*Hilaria jamesii*	*Opuntia* spp.			
Spring	5/19/2008	1755	T2-7	JM,RJ	Disturbed Grassland	North	Clear, Calm, 80F	Lark sparrow call	No	NA	None	NA	NA	75%	15%	*Hilaria jamesii*	*Gutierrezia sarothrae*	*Atriplex canescens*	*Bromus tectorum*	

Piñon Ridge Uranium Mill
Project # 83088-1.8.2

										Vegetation Information						Dominant Plant Species				
Season	Date	Time	Site Location	Biological Assessors	General Site Description	Aspect	WX Conditions	Signs of Wildlife Observed	Bird Survey	Canopy Height	Canopy Cover	DBH (in) (maximum)	DBH (in) (mean)	Ground Cover (%)	Debris Cover (% estimated)	Species 1	Species 2	Species 3	Species 4	Species 5
Spring	5/20/2008	0801	T2-8	JM,RJ	Big Sage	Northwest	Clear, Calm, 77˚F	None	Yes	NA	None	NA	NA	50%	25%	*Artemesia tridentata*	*Bromus tectorum*	*Gutierrezia sarothae*		
Spring	5/20/2008	1112	T2-9	JM,RJ	Big Sage	West-Southwest	Clear, Calm, 87˚F	None	No	NA	None	NA	NA	45%	15%	*Artemesia tridentata*	*Hordeum jubatum*	*Vulpia octoflora*	Brassicaceae	*Panicum capillare*
Spring	5/19/2008	0915	T3-1	JM,RJ	PJ on steep slope	Northeast	Clear, Calm, 72F	Lark sparrow call	Yes	15ft	10%	6.5	5.4	18%	35%	*Pinus edulis*	*Juniperus monosperma*	*Cercocarpus montanus*	*Fendlera rupicola*	*Agrostis palustris*
Spring	5/19/2008	0857	T3-2	JM,RJ	Native Grassland	North-Northeast	Clear, Calm, 65F	Lark sparrow sight/call, Red harvester ants	No	NA	None	NA	NA	50%	<10%	*Atriplex canescens*	*Artemesia tridentata*	*Bromus tectorum*		
Spring	5/19/2008	1141	T3-3	JM,RJ	Native Grassland	Northwest	Clear, Calm, 80F	Lark Sparrow call, cow scat	Yes	NA	None	NA	NA	50%	15%	*Bromus tectorum*	*Artemesia tridentata*	*Erodium cicutarium*		
Spring	5/19/2008	1312	T3-4	JM,RJ	Native Grassland	North	Clear, Calm, 90F	Cow scat	No	NA	None	NA	NA	35%	15%	*Artemesia tridentata*	*Bromus tectorum*			
Spring	5/19/2008	1448	T3-5	JM,RJ	Native Grassland	Northeast	Clear, Calm, 90F	None	Yes	NA	None	NA	NA	30%	<10%	*Gutierrezia sarothrae*	*Artemesia tridentata*	*Hordeum jubatum*		
Spring	5/19/2008	1556	T3-6	JM,RJ	Native Grassland	North	Clear, Wind 3-5mph, 85F	None	No	NA	None	NA	NA	50%	5%	*Hilaria jamesii*	*Bromus tectorum*	*Artemesia tridentata*		
Spring	5/19/2008	1740	T3-7	JM,RJ	Disturbed Big Sage	East-Northeast	Clear, Calm, 80F	Rabbit scat, Lark sparrow call	Yes	NA	None	NA	NA	55%	<10%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Opuntia* spp.	*Bromus tectorum*	*Hordeum jubatum*
Spring	5/20/2008	0818	T3-8	JM,RJ	Big Sage	Northeast	Clear, Calm, 80F	Rabbit scat, Lark sparrow call	No	NA	None	NA	NA	50%	15%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Vulpia octoflora*		
Spring	5/20/2008	1050	T3-9	JM,RJ	Disturbed Big Sage	South-Southwest	Clear, Calm, 87˚F	Lark sparrow call, Red harvester ants	Yes	NA	None	NA	NA	45%	15%	*Artemesia tridentata*	*Gutierrezia sarothrae*			
Spring	5/19/2008	0938	T4-1	JM,RJ	Big Sage	Northeast	Clear, Calm, 72F	Lark sparrow sight/call	No	NA	None	NA	NA	50%	15%	*Artemesia tridentata*	*Atriplex canescens*	*Gutierrezia sarothae*	*Bromus tectorum*	*Opuntia* spp.
Spring	5/19/2008	1000	T4-2	JM,RJ	Native Grassland	North	Clear, Calm, 75F	Lark sparrow call, Red harvester ants, Cow scat	Yes	NA	None	NA	NA	75%	15%	*Bromus tectorum*	*Erodium cicutarium*			
Spring	5/19/2008	1132	T4-3	JM,RJ	Native Grassland	Northeast	Clear, Calm, 80F	Lark Sparrow call, cow scat	No	NA	None	NA	NA	65%	15%	*Bromus tectorum*	Erodium cicutarium			
Spring	5/19/2008	1318	T4-4	JM,RJ	Native Grassland	North	Clear, Calm, 90F	Lark Sparrow call, cow scat	Yes	NA	None	NA	NA	75%	40%	*Bromus tectorum*	*Atriplex canescens*			
Spring	5/19/2008	1440	T4-5	JM,RJ	Disturbed Big Sage	North	Clear, Calm, 90F	Lark sparrow call	No	NA	None	NA	NA	65%	15%	*Gutierrezia sarothrae*	*Artemesia tridentata*	*Bromus tectorum*		
Spring	5/19/2008	1605	T4-6	JM,RJ	Disturbed Big Sage	North	Clear, Calm, 80F	None	Yes	NA	None	NA	NA	45%	<10%	*Artemesia tridentata*	*Bromus tectorum*	*Gutierrezia sarothae*		
Spring	5/19/2008	1733	T4-7	JM,RJ	Disturbed Big Sage	South-Southwest	Clear, Calm, 80F	None	No	NA	None	NA	NA	55%	<10%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Opuntia* spp.		
Spring	5/20/2008	0826	T4-8	JM,RJ	Big Sage	West	Clear, Calm, 80F	Rabbit scat, Lark sparrow call	Yes	NA	None	NA	NA	45%	<10%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Hilaria jamesii*		
Spring	5/20/2008	1044	T4-9	JM,RJ	Disturbed Big Sage	West	Clear, Calm, 87˚F	None	No	NA	None	NA	NA	35%	<10%	*Artemesia tridentata*	*Vulpia octoflora*			
Spring	5/20/2008	1002	T4-10	JM,RJ	US90 ROW	South	Clear, Calm, 85F	None	Yes	NA	None	NA	NA	65%	25%	*Bromus tectorum*	*Hordeum jubatum*	*Panicum capillare*	*Ericameria nauseosa*	*Artemesia tridentata*
Spring	5/19/2008	1018	T5-2	JM,RJ	Disturbed Grassland	North	Clear, Calm, 77˚F	Lark Sparrow call, cow scat	No	NA	None	NA	NA	65%	40%	*Bromus tectorum*	*Atriplex canescens*	*Erodium cicutarium*	*Opuntia* spp.	
Spring	5/19/2008	1116	T5-3	JM,RJ	Native Grassland	Northwest	Clear, Calm, 82F	None	Yes	NA	None	NA	NA	15%	<10%	*Bromus tectorum*	*Ceratocephala testiculata*	*Atriplex canescens*		
Spring	5/19/2008	1332	T5-4	JM,RJ	Native Grassland	North	Clear, Calm, 90F	Lark Sparrow call, cow scat	No	NA	None	NA	NA	45%	<10%	*Bromus tectorum*	*Artemesia tridentata*	Brassicaceae		
Spring	5/19/2008	1425	T5-5	JM,RJ	Big Sage	North-Northeast	Clear, Calm, 90F	Lark sparrow call	Yes	NA	None	NA	NA	25%	40%	*Artemesia tridentata*				
Spring	5/19/2008	1621	T5-6	JM,RJ	Big Sage	North	Clear, Calm, 80F	None	No	NA	None	NA	NA	55%	<10	*Artemesia tridentata*	*Opuntia* spp.			
Spring	5/19/2008	1719	T5-7	JM,RJ	Disturbed Big Sage	North-Northeast	Clear, Calm, 85F	Black-tailed jackrabbit	Yes	NA	None	NA	NA	55%	<10%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Hordeum jubatum*		
Spring	5/20/2008	0844	T5-8	JM,RJ	Big Sage	Southeast	Clear, Calm, 80F	Rabbit scat, Lark sparrow call	No	NA	None	NA	NA	45%	25%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Hordeum jubatum*	*Vulpia octoflora*	
Spring	5/20/2008	1024	T5-9	JM,RJ	Disturbed Big Sage	East	Clear, Calm, 87˚F	Red harvester ants	Yes	NA	None	NA	NA	45%	<10%	*Artemesia tridentata*	*Vulpia octoflora*			
Spring	5/20/2008	0952	T5-10	JM,RJ	Big Sage	Northeast	Clear, Calm, 87˚F	None	No	NA	None	NA	NA	35%	<10%	*Artemesia tridentata*	*Hilaria jamesii*	*Gutierrezia sarothae*	*Hordeum jubatum*	
Spring	5/19/2008	1026	T6-2	JM,RJ	Native Grassland	North-Northeast	Clear, Calm, 77˚F	Lark sparrow call, grasshoppers	Yes	NA	None	NA	NA	65%	<10%	*Bromus tectorum*	*Atriplex canescens*	*Erodium cicutarium*		
Spring	5/19/2008	1109	T6-3	JM,RJ	Disturbed Grassland	South-Southwest	Clear, Calm, 80F	Lark sparrow call	No	NA	None	NA	NA	<10%	<10%	*Atriplex canescens*	*Bromus tectorum*			

Piñon Ridge Uranium Mill
Project # 83088-1.8.2

										Vegetation Information						Dominant Plant Species				
Season	Date	Time	Site Location	Biological Assessors	General Site Description	Aspect	WX Conditions	Signs of Wildlife Observed	Bird Survey	Canopy Height	Canopy Cover	DBH (in) (maximum)	DBH (in) (mean)	Ground Cover (%)	Debris Cover (% estimated)	Species 1	Species 2	Species 3	Species 4	Species 5
Spring	5/19/2008	1338	T6-4	JM,RJ	Native Grassland	North	Clear, Calm, 90F	None	Yes	NA	None	NA	NA	75%	<10%	*Bromus tectorum*	*Gutierrezia sarothrae*	*Atriplex canescens*		
Spring	5/19/2008	1417	T6-5	JM,RJ	Disturbed Big Sage	South	Clear, Calm, 90F	None	No	NA	None	NA	NA	35%	<10%	*Gutierrezia sarothrae*	*Artemesia tridentata*	*Bromus tectorum*		
Spring	5/19/2008	1632	T6-6	JM,RJ	Big Sage	North-Northwest	Clear, Calm, 87˚F	None	Yes	NA	None	NA	NA	45%	<10%	*Artemesia tridentata*				
Spring	5/19/2008	1712	T6-7	JM,RJ	Disturbed Big Sage	East	Clear, Calm, 80F	None	No	NA	None	NA	NA	45%	<10	*Artemesia tridentata*	Biological Soil Crusts			
Spring	5/20/2008	0852	T6-8	JM,RJ	Big Sage	North-Northeast	Clear, Calm, 80F	Deer tracks, Lark sparrow call	Yes	NA	None	NA	NA	55%	<10%	*Artemesia tridentata*	*Gutierrezia sarothrae*			
Spring	5/20/2008	0941	T6-9	JM,RJ	Disturbed Big Sage	Northwest	Clear, Calm, 87˚F	Black-tailed jackrabbit, Lark sparrow call	No	NA	None	NA	NA	55%	<10%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Bromus tectorum*	*Hordeum jubatum*	*Vulpia octoflora*
Spring	5/19/2008	1043	T7-2	JM,RJ	Disturbed Grassland	Northeast	Clear, Calm, 77˚F	None	No	NA	None	NA	NA	15%	<10%	*Atriplex canescens*	*Bromus tectorum*			
Spring	5/19/2008	1053	T7-3	JM,RJ	Native Grassland	Northeast	Clear, Calm, 77˚F	Cow scat	Yes	NA	None	NA	NA	35%	<10%	*Atriplex canescens*	*Bromus tectorum*	*Erodium cicutarium*		
Spring	5/19/2008	1352	T7-4	JM,RJ	Disturbed Grassland	North	Clear, Calm, 90F	Lark sparrow call	No	NA	None	NA	NA	65%	15%	*Bromus tectorum*	*Atriplex canescens*	*Erodium cicutarium*		
Spring	5/19/2008	1359	T7-5	JM,RJ	Disturbed Grassland	South	Clear, Calm, 90F	None	Yes	NA	None	NA	NA	15%	<10%	*Bromus tectorum*	*Erodium cicutarium*			
Spring	5/19/2008	1645	T7-6	JM,RJ	Disturbed Big Sage	North	Clear, Calm, 80F	None	No	NA	None	NA	NA	35%	<10%	*Artemesia tridentata*	*Atriplex canescens*	*Hordeum jubatum*	*Bromus tectorum*	
Spring	5/19/2008	1655	T7-7	JM,RJ	Disturbed Big Sage	Southeast	Clear, Calm, 85F	None	Yes	NA	None	NA	NA	25%	<10%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Bromus tectorum*		
Spring	5/20/2008	0908	T7-8	JM,RJ	Disturbed Big Sage	North	Clear, Calm, 85F	Lark sparrow call	No	NA	None	NA	NA	35%	<10%	*Artemesia tridentata*	*Vulpia octoflora*			
Spring	5/20/2008	0925	T7-9	JM,RJ	Disturbed Big Sage	West-Southwest	Clear, Calm, 85F	Lark sparrow call	Yes	NA	None	NA	NA	55%	15%	*Artemesia tridentata*	*Gutierrezia sarothrae*	*Hilaria jamesii*	*Vulpia octoflora*	

APPENDIX B

HABITAT ASSESSMENT DATA FORMS

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8/24/07
Time: 0818
Site Location: TI-3
Biological Assessor (s): JM SB

Species of Interest:

General Site Description: PJ HABITAT ON 50% SLOPE TREE DENSITY ~15-20%
Aspect: EAST
Weather Conditions: CLEAR CALM 80°F
Transect Number: 1
Transect Orientation: N-S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	MULTIPLE BIRDS
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

SAGE SWALLOW
MOURNING DOVE
RUSTY CAPPED FLYCATCHER

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: 18 ft
DBH: (maximum) 3.9 4.7 (6.3) in
Ground Cover: N N N N N Y = 18%
Canopy Cover: N N N N N N = 0%
DBH: (mean) 4.9 in
Debris Cover (estimated): <5%

Five (5) Dominant Plant Species (in descending order of dominance):

1)	Juniperus monosperma	70%
2)	Pinus edulis	20%
3)	BROOM SNAKEWEED	5%
4)	WITCHGRASS	<5%
5)	NATIVE GRASSES	<5%

Other Remarks:

14.9

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8/23/07
Time: 1653
Site Location: T1-5
Biological Assessor (s): JM, SB

Species of Interest:

General Site Description: NATIVE GRASSLAND
Aspect: NE
Weather Conditions: CLEAR WIND 8-12 MPH 90°F
Transect Number: 1
Transect Orientation: N-S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	RABBIT SCAT
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT SCAT Burrows

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: —
DBH: (maximum) —
Ground Cover: YYYYYN = 83%
Canopy Cover: —
DBH: (mean) —
Debris Cover (estimated): 60%

Five (5) Dominant Plant Species (in descending order of dominance):

1)	BUNCH GRASS	85
2)	RUSSIAN THISTLE	10
3)	BIG SAGE	5
4)		
5)		

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8/23/07
Time: 1319
Site Location: T1-7
Biological Assessor (s): JM, SB

Species of Interest:

General Site Description: NATIVE GRASSLAND
Aspect: ESE
Weather Conditions: CLEAR BREEZY 87°F
Transect Number: 1
Transect Orientation: N-S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT BURROWS

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: N/A
DBH: (maximum) N/A
Ground Cover: N, N, N, N, Y, Y = 33%

Canopy Cover: N/A
DBH: (mean) N/A
Debris Cover (estimated): NONE

Five (5) Dominant Plant Species (in descending order of dominance):

1) NATIVE GRASSES 95%
2)
3)
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8/23/07
Time: 1158
Site Location: T1-9
Biological Assessor (s): JM SB

Species of Interest:

General Site Description: NATIVE GRASSLAND
Aspect:
Weather Conditions:
Transect Number:
Transect Orientation:

Yes	No		Comments
☐	☑	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

NONE

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: N/A
DBH: (maximum) N/A
Ground Cover: N, N, N, N, Y, Y = 33.3%
Canopy Cover: N/A
DBH: (mean) N/A
Debris Cover (estimated): 20%

Five (5) Dominant Plant Species (in descending order of dominance):

1) NATIVE GRASSES 85%
2) RUSSIAN THISTLE <5%
3) BROOM SNAKEWEED <5%
4)
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8/24/07
Time: 0849
Site Location: T2-3
Biological Assessor (s): JM-SB

Species of Interest:

General Site Description: NATIVE GRASSLAND
Aspect: NE
Weather Conditions: CLEAR CALM 82°F
Transect Number: 2
Transect Orientation: N-S

Yes	No		Comments
☐	☐	Signs of wildlife observed?	RABBIT SCAT
☐	☐	Protected species observed?	
☐	☐	Protected species habitat observed?	
☐	☐	Wetland features present?	
☐	☐	Located within the riparian habitat?	
☐	☐	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT SCAT
SAGE SPARROW

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: YYYYNN = 66.7%

Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): 85%

Five (5) Dominant Plant Species (in descending order of dominance):

1)	ARTEMISIA SP	40 %
2)	GRASS #1 (KEY LATER)	20 %
3)	MUSTARD	20 %
4)	BROMUS TECTORUM	10 %
5)		

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8-23-07
Time: 16:27
Site Location: T2-5
Biological Assessor (s): JM/SB

Species of Interest:

General Site Description: Grassland
Aspect: North
Weather Conditions: clear
Transect Number: T2
Transect Orientation: N-S

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Cow Dung
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Cow dung

Vegetative Information:

Riparian Vegetation Present (yes/no): no
Canopy Height: none
DBH: (maximum) —
Ground Cover: Y Y Y Y Y N 85%

Canopy Cover: no
DBH: (mean) —
Debris Cover (estimated): 20%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Russian Thistle 60%
2) Natives in Grass 30%
3) Prickley Pear 10%
4)
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8/23/07
Time: 1325
Site Location: TZ-7
Biological Assessor (s): JM, SB

Species of Interest:

General Site Description: NATIVE GRASSLAND WITH SPARSE BROOM SNAKE WEED
Aspect: EAST
Weather Conditions: PARTLY CLOUDY, WIND 8-12 MPH 80°F
Transect Number: 2
Transect Orientation: N-S

Yes	No		Comments
☐	☑	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

NONE

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: N/A
DBH: (maximum) N/A
Ground Cover: YYYYNN = 66.7%
Canopy Cover: N/A
DBH: (mean) N/A
Debris Cover (estimated): 5%

Five (5) Dominant Plant Species (in descending order of dominance):

1) NATIVE GRASSES 80%
2) BROOM SNAKEWEED 5%
3) RUSSIAN THISTLE 5%
4)
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8/23/07
Time: 1135
Site Location: T2-9
Biological Assessor (s): JM SB

Species of Interest:

General Site Description: BIG SAGE W/ RUSSIAN THISTLE DEBRIS
Aspect: WSW
Weather Conditions: CLEAR 5-8 MPH WIND 85°F
Transect Number: 2
Transect Orientation: N-S

Yes	No		Comments
☐	☐	Signs of wildlife observed?	RABBIT SCAT / SMALL BURROWS
☐	☐	Protected species observed?	
☐	☐	Protected species habitat observed?	
☐	☐	Wetland features present?	
☐	☐	Located within the riparian habitat?	
☐	☐	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT SCAT

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: N/A
DBH: (maximum) N/A
Ground Cover: Y, Y, N, N, N, N = 33.3%
Canopy Cover: N/A
DBH: (mean) N/A
Debris Cover (estimated): 35%

Five (5) Dominant Plant Species (in descending order of dominance):

1) BIG SAGE 80%
2) BROOM SNAKEWEED 10%
3) NATIVE GRASSES 5%
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8/24/07
Time: 1107
Site Location: T8-1
Biological Assessor (s): JM SB

Species of Interest:

General Site Description: PJ HABITAT ON 100% SLOPE
Aspect: NE
Weather Conditions: CLEAR CALM 82°F
Transect Number: 3
Transect Orientation: N-S

Yes	No		Comments
☐	☐	Signs of wildlife observed?	GREY BREASTED BLUE JAY
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

EASTERN FENCE LIZARD
GREY BREASTED BLUE JAY

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: 18-20 ft
DBH: (maximum) 3.9 7.0 5.2
Ground Cover: YNNNNN = 18%
Canopy Cover: ~30%
DBH: (mean) 5.39
Debris Cover (estimated): 35%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Pinus edulis	55%	
2) Juniperus monosperma	25%	
3) Mountain Mahogony	10%	
4) Unknown Shrub (KEY)	5%	Fendlera rupicola
5) Native Bunchgrass	<5%	

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8-24-07
Time: 9:10
Site Location: T3-3
Biological Assessor (s): JM/SB

Species of Interest:

General Site Description: Grassland
Aspect: N.W
Weather Conditions: Clear
Transect Number: T3
Transect Orientation: N-S

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Birds, Rabbit Shat
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Birds Rabbit Shat

Vegetative Information:

Riparian Vegetation Present (yes/no): no
Canopy Height: none
DBH: (maximum) ~
Ground Cover: YYYNNN 50%
Canopy Cover: none
DBH: (mean) none
Debris Cover (estimated): 35%

Five (5) Dominant Plant Species (in descending order of dominance):

1) native Grasses 60%
2) Russian Thistle 30%
3) Prickly Pear 5%
4) Big Sage 5%
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8-23-07
Time: 16:21
Site Location: T3-5
Biological Assessor (s): SH/JH

Species of Interest:

General Site Description: Grassland,
Aspect: NE
Weather Conditions: Clear
Transect Number: T3
Transect Orientation: N-S

Yes	No	N/B		Comments
☒	☐	☒	Signs of wildlife observed?	Birds, Rabbit Scat.
☐	☒	☐	Protected species observed?	
☐	☒	☐	Protected species habitat observed?	
☐	☒	☐	Wetland features present?	
☐	☒	☐	Located within the riparian habitat?	
☐	☒	☐	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

~~Birds, Scat, Rabbit Scat~~ SH/B
Birds & Rabbit Scat.

Vegetative Information:

Riparian Vegetation Present (yes/no): None
Canopy Height: no
DBH: (maximum) —
Ground Cover: YYYYYY 100%
Canopy Cover: none
DBH: (mean) —
Debris Cover (estimated): 35%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Broom Snakeweed 70%
2) Big Sage 20%
3) Bromus Tectorum 5%
4)
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 6-23-07
Time: 13:44
Site Location: T3-7
Biological Assessor (s): JH, SB

Species of Interest:

General Site Description: Big Sage Brush with Broom Snake weed
Aspect: ENE
Weather Conditions: Clear to Partly Cloudy winds 4-8 mile/Hour 65°
Transect Number: 3
Transect Orientation: N-S

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Butterfly, S Parrouet
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Rabbit Sbat Butterfly, S Parrouet

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: None
DBH: (maximum)
Ground Cover: NNNNY = 10%
Canopy Cover: None
DBH: (mean) —
Debris Cover (estimated): ~10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Big Sage 40%
2) Snake weed 40%
3) Prickley Pear < 5
4) Biological Soil Crust. 5%
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8/23/07
Time: 1116
Site Location: T3-9
Biological Assessor (s): JM, LB, SB

Species of Interest:

General Site Description: BIG SAGE WITH SOUTHSIDE MECHANICALLY CLEARED
Aspect: SSW
Weather Conditions: CLEAR WIND 8-15 MPH 80°F
Transect Number: 3
Transect Orientation: N/S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	BURROWS AT SITE
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

EASTERN FENCE LIZZARD IN BROOM ~~SAGE~~ SNAKE WEED

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height:
DBH: (maximum)
Ground Cover: YYNNNN = 33.3%
Canopy Cover: N/A
DBH: (mean) N/A
Debris Cover (estimated): 7%

Five (5) Dominant Plant Species (in descending order of dominance):

1) BIG SAGE 40%
2) BROOM 30%
3) NATIVE GRASS 10%
4) MUSTARD 5%
5)

Other Remarks:

JM, LB, SB
~~JDH / MZ 2007~~

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8/24/01
Time: 1051
Site Location: T4-1
Biological Assessor (s): JM, SB

Species of Interest:

General Site Description: BIG SAGE JUST NORTH OF PJ HABITAT W/GRASSLAND
Aspect: NE
Weather Conditions: CLEAR CALM 85°F
Transect Number: 4
Transect Orientation: N-S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	SEE BELOW
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

BLUE TAILED SKINK
DUSTY CAPPED FLYCATCHER

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: —
DBH: (maximum) —
Ground Cover: YYYNNNE 50%
Canopy Cover: —
DBH: (mean) —
Debris Cover (estimated): 60%

Five (5) Dominant Plant Species (in descending order of dominance):

1)	BIG SAGE	30%
2)	APUNTIA SP	20%
3)	BROOM SNAKEWEED	<5%
4)	BROMUS TECTORUM	15%
5)		

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8-24-07
Time: 09:22
Site Location: T4-3
Biological Assessor (s): JM/SA

Species of Interest:

General Site Description: Grassland (native)
Aspect: NE
Weather Conditions: Clear
Transect Number: T4
Transect Orientation: N-S

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Birds, Rabbit & Goat, Mountain Blue Bird
☐	☒	Protected species observed?	Gray Breast Blue Jay, Sagebrush
☐	☒	Protected species habitat observed?	Shrike
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

See Comments

Vegetative Information:

Riparian Vegetation Present (yes/no): no
Canopy Height: none
DBH: (maximum) —
Ground Cover: NNNNNY
Canopy Cover: none
DBH: (mean) —
Debris Cover (estimated):

Five (5) Dominant Plant Species (in descending order of dominance):

1) Native Grasses 80%
2) Prickley Pear 5%
3) Otra ffleg 5%
4) Russian Thistle 5%
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8/23/07
Time: 1601
Site Location: T4-5
Biological Assessor (s): JM SB

Species of Interest:

General Site Description: DISTURBED AREA
Aspect: NORTH
Weather Conditions: PARTLY CLOUDY BREEZY 90°F
Transect Number: 4
Transect Orientation: N-S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	RABBIT SCAT
☐	☐	Protected species observed?	
☐	☐	Protected species habitat observed?	
☐	☐	Wetland features present?	
☐	☐	Located within the riparian habitat?	
☐	☐	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT SCAT

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: /
DBH: (maximum) /
Ground Cover: NNNYYY = 50%
Canopy Cover: /
DBH: (mean) /
Debris Cover (estimated): 50%

Five (5) Dominant Plant Species (in descending order of dominance):

1)	BROOM SNAKEWEED	50%
2)	ATRIPLEX	10%
3)	BIG SAGE	8%
4)	BROMUS TECTORUM	5%
5)	RUSSIAN THISTLE	5%

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8-23-07
Time: 13:57
Site Location: T4-7
Biological Assessor (s): JM / SB

Species of Interest:

General Site Description: Big Sage, Broom Snakeweed
Aspect: SSW
Weather Conditions: Partly Cloudy
Transect Number: T4
Transect Orientation: N-S

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Rabbit Scat, Ground Squirrel Bone
☐	☒	Protected species observed?	Ground
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Rabbit Scat, Ground Squirrel Bones.

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: None
DBH: (maximum) —
Ground Cover: YYYYNN 80%
Canopy Cover: None
DBH: (mean) —
Debris Cover (estimated): 25%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Big Sage 40%
2) Broom Snakeweed 40%
3) Native grasses less than 5%
4)
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8/23/07
Time: 1051
Site Location: T4-9
Biological Assessor (s): SM, LB, SB

Species of Interest:

General Site Description: BIG SAGE WITH MECHANICAL CLEARING (DISTURBED)
Aspect: WEST
Weather Conditions: CLEAR BREZY (GUSTS TO 15 MPH)
Transect Number: T4
Transect Orientation: N-S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

COW SCAT
Swallows

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: N/A
DBH: (maximum) N/A
Ground Cover: YYNNNN = ~~50%~~ 33.3%

Canopy Cover:
DBH: (mean)
Debris Cover (estimated):

Five (5) Dominant Plant Species (in descending order of dominance):

1) NATIVE GRASS 30%
2) MUSTARD SPECIES 70%
3)
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: Piñon Ridge Uranium Mill
Project Number: 83088-1.8.2
Date: 8-24-07
Time: 10:55
Site Location: TS-3
Biological Assessor (s): JMISB

Species of Interest:

General Site Description: Grassland (native)
Aspect: ~~SE~~ ~~SW~~ NW
Weather Conditions: Clear
Transect Number: T5
Transect Orientation: N-S

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Horn Lizard, Rabbit Scat
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Horn Lizard, Rabbit Scat.

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: None
DBH: (maximum)
Ground Cover: Y Y NNN
Canopy Cover: None
DBH: (mean) —
Debris Cover (estimated): 70%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Russian Thistle 90%
2) Atriplex 5%
3) Grass 5%
4)
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8-23-07
Time: 15:54
Site Location: T5-5
Biological Assessor (s): SB/JM

Species of Interest:

General Site Description: BIG SAGE
Aspect: NEE
Weather Conditions: PARTLY CLOUDY CALM 87°F
Transect Number: 5
Transect Orientation: N-S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	Ob Jack Rabbit, Flycatcher, Rabbit Scat
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Black Tail Jackrabbit, Cottontail, Flycatcher, Rabbit Scat
BORROWS AT SITE

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: —
DBH: (maximum) —
Ground Cover: N,N,N,N,Y,Y = 33.3%
Canopy Cover: —
DBH: (mean) —
Debris Cover (estimated): 41%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Big Sage 90%
2) Mustard sp 5%
3)
4)
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8-23-07
Time: 14:19
Site Location: T5-7
Biological Assessor (s): JH & SB

Species of Interest:

General Site Description: Big Sage, Broom Snakeweed, Native Grasses
Aspect: NNE
Weather Conditions: Partly Cloudy
Transect Number: T5
Transect Orientation: N-S

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Rabbit Shat
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Rabbit Shat, Moth.

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: None
DBH: (maximum) —
Ground Cover: YYYNNN 50%
Canopy Cover: None
DBH: (mean) —
Debris Cover (estimated):

Five (5) Dominant Plant Species (in descending order of dominance):

1) Big Sage 50%
2) Broom Snakeweed 40%
3) Native Grasses Less than 5%
4)
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: ~~T5-9 PM~~ 8/23/07
Time: 1037
Site Location: T5-9
Biological Assessor (s): _____

Species of Interest:

General Site Description: BIG SAGE INTER DISPURSED W BROOM SNAKE WEED
Aspect: E
Weather Conditions: CLEAR BREEZY 85°F
Transect Number: 5
Transect Orientation: N-S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	LIZARD / SWALLOW
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

JUVENILE EASTERN FENCE LIZZARD
SWALLOW

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: YYYYYN = 87%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): 15%

Five (5) Dominant Plant Species (in descending order of dominance):

1) BIG SAGE 90%
2) BROOM SNAKE WEED 3%
3) UNIDENTIFYABLE GRASS 1%
4)
5)

Other Remarks: _____

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8/24/07
Time: 1012
Site Location: T6-3
Biological Assessor (s): JM SB

Species of Interest:

General Site Description: DISTURBED BANK NEXT TO ARROYO
Aspect: SSW
Weather Conditions: CLEAR CALM 85°
Transect Number: 6
Transect Orientation: N-S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	RABBIT SCAT
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT SCAT

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: —
DBH: (maximum) —
Ground Cover: NNNVV = 33.3%
Canopy Cover: —
DBH: (mean) —
Debris Cover (estimated): 12%

Five (5) Dominant Plant Species (in descending order of dominance):

1) ~~ATRIPLEX~~ 50%
2) RUSSIAN THISTLE 50%
3)
4)
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8-23-07
Time: 15:33
Site Location: T6-5
Biological Assessor (s): JM/SB

Species of Interest:

General Site Description: Broom Snakeweed / Russian thistle
Aspect: South
Weather Conditions: Clear
Transect Number: T6
Transect Orientation: N-S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	BLACK TAILED JACK RABBIT
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

BURROWS FOR MEDIUM SIZED RABBITS.
COW SCAT
RABBIT SCAT
BLACK TAILED JACK RABBIT
SPARROW SINGING

Vegetative Information:

Riparian Vegetation Present (yes/no): _____
Canopy Height: _____ Canopy Cover: _____
DBH: (maximum) _____ DBH: (mean) _____
Ground Cover: Y,Y,Y,Y,N,N = 66.7% Debris Cover (estimated): _____

Five (5) Dominant Plant Species (in descending order of dominance):

1) BROOM SNAKE WEED 75%
2) RUSSIAN THISTLE 15%
3) BIG SAGE 5%
4)
5)

Other Remarks: _____

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8-23-07
Time: ~~10:30~~ 14:29
Site Location: T6-7
Biological Assessor (s): JH / SB

Species of Interest:

General Site Description: BIG SAGE W/ BROOM SNAKE WEED
Aspect: EAST
Weather Conditions: PARTLY CLOUDY SLIGHTLY BREEZY 85°F
Transect Number: 6
Transect Orientation: N-S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	RED ANTS / RABBIT SCAT
☐	☐	Protected species observed?	
☐	☐	Protected species habitat observed?	
☐	☐	Wetland features present?	
☐	☐	Located within the riparian habitat?	
☐	☐	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

BLACK W/ WHITE TIGES BUTTERFLY (RED THORN)
RED ANTS
RABBIT SCAT
~~RED~~

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: —
DBH: (maximum) —
Ground Cover: Y, Y, Y, Y, N, N = 66.7%
Canopy Cover: —
DBH: (mean) —
Debris Cover (estimated): 13%

Five (5) Dominant Plant Species (in descending order of dominance):

1)	BROOM SNAKE WEED	60%
2)	BIG SAGE	30%
3)	BIOLOGICAL SOIL CRUST	5%
4)		
5)		

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: Piñon Ridge Uranium Mill
Project Number: 83088-1.8.2
Date: 8/23/07
Time: 1010
Site Location: T6-9
Biological Assessor (s): JM SB LB

Species of Interest:

General Site Description: BIG SAGE W/BROOM SNAKEWEED
Aspect: NW
Weather Conditions: CLEAR BREEZY 87°F
Transect Number: T6
Transect Orientation: N-S

Yes	No		Comments
☐	☑	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) N/A
Ground Cover: YYYYNN = 66.7%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): 5%

Five (5) Dominant Plant Species (in descending order of dominance):

1)	BIG SAGE	80%
2)	BROOM SNAKEWEED	10%
3)	NATIVE GRASSES	5%
4)		
5)		

Other Remarks:

JM/LB/SB
~~JDH / MZ~~ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: ~~8-23-07~~ 8-24-07
Time: 10:31
Site Location: T7-3
Biological Assessor (s): JH/SB

Species of Interest:

General Site Description: Native Grassland
Aspect: N:E
Weather Conditions: Clear
Transect Number: T-7
Transect Orientation: N/S

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Birds, Rabbit Shot
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Birds Rabbit Shot

Vegetative Information:

Riparian Vegetation Present (yes/no): no
Canopy Height: none
DBH: (maximum) —
Ground Cover: WWNNY
Canopy Cover: none
DBH: (mean) —
Debris Cover (estimated): 80%

Five (5) Dominant Plant Species (in descending order of dominance):

1) native Grass 80%
2) Russian Thistle 5%
3) atriplex 5%
4)
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8-23-07
Time: ~~15:30~~ 15:24 SWB
Site Location: T7-5
Biological Assessor (s): JH/SB

Species of Interest:

General Site Description: Disturbed Grassland
Aspect: South
Weather Conditions: Partly Cloudy
Transect Number: T7
Transect Orientation: N-S,

Yes	No		Comments
☒	☒	Signs of wildlife observed?	Birds, Rabbit Shot
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Birds

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: None
DBH: (maximum) —
Ground Cover: BUNNY 1%
Canopy Cover: None
DBH: (mean) —
Debris Cover (estimated): 30%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Russian thistle 80%
2) Bromus tectorum 10%
3)
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8-23-07
Time: 15:00
Site Location: T7-7
Biological Assessor (s): SB/JM

Species of Interest:

General Site Description: Big Sage, Broom Snakeweed
Aspect: SE
Weather Conditions: Partly Cloudy
Transect Number: T7
Transect Orientation: N-S

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Birds,
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Birds.

Vegetative Information:

Riparian Vegetation Present (yes/no): no
Canopy Height: None
DBH: (maximum) —
Ground Cover: Y Y N N N N 33%
Canopy Cover: None
DBH: (mean) —
Debris Cover (estimated): 30%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Sage 60%
2) Broom Snakeweed 3%
3) Foxtail Barley Less than 5%
4) Native Grass Less than 5%
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: Piñon Ridge Uranium Mill
Project Number: 83088-1.8.2
Date: 8/28/07
Time: 0949
Site Location: T7-9
Biological Assessor (s): JM LB SB

Species of Interest:

General Site Description:
Aspect: WSW
Weather Conditions: CLEAR CALM 85° F
Transect Number: 7
Transect Orientation: T7-9 N-S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

BLUE TAILED SKINK
SPARROW

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NONE
DBH: (maximum) NA
Ground Cover: Y,Y,Y,N,N,N = 50%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): <5%

Five (5) Dominant Plant Species (in descending order of dominance):

1)	BROOM SNAKEWEED	40
2)	NATIVE GRASSES	25
3)	SAGE BRUSH	10
4)	PRICKLY PEAR	5
5)		

Other Remarks:

SD-JM
JDH / ~~MZ~~ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9/19/07
Time: 0923
Site Location: T1-2
Biological Assessor (s): JM, MZ

Species of Interest:

General Site Description: PJ ON STEEP SLOPE
Aspect: NORTH
Weather Conditions: CLEAR CALM 77°F
Transect Number: 1
Transect Orientation: NS

Yes	No		Comments
☐	☑	Signs of wildlife observed?	NONE
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

NONE

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: 15 ft
DBH: (maximum) 0.7, (8.65), 2.2
Ground Cover: 3/6 = 50%
Canopy Cover: 15%
DBH: (mean) 9.55/3 = 3.16 in
Debris Cover (estimated): 5%

Five (5) Dominant Plant Species (in descending order of dominance):

1) BUNCH GRASSES 50%
2) EPHEDRA 20%
3) Pinus edulis 15%
4) Fraxinus anomala 10%
5) Juniperus monosperma 5%

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: Piñon Ridge Uranium Mill
Project Number: 83088-1.8.2
Date: 9.18.07
Time: 1256
Site Location: T1-4
Biological Assessor (s): MZ, JM

Species of Interest:
NA

General Site Description: NATIVE GRASSLAND
Aspect: NORTH
Weather Conditions: CLEAR CALM 87°F
Transect Number: T1
Transect Orientation: N-S

Yes	No		Comments
X		Signs of wildlife observed?	SCAT
	X	Protected species observed?	
	X	Protected species habitat observed?	
	X	Wetland features present?	
	X	Located within the riparian habitat?	
	X	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:
RABBIT SCAT / TRACK

Vegetative Information:

Riparian Vegetation Present (yes/no): ND
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 4/6 = 66%
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 5%

Five (5) Dominant Plant Species (in descending order of dominance):

1) BUNCH GRASS
2) DOWNY BROME
3) PRICKLY PEAR
4) RUSSIAN THISTLE
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9.18.07
Time: 1243
Site Location: T1-6
Biological Assessor (s): MZ, SM

Species of Interest:
NA

General Site Description: NATIVE GRASSLAND
Aspect: NORTH
Weather Conditions: CLEAR CALM 87°F
Transect Number: T1
Transect Orientation: N-S

Yes	No		Comments
☒	☐	Signs of wildlife observed?	SCAT
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:
RABBIT SCAT

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 1/4 = 46.6%
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 5%

Five (5) Dominant Plant Species (in descending order of dominance):

1) BUNCH GRASS
2) DOWNY BROME
3) BIG SAGE
4) FOUR-WING SALTBRUSH
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Fall

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9/18/07
Time: 0817
Site Location: T1-8
Biological Assessor (s): JM ME

Species of Interest:

General Site Description: NATIVE
Aspect:
Weather Conditions:
Transect Number:
Transect Orientation:

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

CLOVE
ABANDONED RABBIT BURROWS
GROUND SQUIRREL BURROW

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: NNNNY
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 5%

Five (5) Dominant Plant Species (in descending order of dominance):

1) NATIVE GRASSES 60%
2) RUSSIAN THISTLE 40%
3) ATRIPLEX CANESCENS
4)
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Fall

Wildlife Observation and Habitat Assessment Form

Project Name: **Pinon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9/18/07
Time: 1519
Site Location: IZ-2
Biological Assessor (s): JM, MZ

Species of Interest:

General Site Description: BIG SAGE NEXT TO PJ ZONE
Aspect: NNE
Weather Conditions: CLEAR BREEZY
Transect Number: 2
Transect Orientation: NS

Yes	No		Comments
☐	☐	Signs of wildlife observed?	COTTONTAIL
☐	☐	Protected species observed?	
☐	☐	Protected species habitat observed?	
☐	☐	Wetland features present?	
☐	☐	Located within the riparian habitat?	
☐	☐	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

COTTONTAIL

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: 15 ft
DBH: (maximum) 6.0 IN
Ground Cover: 4/6 = 66%
Canopy Cover: 20%
DBH: (mean) 6.0 IN
Debris Cover (estimated): 35%

Five (5) Dominant Plant Species (in descending order of dominance):

1) ARTEMESIA TRIDENTATA 35%
2) BROMUS TECTORUM 30%
3) JUNIPERUS MONOSPERMA 20%
4) APLOPAPPUS SP. 10%
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9.18.07
Time: 1506
Site Location: T2-R
Biological Assessor (s): MZ, JM

Species of Interest:
NA

General Site Description: NATIVE GRASSLAND
Aspect: NORTH
Weather Conditions: CLEAR CALM
Transect Number: T2
Transect Orientation: N-S

Yes	No		Comments
☒	☐	Signs of wildlife observed?	SCAT
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:
RABBIT SCAT

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: BG = 83.3%
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 23%

Five (5) Dominant Plant Species (in descending order of dominance):

1) BUNCH GRASS
2) PRICKLY PEAR
3) RUSSIAN THISTLE
4) DOWNY BROME
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9.18.07
Time: 1226
Site Location: T2-6
Biological Assessor (s): MZ, JM

Species of Interest:
NA

General Site Description:
Aspect:
Weather Conditions:
Transect Number:
Transect Orientation:

Yes	No		Comments
☒	☐	Signs of wildlife observed?	SCAT
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:
~~HAMSTER~~, RABBIT SCAT / TRACKS

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 3/6 = 50%
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) BUNCH GRASS
2) PRICKLY PEAR
3) BIG SAGE
4) RUSSIAN THISTLE
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

FALL

Wildlife Observation and Habitat Assessment Form

Project Name: **Pinon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9/18/07
Time: 0827
Site Location: T2-8
Biological Assessor (s): JM MZ

Species of Interest:

General Site Description: BIG SAGE
Aspect: NW
Weather Conditions: CLEAR CALM 70°F
Transect Number: 2
Transect Orientation: N-S

Yes	No		Comments
☐	☑	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover:
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 25%

Five (5) Dominant Plant Species (in descending order of dominance):

1) ARTEMESIA TRIDENTATA
2) BROOM SNAKEWEED
3) BROMUS TECTORUM
4)
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9/18/07
Time:
Site Location: T3-2
Biological Assessor (s): JM MZ

Species of Interest:

General Site Description: NATIVE GRASSLAND
Aspect: NNE
Weather Conditions: CLEAR CALM 87°F
Transect Number: 3
Transect Orientation: NS

Yes	No		Comments
☐	☑	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

NONE

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 3/10 = 50%
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 15%

Five (5) Dominant Plant Species (in descending order of dominance):

1) BUNCH GRASS 80%
2) OPUNTIA SP. 25%
3) BROOM SNAKEWEED 20%
4) BROMUS TECTORUM 20%
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9.18.07
Time: 1322
Site Location: T3-4
Biological Assessor (s): MZ, JM

Species of Interest:
NA

General Site Description: NATIVE GRASSLAND
Aspect: NORTH
Weather Conditions: CLEAR CALM 87°F
Transect Number: T3
Transect Orientation: N-S

Yes	No		Comments
☒	☐	Signs of wildlife observed?	SCAT
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:
RABBIT SCAT

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 5% 83.3%
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 35%

Five (5) Dominant Plant Species (in descending order of dominance):

1) RUSSIAN THISTLE
2) BIG SAGE
3) BUNCH GRASS
4) DOWNY BROME
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9.18.07
Time: 1217
Site Location: T3-L6
Biological Assessor (s): MZ, JM

Species of Interest:
N/A

General Site Description: DISTURB 9.18.07 NRL NATIVE GRASSLAND
Aspect: NORTH
Weather Conditions: CLEAR CALM 87°F
Transect Number: T3
Transect Orientation: N-S

Yes	No		Comments
☒	☐	Signs of wildlife observed?	SCAT
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:
RABBIT SCAT

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 3/6 = 50%
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 5%

Five (5) Dominant Plant Species (in descending order of dominance):

1) DOWNY BROME
2) BLUE GRAMMA
3) PRICKLY PEAR
4)
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9/18/07
Time: 0849
Site Location: T3-B3
Biological Assessor (s): JM ME

Species of Interest:

General Site Description: BIG SAGE
Aspect: NE
Weather Conditions: CLEAR CALM 80°F
Transect Number: 3
Transect Orientation: N-S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

CLAY HEAR SPARROWS
RED ANT PILE

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 50% YYY NNN
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 5%

Five (5) Dominant Plant Species (in descending order of dominance):

1) BROOM SNAKEWEED
2) ARTEMESIA TRIDENTATA
3) NATIVE GRASSES
4)
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9/18/07
Time: 1454
Site Location: T4.2
Biological Assessor (s): JM MZ

Species of Interest:

General Site Description: NATIVE GRASSLAND
Aspect: N
Weather Conditions: CLEAR BREEZY
Transect Number: 4
Transect Orientation: NS

Yes	No		Comments
☐	☑	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 4/6 = 66.6%
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 25%

Five (5) Dominant Plant Species (in descending order of dominance):

1) BUNCH GRASS 40%
2) BROMUS TECTORUM 30%
3) RUSSIAN THISTLE 10%
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Pinon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9.18.07
Time: 1331
Site Location: T4-4
Biological Assessor (s): MZ, JM

Species of Interest:
NA

General Site Description: NATIVE GRASSLAND
Aspect: NORTH
Weather Conditions: CLEAR CALM 87°F
Transect Number: T4
Transect Orientation: N-S

Yes	No		Comments
☒	☐	Signs of wildlife observed?	SCAT
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:
RABBIT SCAT

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 3/4" 50%
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 15%

Five (5) Dominant Plant Species (in descending order of dominance):

1) DOWNY BROME
2) RUSSIAN THISTLE
3) FOUR-WING SALT~~BUSH~~ BRUSH
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: Piñon Ridge Uranium Mill
Project Number: 83088-1.8.2
Date: 9.18.07
Time: 1200
Site Location: T4-6
Biological Assessor (s): MZ, JM

Species of Interest:
NA

General Site Description: DISTURBED BIG SAGE AREA OVERGROWN W/ B. SNAKEWEED
Aspect: NORTH
Weather Conditions: CLEAR CALM 87°F
Transect Number: T4
Transect Orientation: N-S

Yes	No		Comments
X		Signs of wildlife observed?	BIRDS PRESENT / SCAT
	X	Protected species observed?	
	X	Protected species habitat observed?	
	X	Wetland features present?	
	X	Located within the riparian habitat?	
	X	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:
RABBIT SCAT

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 1/4 = 116.6 m2
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 40%

Five (5) Dominant Plant Species (in descending order of dominance):

1) BROOM SNAKEWEED
2) BIG SAGE
3) DOWNY BROME
4)
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: Piñon Ridge Uranium Mill
Project Number: 83088-1.8.2
Date: 9/18/07
Time: 0900
Site Location: T4-B
Biological Assessor (s): JM MZ

Species of Interest:

General Site Description: BIG SAGE
Aspect: W
Weather Conditions: CLEAR CALM 80°F
Transect Number: 4
Transect Orientation: NS

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT SCAT

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: YYY NNN = 50%
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): <5%

Five (5) Dominant Plant Species (in descending order of dominance):

1) ARTEMESIA TRIDENTATA 70%
2) BROOM SNAKEWEED 20%
3) ARISTIDA SP <5%
4)
5)

Other Remarks:

KLEINFELDER

FALL

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9/18/07
Time: 0925
Site Location: TH-10
Biological Assessor (s): JM MZ

Species of Interest:

General Site Description: ROADWAY US90
Aspect: S
Weather Conditions: CLEAR CALM 80°F
Transect Number: 4
Transect Orientation: N-S

Yes	No		Comments
☐	☑	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

NONE

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover:
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 5%

Five (5) Dominant Plant Species (in descending order of dominance):

1) CHRYSOTHAMNUS NAUSIOSA
2) NATIVE GRASSES
3)
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: Piñon Ridge Uranium Mill
Project Number: 83088-1.8.2
Date: 9/18/07
Time: 1446
Site Location: TS-2
Biological Assessor (s): JM ME

Species of Interest:

General Site Description: DISTURBED GRASSLAND
Aspect: N
Weather Conditions: CLEAR WIND 5-7mph 82°F
Transect Number: 5
Transect Orientation: NS

Yes	No		Comments
☑	☐	Signs of wildlife observed?	RABBIT SCAT
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

SCAT

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 1/10 = 16.6%
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 40%

Five (5) Dominant Plant Species (in descending order of dominance):

1) BUNCH GRASS 40%
2) RUSSIAN THISTLE 40%
3) BROMUS TECTORUM 10%
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9.18.07
Time: 1347
Site Location: T5-4
Biological Assessor (s): MZ, JM

Species of Interest:
NA

General Site Description: NATIVE GRASSLANDS
Aspect: NORTH
Weather Conditions: CLEAR CALM 88°F
Transect Number: T5
Transect Orientation: N-S

Yes	No		Comments
☒	☐	Signs of wildlife observed?	SCAT
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:
RABBIT SCAT

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 1/16 = 16.6%

Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) RUSSIAN THISTLE
2) FOUR-WING SALTBUSH
3) DOWNY BROME
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9.18.07
Time: 1150
Site Location: T5-L
Biological Assessor (s): MZ, JM

Species of Interest:
NA

General Site Description: BIG SAGE
Aspect: NORTH
Weather Conditions: CLEAR CALM 85°F
Transect Number: T5
Transect Orientation: N-S

Yes	No		Comments
☒	☐	Signs of wildlife observed?	RABBIT SCAT
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☒	☐	Other sensitive resource observed?	ARROYO 18' WEST POSSIBLE W.O.S.

Biological Indicators / Location / Description of Habitat / Time of Observation:
SCAT
CLIFF SWALLOW

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 1/4 = 50%
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 30%

Five (5) Dominant Plant Species (in descending order of dominance):
1) BIG SAGE
2) NATIVE GRASSES
3)
4)
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Fall

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 8/19/07
Time: 1011
Site Location: T5-8
Biological Assessor (s): JM MZ

Species of Interest:

General Site Description: Big SAGE
Aspect: SE
Weather Conditions: CLEAR CALM 85°F
Transect Number: 5
Transect Orientation: NS

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

SAGE SPARROWS
RABBIT SIGN

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: NO NO YES NO YES NO = 33.3%
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 12%

Five (5) Dominant Plant Species (in descending order of dominance):

1) ARTEMESIA TRIDENTATA 40%
2) BROOM SNAKEWEED 30%
3) BROMUS TECTORUM 5%
4) NATIVE GRASSES 5%
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: Piñon Ridge Uranium Mill
Project Number: 83088-1.8.2
Date: 9/18/07
Time: 0950
Site Location: TS-10
Biological Assessor (s): JM MZ

Species of Interest:

General Site Description: BIG SAGE
Aspect: NE
Weather Conditions: CLEAR CALM
Transect Number: 5
Transect Orientation: N/S

Yes	No		Comments
☐	☑	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

NONE

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: NO/NO/NO/NO/Yes/NO 16.66%

Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 45%

Five (5) Dominant Plant Species (in descending order of dominance):

1) NATIVE GRASS
2) Artemesia tridentata
3) BROOM SNAKEWEED
4)
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9/18/07
Time: 1429
Site Location: TG-2
Biological Assessor (s): JM - MZ

Species of Interest:

General Site Description: NATIVE GRASSLAND
Aspect: NNE
Weather Conditions: PARTLY CLOUDY, CALM, 84°F
Transect Number: 6
Transect Orientation: NS

Yes	No		Comments
☑	☐	Signs of wildlife observed?	RABBIT SCAT
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

SCAT

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 2/6 = 33.3%
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 40%

Five (5) Dominant Plant Species (in descending order of dominance):

1) BROMUS TECTORUM
2) RUSSIAN THISTLE
3) ATRIPLEX CANESCENS
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9.18.07
Time: 16-4
Site Location: 1356
Biological Assessor (s): MZ, JM

Species of Interest:
NA

General Site Description: NATIVE GRASSLAND
Aspect: NORTH
Weather Conditions: CLEAR CALM - SL WIND 87°F
Transect Number: 16
Transect Orientation: N-S

Yes	No		Comments
X		Signs of wildlife observed?	SCAT
	X	Protected species observed?	
	X	Protected species habitat observed?	
	X	Wetland features present?	
	X	Located within the riparian habitat?	
	X	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:
RABBIT SCAT

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 3/4 = 50%
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 5%

Five (5) Dominant Plant Species (In descending order of dominance):

1) DOWNY BROME
2) RUSSIAN THISTLE
3) FOUR-WINGED SALT BRUSH
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: Piñon Ridge Uranium Mill
Project Number: 83088-1.8.2
Date: 9.18.07
Time: 1128
Site Location: TT-6
Biological Assessor (s): MZ, JM

Species of Interest:

General Site Description: BIG. SAGE
Aspect: N-NW
Weather Conditions: CLEAR CALM 85°F
Transect Number: TT6
Transect Orientation: N-S

Yes	No		Comments
☒	☐	Signs of wildlife observed?	RABBIT SCAT
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

NA

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 4/6 = 66.6%
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 5%L

Five (5) Dominant Plant Species (in descending order of dominance):

1) BIG SAGE
2) BROOM SNAKEWEED
3)
4)
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

Fall

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9/18/07
Time: 1023
Site Location: T6-B
Biological Assessor (s): JM MZ

Species of Interest:

General Site Description: BIG SAGE
Aspect: NNE
Weather Conditions: CLEAR CALM 85°F
Transect Number: 6
Transect Orientation: NS

Yes	No		Comments
☑	☐	Signs of wildlife observed?	SPIDER
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT SCAT
SPIDER (YELLOW)

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover:
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 2%

Five (5) Dominant Plant Species (in descending order of dominance):

1) ARTEMESIA + PUDENTATA 70%
2) BROOM SNAKEWEED 25%
3) BROMUS TECTORUM <5%
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9/18/07
Time: 1420
Site Location: T7-2
Biological Assessor (s): JM. MZ

Species of Interest:

General Site Description: DISTURBED PASTURE
Aspect: NE
Weather Conditions: CLEAR BREEZY 85°F
Transect Number: 7
Transect Orientation: NS

Yes	No		Comments
☐	☑	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

NONE

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 1/6 = 16.6%
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 30%

Five (5) Dominant Plant Species (in descending order of dominance):

1) ATRIPLEX CANESCES 90%
2) BROMUS TECTORUM 5%
3)
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: Piñon Ridge Uranium Mill
Project Number: 83088-1.8.2
Date: 9.18.07
Time: 1410
Site Location: T7-4
Biological Assessor (s): _____

Species of Interest:
NA

General Site Description: DISTURBED NATIVE GRASSLAND (FENCE LINE / QUAD ROAD)
Aspect: NORTH
Weather Conditions: CLEAR CALM 89°F
Transect Number: T7
Transect Orientation: N-S

Yes	No		Comments
☒	☐	Signs of wildlife observed?	SCAT
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:
RABBIT SCAT

Vegetative Information:

Riparian Vegetation Present (yes/no): N/2
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 3/4 = 50%
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) RUSSIAN THISTLE
2) FOUR WING SALTBRUSH
3) DOWNY BROME
4)
5)

Other Remarks: _____

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9.17.07
Time: 1101
Site Location: T7-6
Biological Assessor (s): JM, MZ

Species of Interest:

General Site Description: DISTURBED BIG SAGE (ARROYO)
Aspect: ARROYO DRAINS NORTH
Weather Conditions: CLEAR CALM 85°F
Transect Number: T7
Transect Orientation: N-S

Yes	No		Comments
☒	☐	Signs of wildlife observed?	RABBIT SCAT
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	ARROYO POSSIBLE W.U.S.
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

CLIFF SWALLOWS APPROX. 12

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: Veg = 11.0%
Canopy Cover: None
DBH: (mean) NA
Debris Cover (estimated): 20%

Five (5) Dominant Plant Species (in descending order of dominance):

1) ATRIPLEX CANENSCE
2) RUSSIAN THISTLE
3)
4)
5)

Other Remarks:

JDH / MZ 2007

KLEINFELDER

FALL

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088-1.8.2**
Date: 9/18/07
Time: 1046
Site Location: T7-B
Biological Assessor (s): JM ME

Species of Interest:

General Site Description: FENCE LINE / BIG SAGE
Aspect: N
Weather Conditions: CLEAR CALM 85°F
Transect Number: 7
Transect Orientation: NS

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

NONE SEEN
GROUND SQUIRREL BURROWS

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: NO NO NO YES NO YES = 33.3%
Canopy Cover: NONE
DBH: (mean) NA
Debris Cover (estimated): 5%

Five (5) Dominant Plant Species (in descending order of dominance):

1) BIG SAGE ARTEMESIA TRIDENTATA
2) NATIVE GRASSES
3)
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 0840 JJM
Site Location: ~~T3-T~~ T1-3
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: PJ CV SLOPE
Aspect: E
Weather Conditions: CLEAR CALM 15°F 3" SNOW
Transect Number: 3
Transect Orientation: NS

Yes	No		Comments
☐	☐	Signs of wildlife observed?	DEER / ELK TRACKS
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: 15 FT
DBH: (maximum)
Ground Cover:
Canopy Cover:
DBH: (mean)
Debris Cover (estimated):

Five (5) Dominant Plant Species (in descending order of dominance):

1)	SNAKE	30
2)	JUNIPER	20
3)		20
4)		
5)		

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1229
Site Location: T1-5
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: GRASSLAND
Aspect: NE
Weather Conditions: CLEAR 10MPH WINDS
Transect Number: 1
Transect Orientation: NS

Yes	No		Comments
☐	☑	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

NONE

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height:
DBH: (maximum)
Ground Cover:
Canopy Cover:
DBH: (mean)
Debris Cover (estimated):

Five (5) Dominant Plant Species (in descending order of dominance):

1)
2)
3)
4)
5)

Other Remarks:

JJM / MZ 200*

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1245
Site Location: T1-7
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: GRASSLAND
Aspect: NE
Weather Conditions: CLEAR 3-5 MPH WIND 3" SNOW
Transect Number: 1
Transect Orientation: N/S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT TRACKS

Vegetative Information:

Riparian Vegetation Present (yes/no): _____
Canopy Height: _____ Canopy Cover: _____
DBH: (maximum) _____ DBH: (mean) _____
Ground Cover: _____ Debris Cover (estimated): _____

Five (5) Dominant Plant Species (in descending order of dominance):

1)
2)
3)
4)
5)

Other Remarks: _____

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1529
Site Location: T1-9
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: DISTURBED GRASSLAND
Aspect: W
Weather Conditions: CLEAR 10 MPH WIND 2" SNOW 20°F
Transect Number: 1
Transect Orientation: NS

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT TRACKS / SCAT

Vegetative Information:

Riparian Vegetation Present (yes/no): _____
Canopy Height: _____ Canopy Cover: _____
DBH: (maximum) _____ DBH: (mean) _____
Ground Cover: _____ Debris Cover (estimated): _____

Five (5) Dominant Plant Species (in descending order of dominance):

1)
2)
3)
4)
5)

Other Remarks: _____

JJM / MZ 200*

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/14/08
Time: 855
Site Location: T-2-3
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: GRASSLAND
Aspect: NE
Weather Conditions: CLEAR CALM 4 IN SNOW
Transect Number: 2
Transect Orientation: N/S

Yes	No		Comments
☐	☑	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

NONE

Vegetative Information:

Riparian Vegetation Present (yes/no): N
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: ?
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): NA

Five (5) Dominant Plant Species (in descending order of dominance):

1) ATRIPLEX CANESCENS
2) PASCOPYRUM SMITHII
3)
4)
5)

Other Remarks:

JJM / MZ 200*

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1142
Site Location: T2-5
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: GRASSLAND
Aspect: WNW
Weather Conditions: CLEAR 12MPH WIND
Transect Number: 2
Transect Orientation: NS

Yes	No		Comments
☐	☑	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

NONE

Vegetative Information:

Riparian Vegetation Present (yes/no):
Canopy Height:
DBH: (maximum)
Ground Cover: >5% SNOW
Canopy Cover:
DBH: (mean)
Debris Cover (estimated):

Five (5) Dominant Plant Species (in descending order of dominance):

1) RUSSIAN THISTLE
2)
3)
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1259
Site Location: TZ-7
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: GRASSLAND
Aspect: NE
Weather Conditions: CLEAR 5 MPH WIND
Transect Number:
Transect Orientation:

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT TRACKS
MOUSE TRACKS

Vegetative Information:

Riparian Vegetation Present (yes/no):
Canopy Height:
DBH: (maximum)
Ground Cover:
Canopy Cover:
DBH: (mean)
Debris Cover (estimated):

Five (5) Dominant Plant Species (in descending order of dominance):

1)
2)
3)
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1523
Site Location: T2-9
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: BIG SAGE
Aspect: SW
Weather Conditions: CLEAR 7 MPH WINDS 20°F 3" SNOW
Transect Number: 2
Transect Orientation: NS

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT TRACKS

Vegetative Information:

Riparian Vegetation Present (yes/no): _____
Canopy Height: _____
DBH: (maximum) _____
Ground Cover: _____
Canopy Cover: _____
DBH: (mean) _____
Debris Cover (estimated): _____

Five (5) Dominant Plant Species (in descending order of dominance):

1)
2)
3)
4)
5)

Other Remarks: _____

JJM / MZ 200*

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 10/10/08
Time: 0925
Site Location: T3-1
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: SV ON SLOPE
Aspect: N
Weather Conditions: CLEAR CALM 12°F
Transect Number: 3
Transect Orientation: N-S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT TRACKS

Vegetative Information:

Riparian Vegetation Present (yes/no): _____
Canopy Height: _____ Canopy Cover: _____
DBH: (maximum) _____ DBH: (mean) _____
Ground Cover: _____ Debris Cover (estimated): _____

Five (5) Dominant Plant Species (in descending order of dominance):

1)
2)
3)
4)
5)

Other Remarks: _____

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: ~~13~~ 902
Site Location: T3-3
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: GRASS SHRUBLAND
Aspect: N
Weather Conditions: CLEAR CALM 17°F 4" SNOW
Transect Number: 3
Transect Orientation: N/S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	MOUSE TRACKS COYOTE TRACKS
☐	☐	Protected species observed?	
☐	☐	Protected species habitat observed?	
☐	☐	Wetland features present?	
☐	☐	Located within the riparian habitat?	
☐	☐	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 50% SNOW
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): <3%

Five (5) Dominant Plant Species (in descending order of dominance):

1) ARTEMISIA TRIDENTATA 60
2) RUSSIAN THISTLE 40
3)
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: T3-5
Time: 1129
Site Location: 1/16/08
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: DISTURBED BIG SAGE/GRASSLAND
Aspect: NW
Weather Conditions: CLEAR 10MPH WIND 15°F 3" SNOW
Transect Number: 3
Transect Orientation: NS

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT TRACKS

Vegetative Information:

Riparian Vegetation Present (yes/no): _____
Canopy Height: _____ Canopy Cover: _____
DBH: (maximum) _____ DBH: (mean) _____
Ground Cover: _____ Debris Cover (estimated): _____

Five (5) Dominant Plant Species (in descending order of dominance):

1) BROOM SNAKEWEED
2) ARTEMISIA TRIDENTATA
3)
4)
5)

Other Remarks: _____

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1307
Site Location: T3-7
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: BIG SAGE
Aspect: NE
Weather Conditions: CLEAR CALM
Transect Number: 3
Transect Orientation: NS

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT TRACKS

Vegetative Information:

Riparian Vegetation Present (yes/no):
Canopy Height:
DBH: (maximum)
Ground Cover:
Canopy Cover:
DBH: (mean)
Debris Cover (estimated):

Five (5) Dominant Plant Species (in descending order of dominance):

1)
2)
3)
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1511
Site Location: T3-9
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: DISTURBED BIG SAGE
Aspect: W
Weather Conditions: CLEAR 5MPH
Transect Number: 3
Transect Orientation: N/S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT TRACKS

Vegetative Information:

Riparian Vegetation Present (yes/no): _____
Canopy Height: _____
DBH: (maximum) _____
Ground Cover: _____
Canopy Cover: _____
DBH: (mean) _____
Debris Cover (estimated): _____

Five (5) Dominant Plant Species (in descending order of dominance):

1)
2)
3)
4)
5)

Other Remarks: _____

JJM / MZ 200*

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 0945
Site Location: T4-1
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: Big sage
Aspect:
Weather Conditions:
Transect Number:
Transect Orientation:

Yes	No		Comments
☐	☐	Signs of wildlife observed?	RABBIT/ELK TRACKS
☐	☐	Protected species observed?	
☐	☐	Protected species habitat observed?	
☐	☐	Wetland features present?	
☐	☐	Located within the riparian habitat?	
☐	☐	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no):
Canopy Height:
DBH: (maximum)
Ground Cover:
Canopy Cover:
DBH: (mean)
Debris Cover (estimated):

Five (5) Dominant Plant Species (in descending order of dominance):

1)	ARTEMESIA	80
2)	ATRIPLEX CANENSE	10
3)	BROMUS	<5
4)		
5)		

Other Remarks:

JJM / MZ 200*

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 957
Site Location: T4-3
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: GRASSLAND
Aspect: N
Weather Conditions: CLEAR WIND 5MPH
Transect Number: 4
Transect Orientation: N/S

Yes	No		Comments
☐	☑	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

NONE

Vegetative Information:

Riparian Vegetation Present (yes/no): _____
Canopy Height: _____
DBH: (maximum) _____
Ground Cover: _____
Canopy Cover: _____
DBH: (mean) _____
Debris Cover (estimated): _____

Five (5) Dominant Plant Species (in descending order of dominance):

1) COMPLETELY COVERED BY SNOW
2)
3)
4)
5)

Other Remarks: _____

JJM / MZ 200*

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/07
Time: 1120
Site Location: T4-5
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: DISTURBED BIG SAGE
Aspect: N
Weather Conditions: CLEAR 10 MPH WIND 20°F 3" SNOW
Transect Number: 5
Transect Orientation: N/S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT TRACKS

Vegetative Information:

Riparian Vegetation Present (yes/no): _____
Canopy Height: _____
DBH: (maximum) _____
Ground Cover: _____
Canopy Cover: _____
DBH: (mean) _____
Debris Cover (estimated): _____

Five (5) Dominant Plant Species (in descending order of dominance):

1) BLOOM SNAKE WEED
2) ANNUALS
3)
4)
5)

Other Remarks: _____

JJM / MZ 200*

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1324
Site Location: T4-J
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: Big Sage
Aspect: N
Weather Conditions:
Transect Number:
Transect Orientation:

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Rabbit tracks

Vegetative Information:

Riparian Vegetation Present (yes/no):
Canopy Height:
DBH: (maximum)
Ground Cover:
Canopy Cover:
DBH: (mean)
Debris Cover (estimated):

Five (5) Dominant Plant Species (in descending order of dominance):

1) Big Sage
2) Brown
3)
4)
5)

Other Remarks:

JJM / MZ 200*

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1501
Site Location: TU-9
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: DISTURBED BIG SAGE
Aspect: SW
Weather Conditions: CLEAR
Transect Number: 4
Transect Orientation: N/S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT TRACKS

Vegetative Information:

Riparian Vegetation Present (yes/no): _____
Canopy Height: _____
DBH: (maximum) _____
Ground Cover: _____
Canopy Cover: _____
DBH: (mean) _____
Debris Cover (estimated): _____

Five (5) Dominant Plant Species (in descending order of dominance):

1)
2)
3)
4)
5)

Other Remarks: _____

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1004
Site Location: TS-3
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: GRASSLAND
Aspect: N
Weather Conditions: CLOUD WIND 10 MPH 10°F 4" SNOW
Transect Number: 5
Transect Orientation: N S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	RABBIT TRACKS
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): _____
Canopy Height: _____
DBH: (maximum) _____
Ground Cover: _____
Canopy Cover: _____
DBH: (mean) _____
Debris Cover (estimated): _____

Five (5) Dominant Plant Species (in descending order of dominance):

1) NONE DUE TO SNOW
2)
3)
4)
5)

Other Remarks: _____

JJM / MZ 200*

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1105
Site Location: T5-5
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: Big sage
Aspect: NW
Weather Conditions: CLEAR CALM 15°F 3" SNOW
Transect Number: 5
Transect Orientation: NS

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

BLACK TAIL JACKRABBIT

Vegetative Information:

Riparian Vegetation Present (yes/no):
Canopy Height:
DBH: (maximum)
Ground Cover:
Canopy Cover:
DBH: (mean)
Debris Cover (estimated):

Five (5) Dominant Plant Species (in descending order of dominance):

1) ARTEMESIA TRIDENTATA
2)
3)
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1332
Site Location: T5-7
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: Big SAGE
Aspect: NE
Weather Conditions: CLEAR 5 MPH 20°F 3" SNOW
Transect Number: 5
Transect Orientation: NS

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT TRACKS

Vegetative Information:

Riparian Vegetation Present (yes/no):
Canopy Height:
DBH: (maximum)
Ground Cover:
Canopy Cover:
DBH: (mean)
Debris Cover (estimated):

Five (5) Dominant Plant Species (in descending order of dominance):

1) Big SAGE
2) BROOM SNAKEWEED
3)
4)
5)

Other Remarks:

JJM / MZ 200*

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1443
Site Location: T5-9
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: BIG SAGE
Aspect: ESE
Weather Conditions: CLEAR 3-5 MPH WIND 20°F 3" SNOW
Transect Number: 5
Transect Orientation: N/S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT TRACKS

Vegetative Information:

Riparian Vegetation Present (yes/no):
Canopy Height:
DBH: (maximum)
Ground Cover:
Canopy Cover:
DBH: (mean)
Debris Cover (estimated):

Five (5) Dominant Plant Species (in descending order of dominance):

1)
2)
3)
4)
5)

Other Remarks:

JJM / MZ 200*

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1019
Site Location: T6-3
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: DISTURBED GRASSLAND
Aspect: WNW
Weather Conditions: CLEAR WIND 5 MPH 3 INCHES SNOW
Transect Number: 6
Transect Orientation: NS

Yes	No		Comments
☐	☐	Signs of wildlife observed?	
☐	☐	Protected species observed?	
☐	☐	Protected species habitat observed?	
☐	☐	Wetland features present?	
☐	☐	Located within the riparian habitat?	
☐	☐	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT TRACKS
DEER / ELK TRACKS

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: SNOW <5%
Canopy Cover:
DBH: (mean)
Debris Cover (estimated):

Five (5) Dominant Plant Species (in descending order of dominance):

1) ARTEMESIA TRIDENTATA
2) ATRIPLEX CANESCENS
3)
4)
5)

Other Remarks:

JJM / MZ 200*

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 11/16/08
Time: 1055
Site Location: T6-5
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: DISTURBED BIG SAGE
Aspect: ENE
Weather Conditions: CLEAR WIND SMAL 3" SNOW 15°F
Transect Number: 6
Transect Orientation: NS

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT TRACKS

Vegetative Information:

Riparian Vegetation Present (yes/no):
Canopy Height:
DBH: (maximum)
Ground Cover: SNOW 15%
Canopy Cover:
DBH: (mean)
Debris Cover (estimated):

Five (5) Dominant Plant Species (in descending order of dominance):

1) BROOM SNAKEWEED
2) ARTEMISIA TRIDENTATA
3) BROME
4)
5)

Other Remarks:

JJM / MZ 200*

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1347
Site Location: T6-7
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: Big Sage
Aspect: NE
Weather Conditions: Clear, Calm 20°F 3" Snow
Transect Number:
Transect Orientation:

Yes	No		Comments
☐	☐	Signs of wildlife observed?	
☐	☐	Protected species observed?	
☐	☐	Protected species habitat observed?	
☐	☐	Wetland features present?	
☐	☐	Located within the riparian habitat?	
☐	☐	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Rabbit tracks

Vegetative Information:

Riparian Vegetation Present (yes/no):
Canopy Height:
DBH: (maximum)
Ground Cover:
Canopy Cover:
DBH: (mean)
Debris Cover (estimated):

Five (5) Dominant Plant Species (in descending order of dominance):

1)
2)
3)
4)
5)

Other Remarks:

JJM / MZ 200*

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1432
Site Location: TC-9
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: BIG SAGE
Aspect: NNE
Weather Conditions: CLEAR 5MPH WIND
Transect Number: 6
Transect Orientation: N/S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT TRACKS

Vegetative Information:

Riparian Vegetation Present (yes/no): _____
Canopy Height: _____
DBH: (maximum) _____
Ground Cover: _____
Canopy Cover: _____
DBH: (mean) _____
Debris Cover (estimated): _____

Five (5) Dominant Plant Species (in descending order of dominance):

1)
2)
3)
4)
5)

Other Remarks: _____

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 11/16/06
Time: 1025
Site Location: I73
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: DISTURBED GRASSLAND
Aspect: NE
Weather Conditions: CLEAR WIND 7 MPH 4" SNOW
Transect Number: 7
Transect Orientation: NS

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT TRACKS

Vegetative Information:

Riparian Vegetation Present (yes/no):
Canopy Height:
DBH: (maximum)
Ground Cover:
Canopy Cover:
DBH: (mean)
Debris Cover (estimated):

Five (5) Dominant Plant Species (in descending order of dominance):

1) ATRIPLEX CANESCENS
2) RUSSIAN THISTLE
3) BROME
4)
5)

Other Remarks:

JJM / MZ 200*

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1039
Site Location: C7-5
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: DISTURBED GRASSLAND
Aspect: NE
Weather Conditions: CLEAR 10 MPH WIND 15°F 3" SNOW
Transect Number: 7
Transect Orientation: NS

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☐	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT TRACKS

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: N A
DBH: (maximum)
Ground Cover: SNOW 95%
Canopy Cover:
DBH: (mean)
Debris Cover (estimated):

Five (5) Dominant Plant Species (in descending order of dominance):

1) RUSSIAN THISTLE
2)
3)
4)
5)

Other Remarks:

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1357
Site Location: T7-7
Biological Assessor (s): JJM/MZ LB

Species of Interest:

General Site Description: DISTURBED BIG SAGE
Aspect: NW
Weather Conditions: CLEAR 5MPH WIND 20°F 3" SNOW
Transect Number: 7
Transect Orientation: NS

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT TRACKS

Vegetative Information:

Riparian Vegetation Present (yes/no): _____
Canopy Height: _____ Canopy Cover: _____
DBH: (maximum) _____ DBH: (mean) _____
Ground Cover: _____ Debris Cover (estimated): _____

Five (5) Dominant Plant Species (in descending order of dominance):

1)
2)
3)
4)
5)

Other Remarks: _____

JJM / MZ 200*

KLEINFELDER

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 1/16/08
Time: 1417
Site Location: T7-9
Biological Assessor (s): JJM/MZ

Species of Interest:

General Site Description: BIG SAGE (DISTURBED)
Aspect: W
Weather Conditions: CLEAR 3MPH WIND 20°F 2½" SNOW
Transect Number: 7
Transect Orientation: N/S

Yes	No		Comments
☑	☐	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

RABBIT TRACKS

Vegetative Information:

Riparian Vegetation Present (yes/no): _____
Canopy Height: _____ Canopy Cover: _____
DBH: (maximum) _____ DBH: (mean) _____
Ground Cover: _____ Debris Cover (estimated): _____

Five (5) Dominant Plant Species (in descending order of dominance):

1)
2)
3)
4)
5)

Other Remarks: _____

JJM / MZ 200*

Ward Wickett
CSU

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08 Monday
Time: 8:07AM
Site Location: T1-2
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: PJ on steep slope
Aspect: North
Weather Conditions: Clear, Sunny
Transect Number: 1
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: 10-12 feet
DBH: (maximum) 1.8
Ground Cover: 10-20%
Canopy Cover: 5%
DBH: (mean) 1.0, 0.8, 1.8 inches
Debris Cover (estimated): <5%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Pinus edulus
2) Fraxinus anomala
3) Ephedra viridis
4) Juniperus monosperma
5) Grass

Other Remarks: 1 Colorado Ash

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 12:04 PM MONDAY
Site Location: T1-3
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: PJ on Steep slope
Aspect: East
Weather Conditions: Sunny Clear Mid 80s
Transect Number: #1
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Call, Deer Scat
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: 10-12 ft.
DBH: (maximum) 8.7"
Ground Cover: 20-30%
Canopy Cover: 10-20%
DBH: (mean) 8.7", 4.1", 7.0"
Debris Cover (estimated): ≤10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Juniperus monosperma
2) Gutierrezi sarothrae
3) Panicum capillare
4) Bromus tectorum
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 12:48
Site Location: T1-4
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Grassland
Aspect: North
Weather Conditions: Clear sunny 90s
Transect Number: #1
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	Cow Scat
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 60-70%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): 2-10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Opuntia spp.
2) Bromus tectorum
3)
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5/19/08 MONDAY
Time: 3:17 PM
Site Location: T1-5
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: GRASSLAND
Aspect: NE
Weather Conditions: CLEAR. BREEZY 90°F
Transect Number: 1
Transect Orientation: North/South

Yes	No		Comments
☐	☑	Signs of wildlife observed?	
☐	☑	Protected species observed?	
☐	☑	Protected species habitat observed?	
☐	☑	Wetland features present?	
☐	☑	Located within the riparian habitat?	
☐	☑	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

COW SCAT

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: N/A
DBH: (maximum) N/A
Ground Cover: 30-40%
Canopy Cover: N/A
DBH: (mean) N/A
Debris Cover (estimated): 10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) BROMUS TECTORUM
2) ATRIPLEX CANESCENCE
3) OPUNTIA SPP
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 3:34
Site Location: T1-6
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Grassland
Aspect: North
Weather Conditions: Sunny Clear Breezy ↓90s
Transect Number: #1
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 50-60%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Fescue
2) Atriplex canescens
3) opuntia spp.
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 6:03
Site Location: T1-7
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Grassland
Aspect: NE
Weather Conditions: Sunny Clear ~80s
Transect Number: #1
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Cow Scat, BTJR Scat
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 50-60%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): ~10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Fescue
2) Small Grass
3)
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: Piñon Ridge Uranium Mill
Project Number: 83088
Date: 5-20-08
Time: 7:55
Site Location: T1-8
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Grassland
Aspect: North/NE
Weather Conditions: Sunny Clear ↑ 70s
Transect Number: #1
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 60-70%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): 10-20%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Fescue
2) Purple
3) Short-Grass
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08 MONDAY
Time: 8:30
Site Location: T2-Z
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: SAGEBRUSH GRASSLAND
Aspect: NORTHEAST
Weather Conditions: CLEAR SUNNY HIGH 60's
Transect Number: #2
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Sight / Call
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Cow Scat

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: 6-8 ft.
DBH: (maximum) 5.8"
Ground Cover: 50-75%
Canopy Cover: < 10%
DBH: (mean) 5.8", 1.8"
Debris Cover (estimated): 10-20%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemisia tridentata
2) Bromus tectorum
3) Juniperus monosperma
4) Opuntia spp.
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08 Monday
Time: 11:56 AM
Site Location: TZ-3
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: GRASSLAND
Aspect: North
Weather Conditions: Clear Sunny ~80s
Transect Number: #2
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Call
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 60-70%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Bromus tectorum
2) Opuntia spp.
3) Atriplex canescens
4) Purple Flower
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 12:57
Site Location: T2-4
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Grassland
Aspect: North
Weather Conditions: Sunny Clear 90s
Transect Number: #2
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Cow Scat
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 40-50%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Bromus tectorum
2) Opuntia spp.
3) Atriplex canescens
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 3:05
Site Location: TZ-5
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Grassland
Aspect: NW
Weather Conditions: Sunny Clear ↓ 90s Breezy
Transect Number: #2
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Calf
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 50-60%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): < 10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Bromus tectorum
2) Oryzopsis spp.
3) GRASS
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 3:40 PM
Site Location: T2-6
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Grassland
Aspect: NW
Weather Conditions: Sunny Clear Breezy ↑80s
Transect Number: #2
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Call
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 40-50%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Fescue
2) Opuntia spp.
3)
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 5:55
Site Location: T2-7
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Grassland
Aspect: North
Weather Conditions: Sunny Clear ↓80s
Transect Number: #2
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Call
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 70-80%
Canopy Cover: ~ NA
DBH: (mean) NA
Debris Cover (estimated): 10-20%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Fescue
2) Gutierrzia sarothrae
3) Atriplex canensous
4) Bromous tectorum
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-20-08
Time: 8:01 AM
Site Location: T2-8
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush Grassland
Aspect: NW
Weather Conditions: Clear Sunny ↑70s
Transect Number: #2
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 40-50%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): 10-20%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemisia tridentata
2) Bromus tectorum
3) Gutierrzia sarothrae
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08 MONDAY
Time: 9:15 AM
Site Location: T3-1
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: PJ Steep Slope
Aspect: North
Weather Conditions: Sunny Clear Low 70s
Transect Number: #3
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird CALL
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: 12-15ft
Canopy Cover: 10%
DBH: (maximum) 6.5"
DBH: (mean) 3.9, 5.8, 6.5"
Ground Cover: 10-70%
Debris Cover (estimated):

Five (5) Dominant Plant Species (in descending order of dominance):

1) Pinus edulis
2) Juniperus monosperma
3) Fendlera rupicola
4) Cercocarpus montanus
5) GRASS

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08 MONDAY
Time: 8:57 AM
Site Location: T3-2
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: SAGEBRUSH GRASSLAND
Aspect: NORTH
Weather Conditions: SUNNY CLEAR HIGH 60s
Transect Number: #3
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Sight / Call, Red Harvester Ants
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: N/A
DBH: (maximum) N/A
Ground Cover: 50-75%
Canopy Cover: N/A
DBH: (mean) N/A
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Atriplex canescens
2) Artemisia tridentata
3) Bromus tectorum
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08 MONDAY
Time: 11:41 AM
Site Location: T3-3
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush Grassland
Aspect: Northwest
Weather Conditions: Clear Sunny Jr 80s
Transect Number: #3
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Call, Cow Scat
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 50-60%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): 10-20%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Bromus Tectorum
2) Artemisia tridenta
3) Purple Flower
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 1:12 pm
Site Location: T3-4
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush Grassland
Aspect: Northwest
Weather Conditions: Sunny Clear 90s
Transect Number: #3
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Cow Scat
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 30-40%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): 10-20%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemisia tridentata
2) Bromus tectorum
3)
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 2:48 PM
Site Location: T3-5
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sage / Grassland
Aspect: North
Weather Conditions: Sunny Clear ↓90s
Transect Number: #3
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 20-30%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): < 10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Gutierrezia sarothrae
2) Artemisia tridentata
3) Hordeum jubatum
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 3-19-08
Time: 3:56
Site Location: T3-6
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Grassland
Aspect: North
Weather Conditions: Sunny Clear Breezy Mid 80s
Transect Number: #3
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): N/O
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 40-50 %
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Fescue
2) Bromus tectorum
3) Artemisia tridentata
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 5:40
Site Location: TS-7
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush
Aspect: North
Weather Conditions: sunny clear & 80s
Transect Number:
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Call / BTJR Scat
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 50-60%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): 40%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemisia tridentata
2) Gutierrezia sarothra
3) Opuntia spp
4) Bromus tectorum
5) Hordeum jubatum

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-20-08
Time: 8:18
Site Location: T3-8
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush Grassland
Aspect: North west
Weather Conditions: Clear Sunny ↓80s
Transect Number: #3
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Call / BTJR Scat
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): no
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 50-60%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): 10-20%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemsia tridentata
2) Gutierrzia sarothrae
3) Small Grass
4)
5)

Other Remarks:

See Reverse for T1-9

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-20-08
Time: 10:50
Site Location: T3-9
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush- Grassland
Aspect: South-Southwest
Weather Conditions: Clear Sunny ↑80s
Transect Number: #3
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Call, Red Harvester Ants
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: N/A
DBH: (maximum) N/A
Ground Cover: 40-50%
Canopy Cover: N/A
DBH: (mean) N/A
Debris Cover (estimated): 10-20%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemsia tridenta
2) Gutierrzia sorothrae
3)
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08 MONDAY
Time: 9:38am
Site Location: T4-1
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: SAGEBRUSH GRASSLAND
Aspect: Northwest
Weather Conditions: Clear Sunny
Transect Number: #4
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Sight / Call
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: N/A
DBH: (maximum) N/A
Ground Cover: 40-50%
Canopy Cover: N/A
DBH: (mean) N/A
Debris Cover (estimated): 10-20%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemsia tridentata
2) Atriplex canascens
3) Guiterrezia sarothrea
4) Bromus tectorum
5) Oplumia spp

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08 MONDAY
Time: 10:00AM
Site Location: T4-2
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: GRASSLAND
Aspect: North
Weather Conditions: SUNNY Clear Mid 70s
Transect Number: #4
Transect Orientation: North/South

Yes	No		Comments
X		Signs of wildlife observed?	Bird Calf, Red Harvestor Ants
	X	Protected species observed?	
	X	Protected species habitat observed?	
	X	Wetland features present?	
	X	Located within the riparian habitat?	
	X	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

COW SCAT

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 70-80%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): 10-20%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Bromus tectorum
2) Purple Flower
3)
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08 MONDAY
Time: 11:32 AM
Site Location: T1-3
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: GRASSLANDS
Aspect: NORTH
Weather Conditions: SUNNY CLEAR ↓80s
Transect Number: T1
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Call, Cow Scat
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 60-70
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): 10-20%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Bromus tectorum
2) Purple Flower
3)
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 1:18
Site Location: T4-4
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Grassland
Aspect: North
Weather Conditions: Sunny Clear 90's
Transect Number: #4
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Cow Scat / Bird Call
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 70-80%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Bromus tectorum
2) Atriplex canescens
3)
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 2:40 PM
Site Location: TU-5
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush
Aspect: NE
Weather Conditions: Sunny Clear ↓90s
Transect Number: #5
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Call
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 60-70
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): 10-20%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemisia tridentata ↕ switch
2) Gutierrezia sarothrae ↕
3) Bromus tectorum
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-29-08
Time: 4:05
Site Location: T4-6
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush
Aspect: Northwest
Weather Conditions: Sunny Clear ↓80s
Transect Number: #4
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 90-50%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): ~10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemisia tridenta
2) Bromus tectorum
3) Gutierriza sarothrae
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: Piñon Ridge Uranium Mill
Project Number: 83088
Date: 5-19-08
Time: 5:33
Site Location: T4-7
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush
Aspect: NE
Weather Conditions: Sunny Clear ↓80s
Transect Number: #4
Transect Orientation: North/South

Yes	No		Comments
☐	☑	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 50-60%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemisia tridentata
2) Gutierrazia sarothrae
3) Opuntia spp.
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-20-08
Time: 8:26
Site Location: T4-8
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush Grassland
Aspect: NorthEast
Weather Conditions: Sunny Clear ↓80s
Transect Number: #4
Transect Orientation: North/South

Yes	No		Comments
X		Signs of wildlife observed?	Bird Call / BTJP Scat
	X	Protected species observed?	
	X	Protected species habitat observed?	
	X	Wetland features present?	
	X	Located within the riparian habitat?	
	X	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 40-50%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): ~10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemsia tridentata
2) Gutierrzia sorothrae
3) Fescue
4)
5)

Other Remarks:

See Reverse for T2-9

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-20-08
Time: 10:44
Site Location: T4-9
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush - Disturbed
Aspect: South
Weather Conditions: Sunny clear 9805
Transect Number: T4
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 30-40%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): ~10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemsia tridentata
2) Small Grass
3)
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: Piñon Ridge Uranium Mill
Project Number: 83088
Date: 5-20-08
Time: 10:02 AM
Site Location: T4-10
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Shoulder along roadside
Aspect: West
Weather Conditions: Sunny clear mid 80s
Transect Number: #4
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 60-70%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): 20-30%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Bromus tectorum
2) Hordeum jubatum
3) Panicum capillare
4) Ericameria nauseosa
5) Artemisia tridentata

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08 MONDAY
Time: 10:18 AM
Site Location: T5-2
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: GRASSLAND
Aspect: NORTH
Weather Conditions: SUNNY CLEAR High 70s
Transect Number: #5
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Call, COW SCAT
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 60-70%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): 40%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Bromus tectorum
2) Atriplex canescens
3) Purple Flower
4) Opuntia spp.
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08 MONDAY
Time: 11:16 AM
Site Location: T5-3
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Disturbed Grassland
Aspect: North
Weather Conditions: Sunny Clear ↓80s
Transect Number: #5
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 10% - 20%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): ~10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Bromos tectorum
2) Pigweed
3) Atriplex canescens
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 1:32 PM
Site Location: TS-4
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Grassland
Aspect: North
Weather Conditions: Sunny, Clear ↓ 90s
Transect Number: #5
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Cow Scat / Bird Call
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 40-50%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): ~10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Bromus tectorum
2) Artemisia tridentata
3) Mustard
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 2:25 PM
Site Location: T5-5
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush
Aspect: NW
Weather Conditions: Sunny Clear ~90s
Transect Number: #5
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Call
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
Canopy Cover: NA
DBH: (maximum) NA
DBH: (mean) NA
Ground Cover: 20-30%
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemisia tridentata
2)
3)
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 4:21
Site Location: TS-6
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush
Aspect: NW
Weather Conditions: Sunny Clear ↓80s
Transect Number: #5
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 50-60%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): < 10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemisia tridenta
2) Oppuntia spp.
3)
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 5:19 PM
Site Location: T5-7
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush
Aspect: Northeast
Weather Conditions: Sunny Clear 80s
Transect Number: #5
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	BT JR
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 50-60
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemsia tridentata
2) Gutierrzia sarothrae
3) Hordeum jubatum
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: Piñon Ridge Uranium Mill
Project Number: 83088
Date: 5-20-08
Time: 8:44
Site Location: TS-8
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush Grassland
Aspect: North/Northwest
Weather Conditions: Sunny Clear ↓80s
Transect Number: #5
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Call / BTJR Scat
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 40-50%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): 20-30%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemisia tridentata
2) Gutierrezia sarothrae
3) Hordeum jubatum
4) Small Grass
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: Piñon Ridge Uranium Mill
Project Number: 83088
Date: 5-20-08
Time: 10:24 AM
Site Location: T5-9
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush
Aspect: Northeast
Weather Conditions: Clear Sunny ↑80s
Transect Number: #5
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Red Harvestor Ants
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 40-50%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemsia tridentata
2) Small Grass
3)
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: Piñon Ridge Uranium Mill
Project Number: 83088
Date: 5-20-08
Time: 9:52
Site Location: T5-10
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush
Aspect: Northeast
Weather Conditions: Sunny clear 1 80s
Transect Number: #5
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: N/A
DBH: (maximum) N/A
Ground Cover: 30-40%
Canopy Cover: N/A
DBH: (mean) N/A
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemisia tridentata
2) Fescue
3) Gutierrezia sarothrae
4) Hordeum jubatum
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08 MONDAY
Time: 10:26
Site Location: T6-Z
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: GRASSLAND
Aspect: NorthEast
Weather Conditions: Sunny Clear High 70s
Transect Number: #6
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Calf, Grasshopper
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 60-70%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Bromus tectorum
2) Atriplex Canescens
3) Purple Flower
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08 MONDAY
Time: 11:09 AM
Site Location: T6-3
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Disturbed Grassland
Aspect: Northeast
Weather Conditions: Sunny Clear ~80s
Transect Number: T6
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Call
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: <10%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Atriplex Canescens
2) Bromus tectorum
3)
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 1:38 PM
Site Location: T6-4
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Grassland
Aspect: North
Weather Conditions: Sunny Clear ↓ 90s
Transect Number: #6
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 70-80%

Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Bromus tectorum
2) Gutierrezia Sarothera
3) Atriplex conescens
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: Piñon Ridge Uranium Mill
Project Number: 83088
Date: 5-19-08
Time: 2:17 PM
Site Location: T6-S
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush Grassland
Aspect: NE
Weather Conditions: Sunny Clear ~90s
Transect Number: #6
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 30-40%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Gutierriza sarothra
2) Artemisia tridenta
3) Bromous tectorum
4) Organe Flower
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 4:37
Site Location: T6-6
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush
Aspect: NW
Weather Conditions: Sunny Clear 1 80s
Transect Number: #6
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 40-50%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): ~10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemsia tridentata
2)
3)
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: Piñon Ridge Uranium Mill
Project Number: 83088
Date: 5-19-08
Time: 5:12
Site Location: T6-7
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush
Aspect: NW
Weather Conditions: Sunny Clear ~80s
Transect Number: #6
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 40-50%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemsia tridentata
2)
3)
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-20-08
Time: 8:52
Site Location: T6-8
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush
Aspect: North
Weather Conditions: Sunny Clear ↓80s
Transect Number: #6
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Call, Deer Track
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 50-60%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): ~10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemisia tridentata
2) Gutierrezia Sarothrae
3)
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-20-08
Time: 9:41 AM
Site Location: T6-9
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush Grassland
Aspect: Northwest
Weather Conditions: Sunny Clear
Transect Number: #6
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Call / BTOR
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 50-60%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemisia tridentata
2) Gutierrzia sarothrae
3) Bromus tectorum
4) Hordeum jubatum
5) Fescue

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08 MONDAY
Time: 10:43 AM
Site Location: T7-2
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: GRASSLAND (Disturbed)
Aspect: Northeast
Weather Conditions: Sunny Clear High 70s
Transect Number: #7
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 10-20%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Atriplex canescens
2) Bromus tectorum
3)
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08 MONDAY
Time: 10:53 AM
Site Location: T7-3
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Disturbed Grassland
Aspect: Northwest
Weather Conditions: Sunny Clear ↑ 70s
Transect Number: #7
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Cow Scat
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 30-40%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): ~10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Atriplex Canescens
2) Bromus tectorum
3) Purple Flower
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 1:57 PM
Site Location: T74
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Disturbed Grassland
Aspect: North East
Weather Conditions: Sunny Clear ↓ 90s
Transect Number: #7
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Call
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 60-70%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): 10-20%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Bromous tectorum
2) Stipa spp. cadescens
3) Purple Flower
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: Piñon Ridge Uranium Mill
Project Number: 83088
Date: 5-19-08
Time: 1:59
Site Location: T7-5
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Disturbed - Road
Aspect: North
Weather Conditions: Sunny Clear ↓90s
Transect Number: #7
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 10-20%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): 40%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Bromous tectorum
2) Purple Flower
3)
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 4:45
Site Location: T7-6
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush (Disturbed)
Aspect: Northeast
Weather Conditions: Sunny Clear ~80s
Transect Number: #7
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 30-40%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): ~10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemisia tridenta
2) Atriplex canescens
3) Hordeum jubatum
4) Bromus tectorum
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-19-08
Time: 4:55
Site Location: T7-7
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush / Roadside
Aspect: North / NW
Weather Conditions: Sunny Clear 80s
Transect Number: #7
Transect Orientation: North/South

Yes	No		Comments
☐	☒	Signs of wildlife observed?	
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): NO
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 20-30%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): <10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemisia tridentata
2) Gutierrzia sarothrae
3) Bromus tectorum
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Piñon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-20-08
Time: 9:08
Site Location: T7-8
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Roadside
Aspect: North
Weather Conditions: Sunny Clear mid 80s
Transect Number: #7
Transect Orientation: North/South

Yes	No		Comments
☒	☐	Signs of wildlife observed?	Bird Call
☐	☒	Protected species observed?	
☐	☒	Protected species habitat observed?	
☐	☒	Wetland features present?	
☐	☒	Located within the riparian habitat?	
☐	☒	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 30-40%
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): ~10%

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemisia tridentata
2) Small Grass
3)
4)
5)

Other Remarks:

KLEINFELDER
Bright People. Right Solutions.

Wildlife Observation and Habitat Assessment Form

Project Name: **Pinon Ridge Uranium Mill**
Project Number: **83088**
Date: 5-20-08
Time: 9:25
Site Location: T7-9
Biological Assessor (s): JJM/RJ

Species of Interest:

General Site Description: Sagebrush Grassland
Aspect: Northwest
Weather Conditions: Sunny Clear mid 80s
Transect Number: #7
Transect Orientation: North/South

Yes	No		Comments
X		Signs of wildlife observed?	Bird Call
	X	Protected species observed?	
	X	Protected species habitat observed?	
	X	Wetland features present?	
	X	Located within the riparian habitat?	
	X	Other sensitive resource observed?	

Biological Indicators / Location / Description of Habitat / Time of Observation:

Vegetative Information:

Riparian Vegetation Present (yes/no): No
Canopy Height: NA
DBH: (maximum) NA
Ground Cover: 50-60 %
Canopy Cover: NA
DBH: (mean) NA
Debris Cover (estimated): 10-20 %

Five (5) Dominant Plant Species (in descending order of dominance):

1) Artemisia tridentata
2) Gutierrezia sarothrae
3) Fescue
4) Small Grass
5)

Other Remarks:

APPENDIX C

PHOTOGRAPHS



Photograph 1 – View of T1-3. Looking south.



Photograph 2 – View of T1-5. Looking north.



Photograph 3 – View of T1-7. Looking north.



Photograph 4 – View of T1-9. Looking north.

KLEINFELDER
Bright People. Right Solutions.

Project Number: 83088.1.8.2 Photos Taken: 8/21/07

Piñon Ridge Property
16910 Highway 90
Bedrock, Colorado 81411

Summer Site Photographs

Appendix C



Photograph 5 – View of T2-3. Looking north.



Photograph 6 – View of T2-5. Looking north.



Photograph 7 – View of T2-7. Looking north.



Photograph 8 – View of T2-9. Looking north.

KLEINFELDER
Bright People. Right Solutions.

Project Number: 83088.1.8.2 Photos Taken: 8/21/07

Piñon Ridge Property
16910 Highway 90
Bedrock, Colorado 81411

Summer Site Photographs

Appendix C



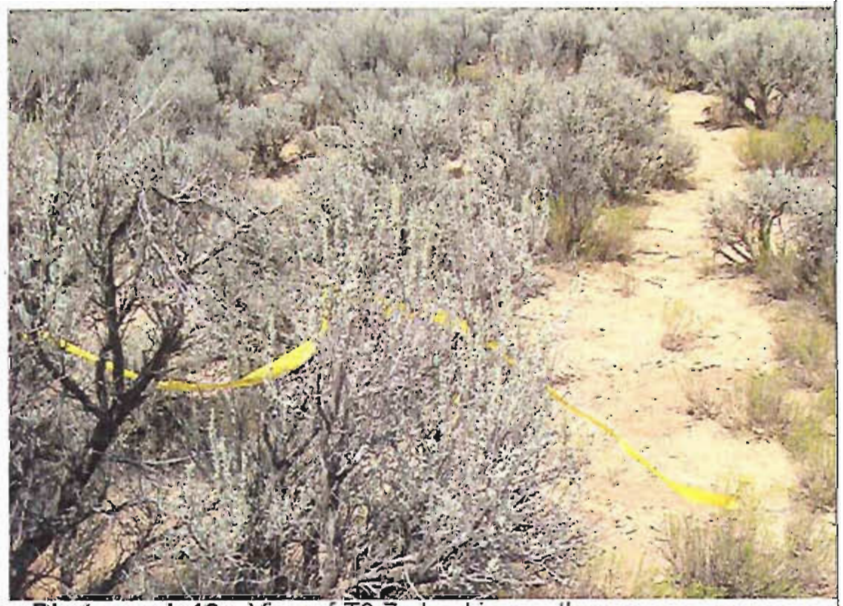
Photograph 9 – View of T3-1. Looking west.



Photograph 10 – View of T3-3. Looking north.



Photograph 11 – View of T3-5. Looking north.



Photograph 12 – View of T3-7. Looking north.

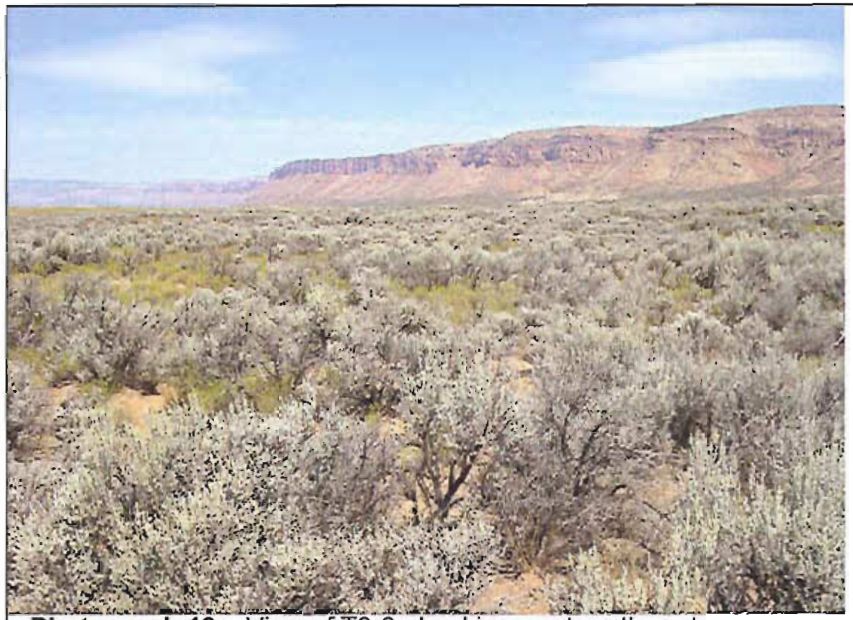
KLEINFELDER
Bright People. Right Solutions.

Project Number: 83088.1.8.2 Photos Taken: 8/21/07

Piñon Ridge Property
16910 Highway 90
Bedrock, Colorado 81411

Summer Site Photographs

Appendix C



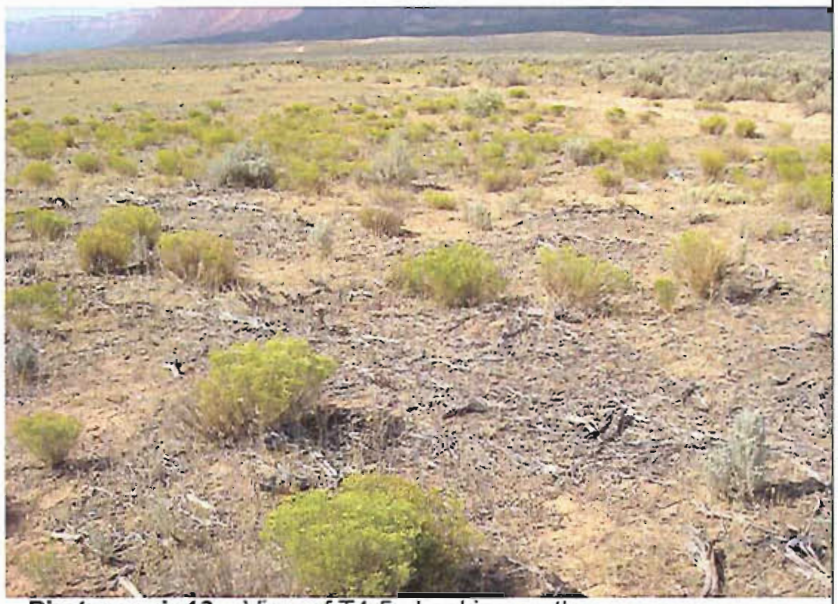
Photograph 13 – View of T3-9. Looking west-northwest.



Photograph 14 – View of T4-1. Looking north.



Photograph 15 – View of T4-3. Looking north.



Photograph 16 – View of T4-5. Looking north.

KLEINFELDER *Bright People. Right Solutions.* Project Number: 83088.1.8.2 Photos Taken: 8/21/07	Piñon Ridge Property 16910 Highway 90 Bedrock, Colorado 81411	**Summer Site Photographs**	**Appendix C**



Photograph 17 – View of T4-7. Looking north.



Photograph 18 – View of T4-9. Looking north.



Photograph 19 – View of T5-3. Looking north.



Photograph 20 – View of T5-5. Looking north.

KLEINFELDER
Bright People. Right Solutions.

Project Number: 83088.1.8.2 Photos Taken: 8/21/07

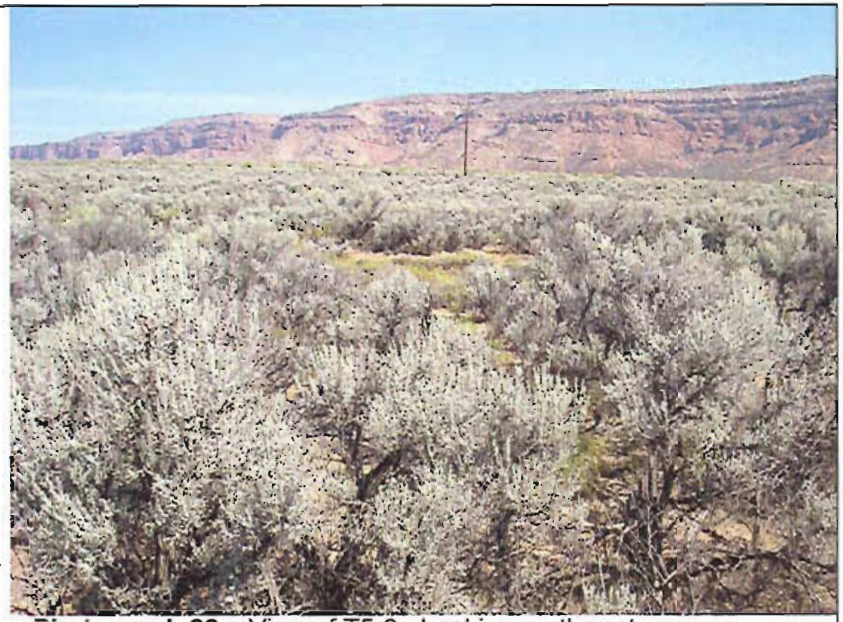
Piñon Ridge Property
16910 Highway 90
Bedrock, Colorado 81411

Summer Site Photographs

Appendix C



Photograph 21 – View of T5-7. Looking north.



Photograph 22 – View of T5-9. Looking northwest.



Photograph 23 – View of T6-3. Looking north.



Photograph 24 – View of T6-5. Looking north.

KLEINFELDER
Bright People. Right Solutions.

Project Number: 83088.1.8.2 Photos Taken: 8/21/07

Piñon Ridge Property
16910 Highway 90
Bedrock, Colorado 81411

Summer Site Photographs

Appendix C



Photograph 25 – View of T6-7. Looking north.



Photograph 26 – View of T7-3. Looking north.



Photograph 27 – View of T7-5. Looking north.



Photograph 28 – View of T7-7. Looking north.

KLEINFELDER
Bright People. Right Solutions.

Project Number: 83088.1.8.2 Photos Taken: 8/21/07

Piñon Ridge Property
16910 Highway 90
Bedrock, Colorado 81411

Summer Site Photographs

Appendix C



Photograph 29 – View of T7-9. Looking northwest.



Photograph 30 – View of grassland/big sage habitat across the Paradox Valley. Looking northeast.



Photograph 31 – View of grassland habitat from edge of the piñon/juniper habitat. Looking northeast.



Photograph 32 – View of Study Area from the southwest corner (T1-2). Looking northeast.

KLEINFELDER
Bright People. Right Solutions.

Project Number: 83088.1.8.2 Photos Taken: 8/21/07

Piñon Ridge Property
16910 Highway 90
Bedrock, Colorado 81411

Summer Site Photographs

Appendix C



Photograph 33 – View of T1-2. Looking east-northeast.



Photograph 34 – View of T1-4. Looking north.



Photograph 35 – View of T1-6. Looking north.



Photograph 36 – View of T1-8. Looking north.

KLEINFELDER
Bright People. Right Solutions.

Project Number: 83088.1.8.2 Photos Taken: 9/18/07

Piñon Ridge Property
16910 Highway 90
Bedrock, Colorado 81411

Fall Site Photographs

Appendix C



Photograph 37 – View of T2-2. Looking north.



Photograph 38 – View of T2-4. Looking north.

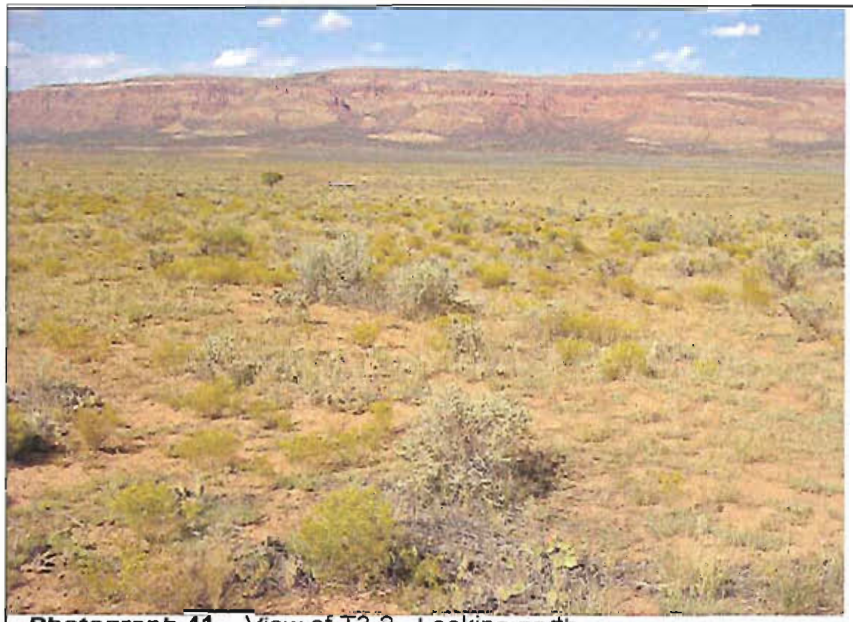


Photograph 39 – View of T2-6. Looking north.



Photograph 40 – View of T2-8. Looking north.

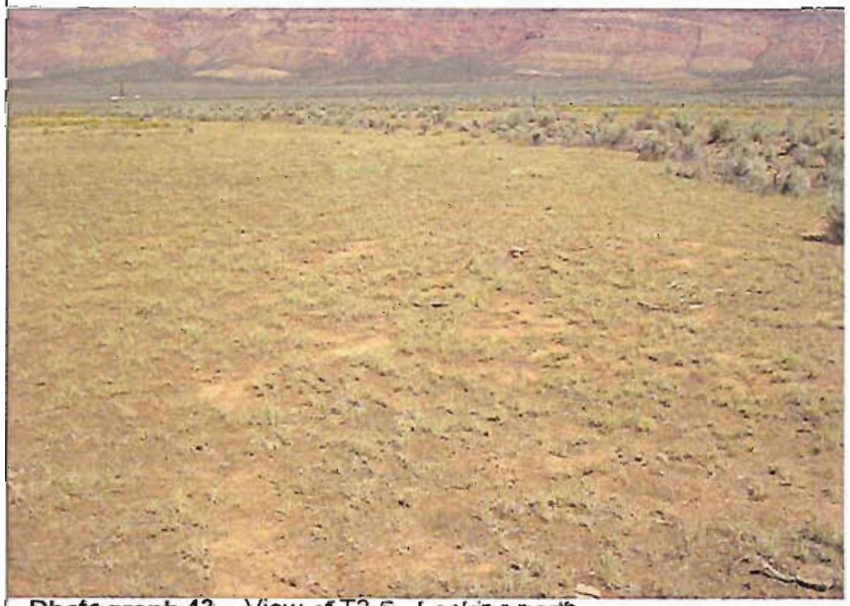
KLEINFELDER Bright People. Right Solutions. Project Number: 83088.1.8.2 Photos Taken: 9/18/07	Piñon Ridge Property 16910 Highway 90 Bedrock, Colorado 81411	**Fall Site Photographs**	**Appendix C**



Photograph 41 – View of T3-2. Looking north.



Photograph 42 – View of T3-4. Looking north.

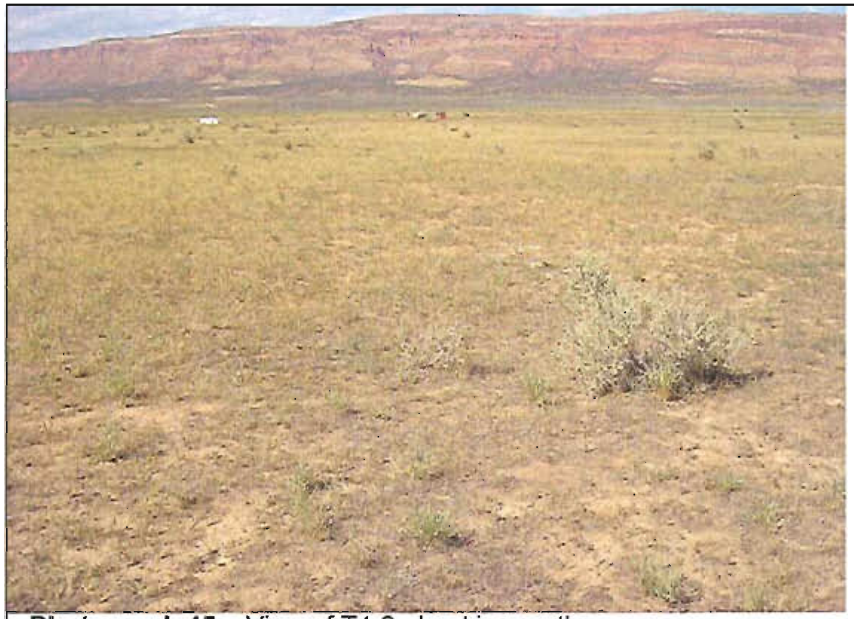


Photograph 43 – View of T3-6. Looking north.

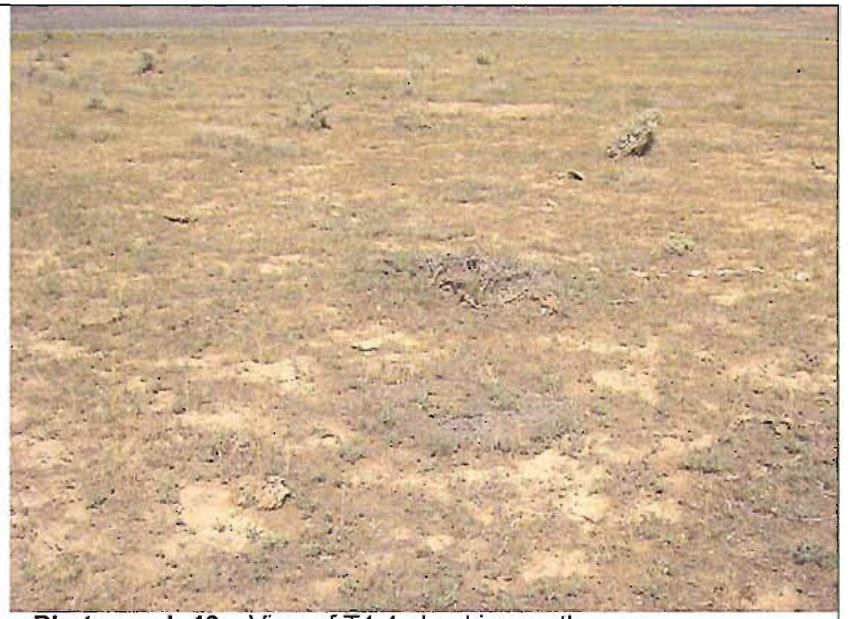


Photograph 44 – View of T3-8. Looking north.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088.1.8.2 Photos Taken: 9/18/07	Piñon Ridge Property 16910 Highway 90 Bedrock, Colorado 81411	**Fall Site Photographs**	**Appendix C**



Photograph 45 – View of T4-2. Looking north.



Photograph 46 – View of T4-4. Looking north.



Photograph 47 – View of T4-6. Looking north.



Photograph 48 – View of T4-10. Looking north.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088.1.8.2 Photos Taken: 9/18/07	Piñon Ridge Property 16910 Highway 90 Bedrock, Colorado 81411	**Fall Site Photographs**	**Appendix C**



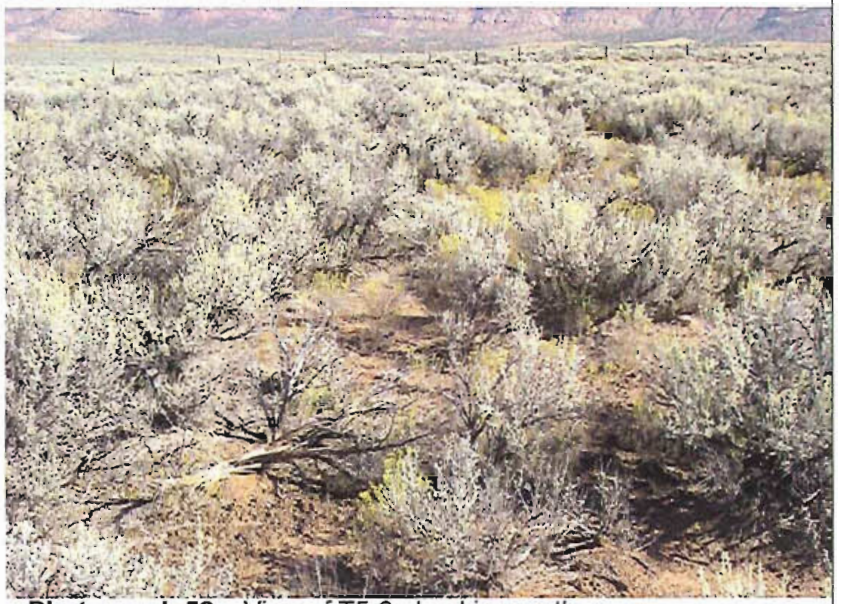
Photograph 49 – View of T5-2. Looking north.



Photograph 50 – View of T5-4. Looking north.

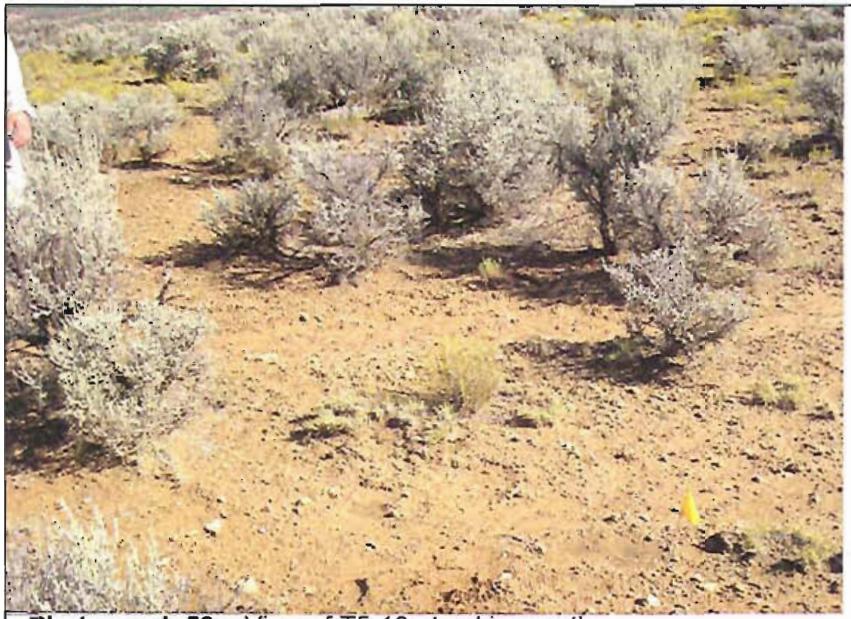


Photograph 51 – View of T5-6. Looking north.



Photograph 52 – View of T5-8. Looking north.

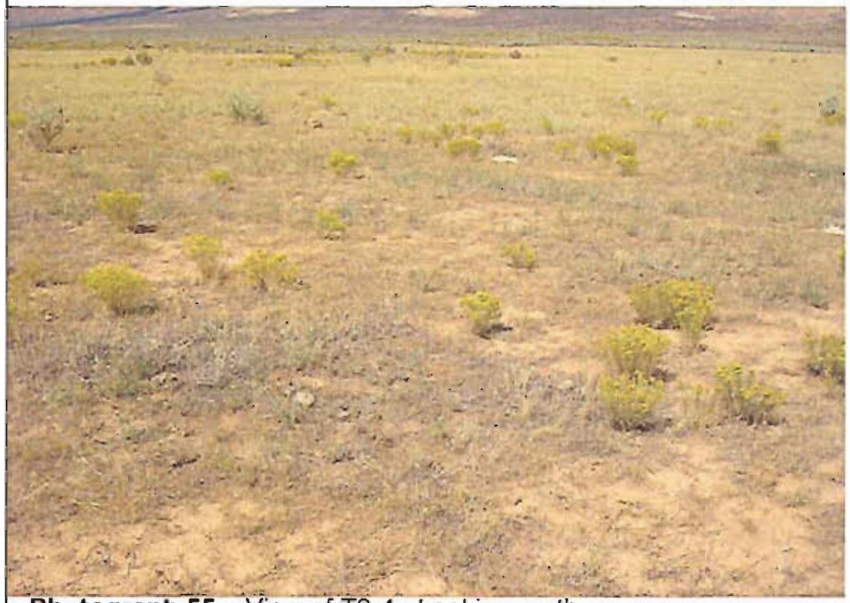
KLEINFELDER *Bright People. Right Solutions.* Project Number: 83088.1.8.2 Photos Taken: 9/18/07	Piñon Ridge Property 16910 Highway 90 Bedrock, Colorado 81411	**Fall Site Photographs**	**Appendix C**



Photograph 53 – View of T5-10. Looking north.



Photograph 54 – View of T6-2. Looking north.



Photograph 55 – View of T6-4. Looking north.



Photograph 56 – View of T6-6. Looking north.

KLEINFELDER
Bright People. Right Solutions.

Project Number: 83088.1.8.2 Photos Taken: 9/18/07

Piñon Ridge Property
16910 Highway 90
Bedrock, Colorado 81411

Fall Site Photographs

Appendix C



Photograph 57 – View of T6-8. Looking north.



Photograph 58 – View of T7-2. Looking north.



Photograph 59 – View of T7-4. Looking north.

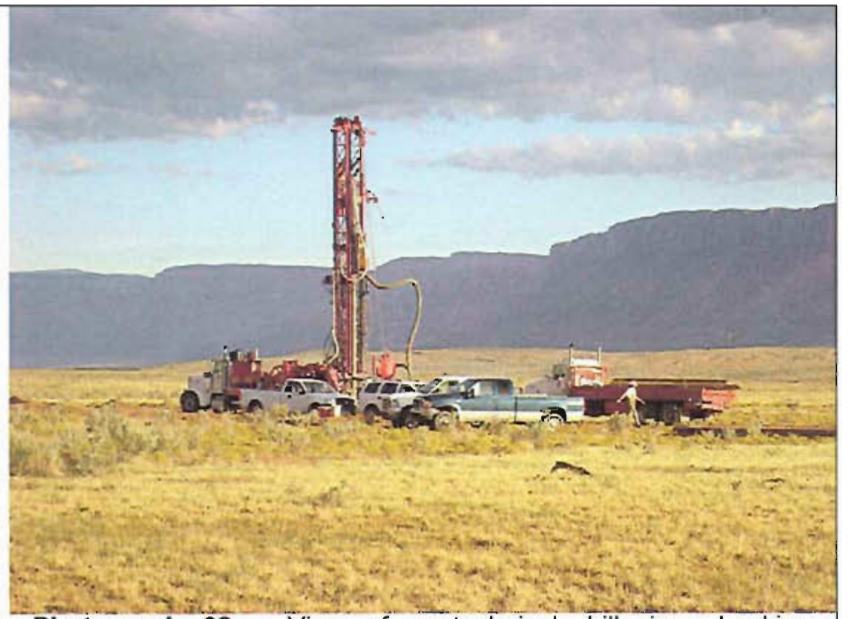


Photograph 60 – View of T7-6. Looking north.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088.1.8.2 Photos Taken: 9/18/07	Piñon Ridge Property 16910 Highway 90 Bedrock, Colorado 81411	**Fall Site Photographs**	**Appendix C**



Photograph 61 – View of T7-8. Looking north.



Photograph 62 – View of geotechnical drill rig. Looking northwest.



Photograph 63 – View of Mr. Matt Zoss acquiring GPS position at T1-2. Looking west.



Photograph 64 – View of Mr. Jeff Meyer investigating a bird call during a point count survey at T1-2. Looking northeast.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088.1.8.2 Photos Taken: 9/18/07	Piñon Ridge Property 16910 Highway 90 Bedrock, Colorado 81411	**Fall Site Photographs**	**Appendix C**



Photograph 65 – View of T1-5. Looking north.



Photograph 66 – View of T1-7. Looking north.



Photograph 67 – View of T1-9. Looking north.



Photograph 68 – View of T2-3. Looking northeast.

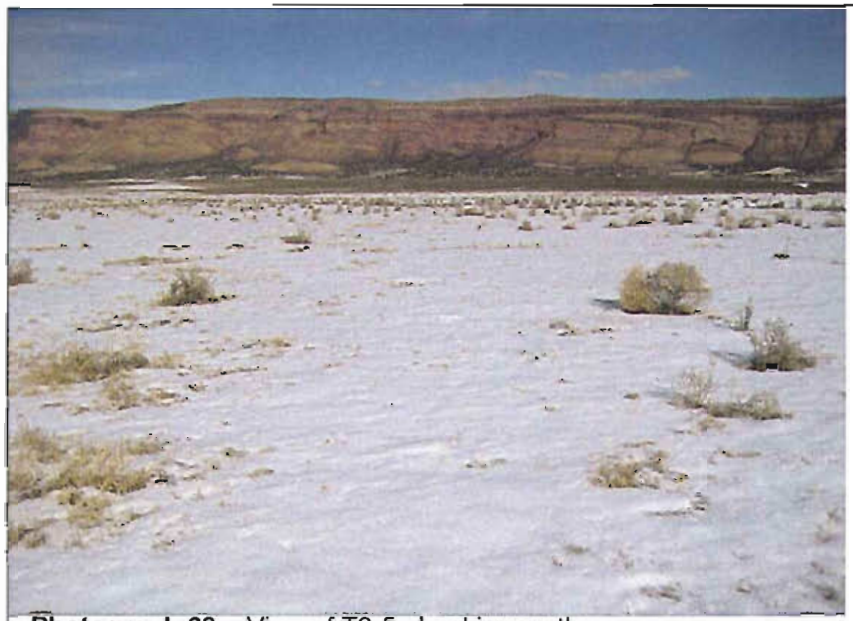
KLEINFELDER
Bright People. Right Solutions.

Project Number: 83088.1.8.2 Photos Taken: 1/16/08

Piñon Ridge Property
16910 Highway 90
Bedrock, Colorado 81411

Winter Site Photographs

Appendix C



Photograph 69 – View of T2-5. Looking north.



Photograph 70 – View of T2-7. Looking north.



Photograph 71 – View of T2-9. Looking north.



Photograph 72 – View of T3-1. Looking north.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088.1.8.2 Photos Taken: 1/16/08	Piñon Ridge Property 16910 Highway 90 Bedrock, Colorado 81411	**Winter Site Photographs**	**Appendix C**



Photograph 73 – View of T3-3. Looking north.



Photograph 74 – View of T3-5. Looking north.



Photograph 75 – View of T3-7. Looking north.



Photograph 76 – View of T3-9. Looking north.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088.1.8.2 Photos Taken: 1/16/08	Piñon Ridge Property 16910 Highway 90 Bedrock, Colorado 81411	**Winter Site Photographs**	**Appendix C**



Photograph 77 – View of T4-1. Looking north.



Photograph 78 – View of T4-3. Looking north.



Photograph 79 – View of T4-5. Looking north.



Photograph 80 – View of T4-7. Looking north.

KLEINFELDER
Bright People. Right Solutions.

Project Number: 83088.1.8.2 Photos Taken: 1/16/08

Piñon Ridge Property
16910 Highway 90
Bedrock, Colorado 81411

Winter Site Photographs

Appendix C



Photograph 81 – View of T4-9. Looking north.



Photograph 82 – View of T5-3. Looking north.



Photograph 83 – View of T5-5. Looking north.



Photograph 84 – View of T5-7. Looking north.

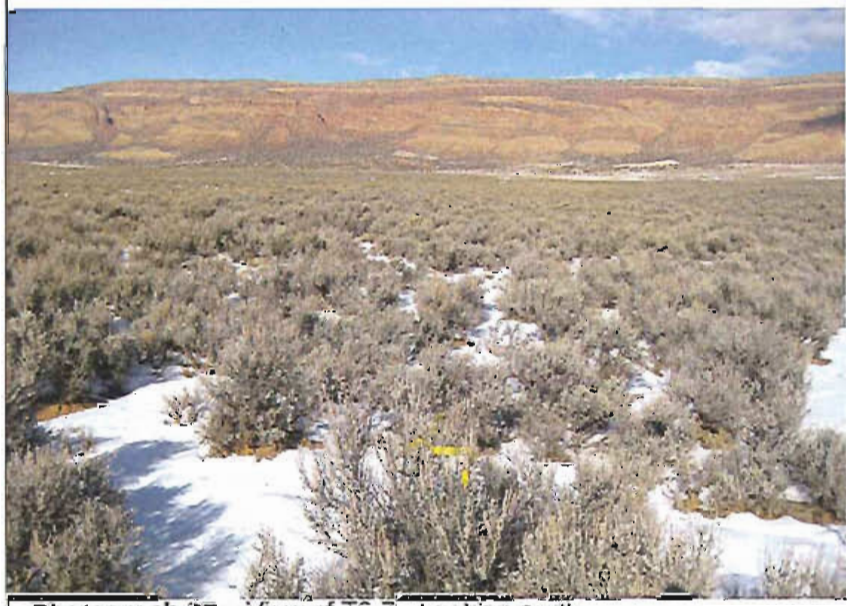
KLEINFELDER *Bright People. Right Solutions.* Project Number: 83088.1.8.2 Photos Taken: 1/16/08	Piñon Ridge Property 16910 Highway 90 Bedrock, Colorado 81411	**Winter Site Photographs**	**Appendix C**



Photograph 85 – View of T5-9. Looking north.



Photograph 86 – View of T6-3. Looking north.



Photograph 87 – View of T6-7. Looking north.



Photograph 88 – View of T6-9. Looking north.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088.1.8.2 Photos Taken: 1/16/08	Piñon Ridge Property 16910 Highway 90 Bedrock, Colorado 81411	**Winter Site Photographs**	**Appendix C**



Photograph 89 – View of T7-5. Looking north.



Photograph 90 – View of T7-7. Looking north.



Photograph 91 – View of T7-9. Looking north.



Photograph 92 – View of the La Sal mountain range. Looking west down the Paradox Valley.

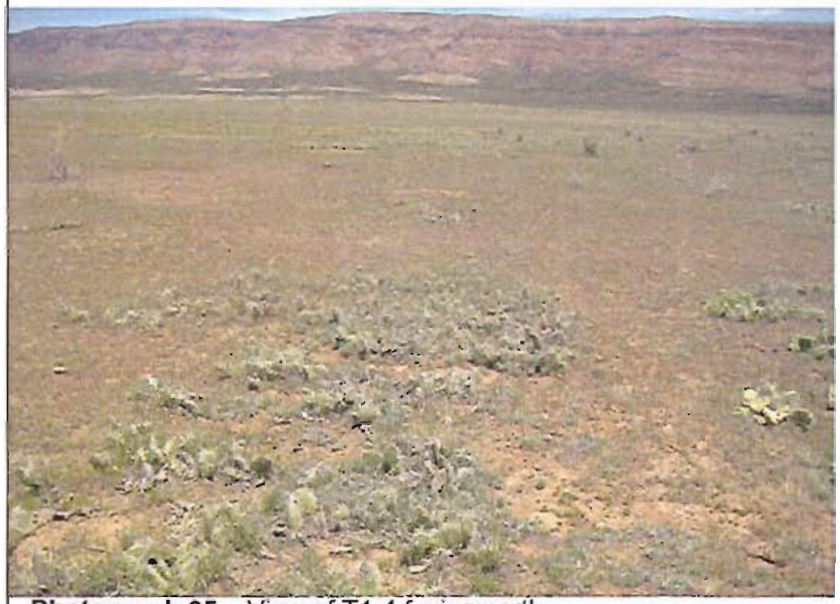
KLEINFELDER *Bright People. Right Solutions.* Project Number: 83088.1.8.2 Photos Taken: 1/16/08	Piñon Ridge Property 16910 Highway 90 Bedrock, Colorado 81411	**Winter Site Photographs**	**Appendix C**



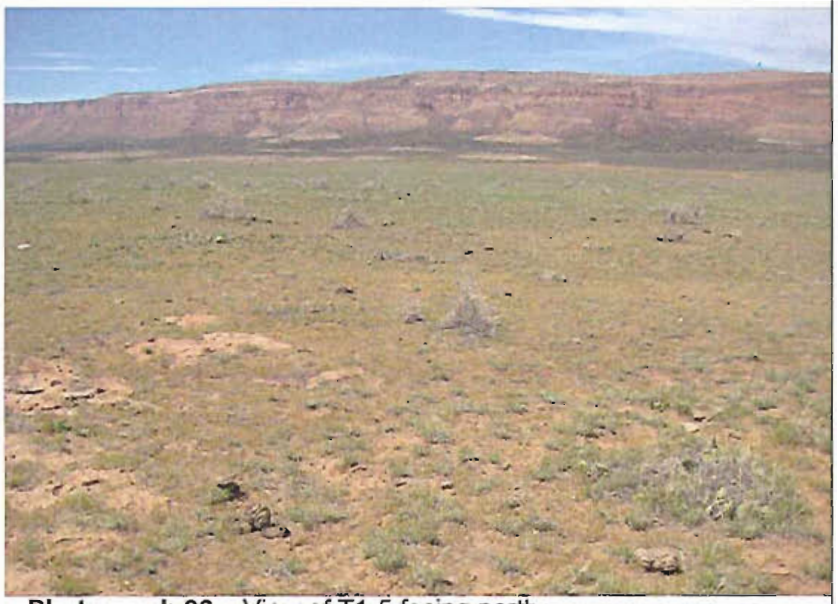
Photograph 93 – View of T1-2 facing north.



Photograph 94 – View of T1-3 facing north.



Photograph 95 – View of T1-4 facing north.



Photograph 96 – View of T1-5 facing north.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088 Photos Taken: 05.19.08	Piñon Ridge property 16910 Highway 90 Bedrock, CO 81411	**Spring Site Photographs**	**Appendix C**



Photograph 97 – View of T1-6 facing north.



Photograph 98 – View of T1-7 facing north.



Photograph 99 – View of T1-8 facing north.



Photograph 100 – View of T1-9 facing north.

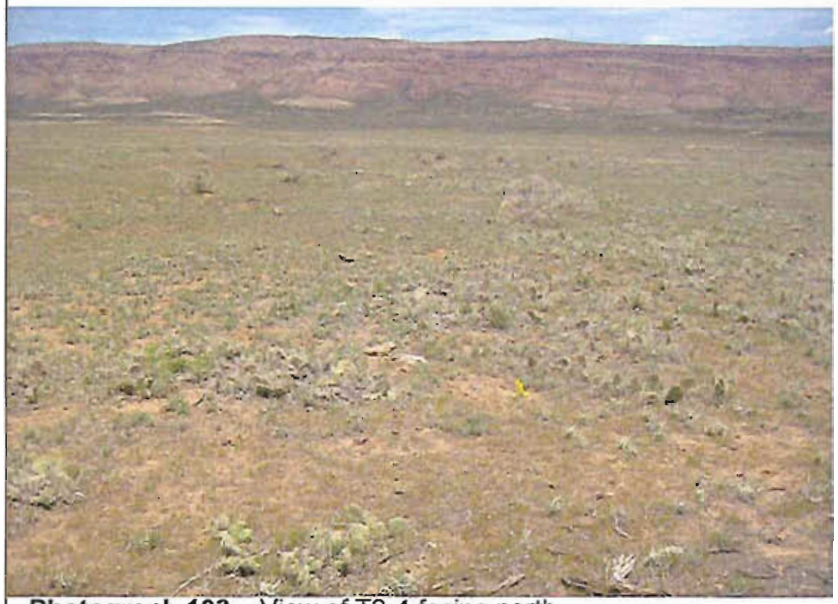
KLEINFELDER Bright People. Right Solutions. Project Number: 83088 Photos Taken: 05/19/08	Piñon Ridge property 16910 Highway 90 Bedrock, CO 81411	**Spring Site Photographs**	**Appendix C**



Photograph 101 – View of T2-2 facing north.



Photograph 102 – View of T2-3 facing north.



Photograph 103 – View of T2-4 facing north.



Photograph 104 – View of T2-5 facing north.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088 Photos Taken: 05/19/08	Piñon Ridge property 16910 Highway 90 Bedrock, CO 81411	**Spring Site Photographs**	**Appendix C**



Photograph 105 – View of T2-6 facing north.



Photograph 106 – View of T2-7 facing north.



Photograph 107 – View of T2-8 facing north.



Photograph 108 – View of T2-9 facing north.

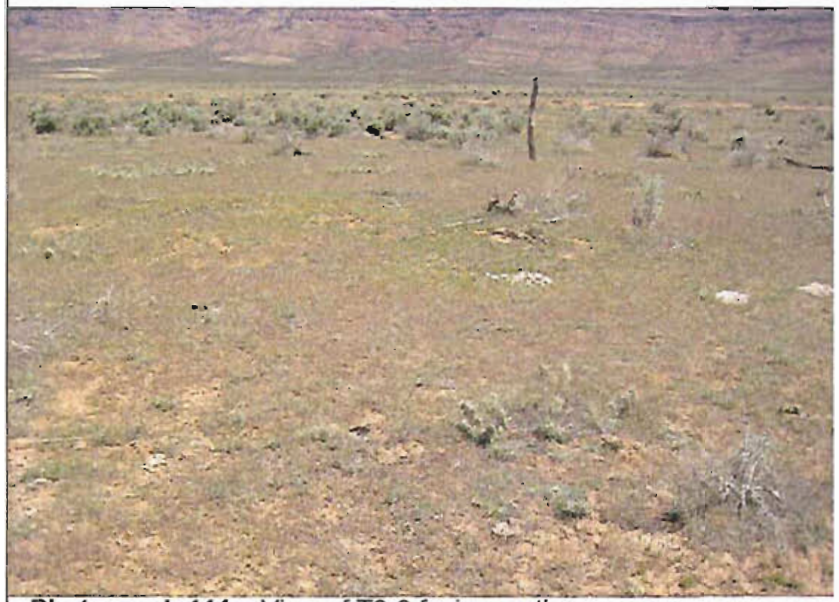
KLEINFELDER Bright People. Right Solutions. Project Number: 83088 Photos Taken: 05/19/08	Piñon Ridge property 16910 Highway 90 Bedrock, CO 81411	**Spring Site Photographs**	**Appendix C**



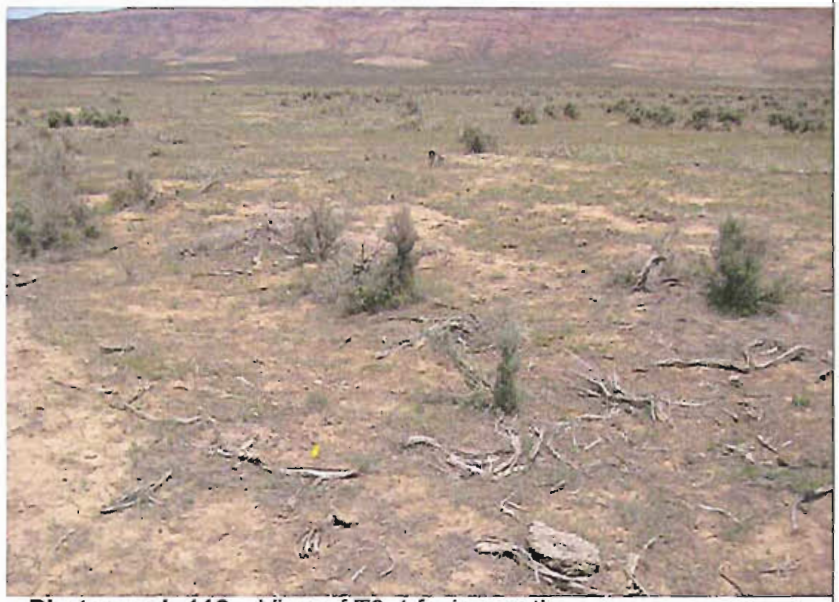
Photograph 109 – View of T3-1 facing north.



Photograph 110 – View of T3-2 facing north.



Photograph 111 – View of T3-3 facing north.



Photograph 112 – View of T3-4 facing north.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088 Photos Taken: 05/19/08	Piñon Ridge property 16910 Highway 90 Bedrock, CO 81411	**Spring Site Photographs**	**Appendix C**



Photograph 113 – View of T3-5 facing north.



Photograph 114 – View of T3-6 facing north.

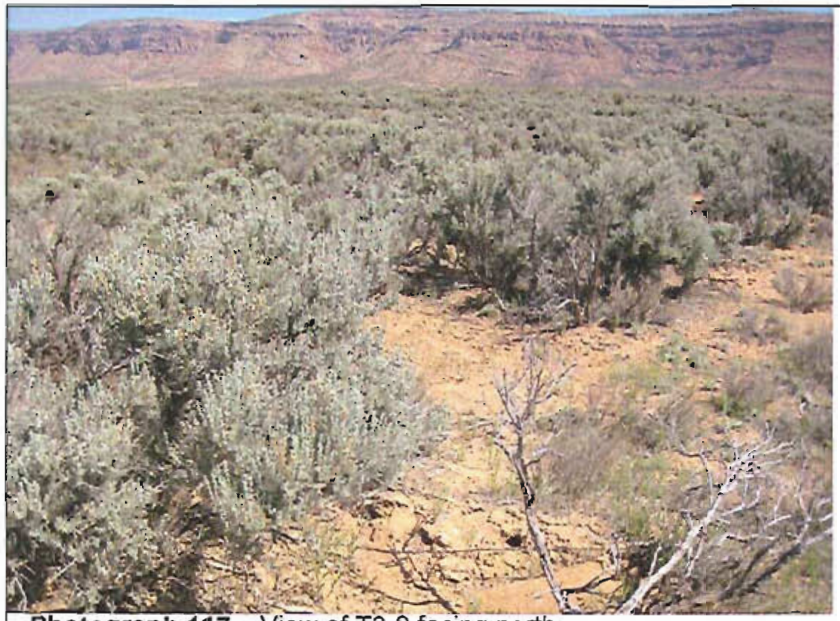


Photograph 115 – View of T3-7 facing north.



Photograph 116 – View of T3-8 facing north.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088 Photos Taken: 05/19/08	Piñon Ridge property 16910 Highway 90 Bedrock, CO 81411	**Spring Site Photographs**	**Appendix C**



Photograph 117 – View of T3-9 facing north.



Photograph 118 – View of T4-1 facing north.



Photograph 119 – View of T4-2 facing north.

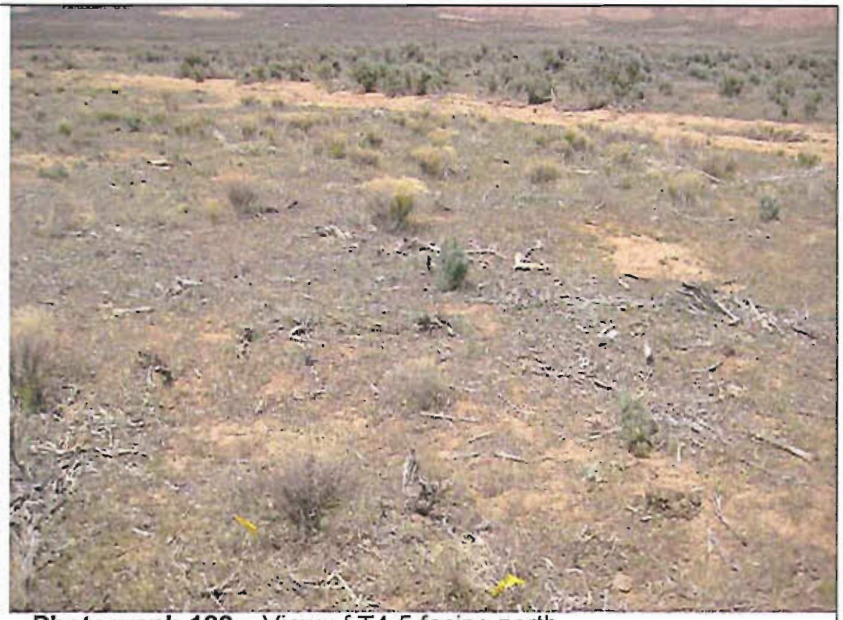


Photograph 120 – View of T4-3 facing north.

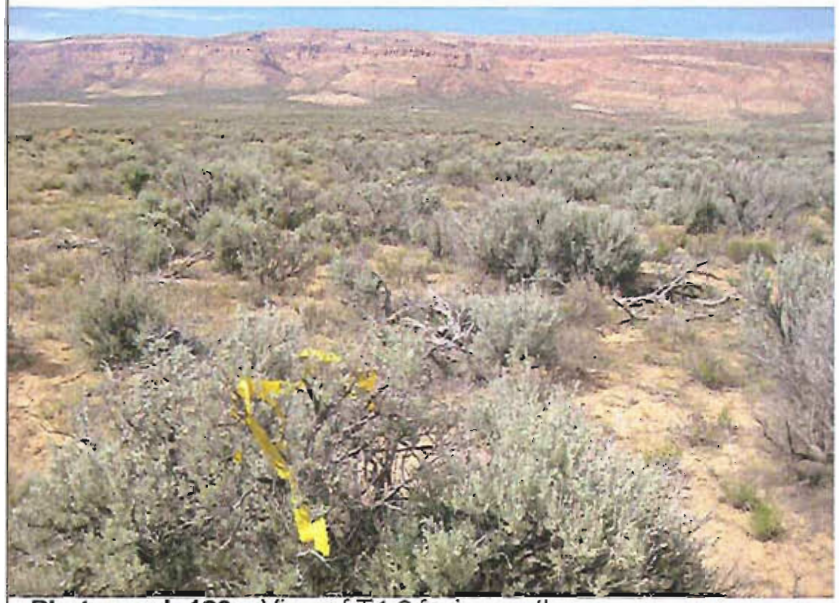
KLEINFELDER Bright People. Right Solutions. Project Number: 83088 Photos Taken: 05/19/08	Piñon Ridge property 16910 Highway 90 Bedrock, CO 81411	**Spring Site Photographs**	**Appendix C**



Photograph 121 – View of T4-4 facing north.



Photograph 122 – View of T4-5 facing north.

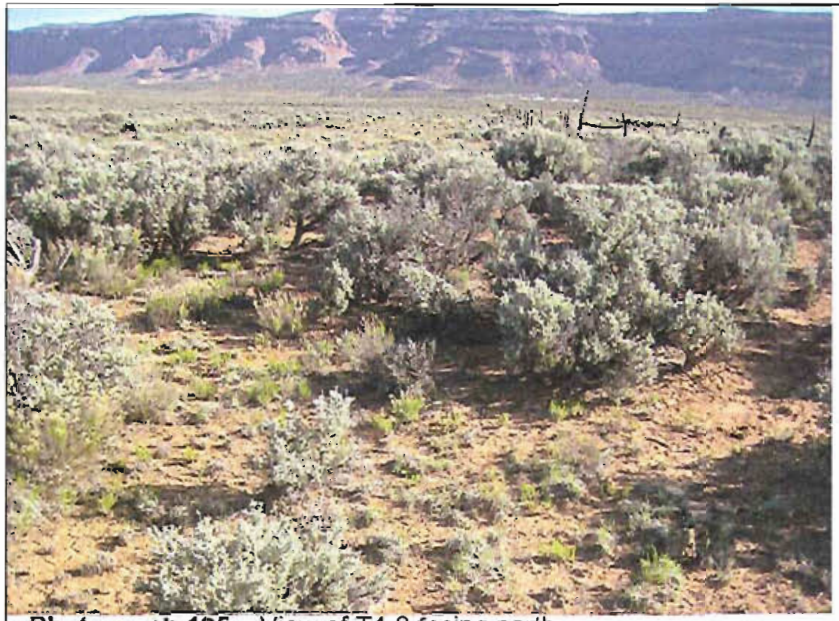


Photograph 123 – View of T4-6 facing north.



Photograph 124 – View of T4-7 facing north.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088 Photos Taken: 05/19/08	Piñon Ridge property 16910 Highway 90 Bedrock, CO 81411	**Spring Site Photographs**	**Appendix C**



Photograph 125 – View of T4-8 facing north.



Photograph 126 – View of T4-9 facing north.



Photograph 127 – View of T4-10 facing north.

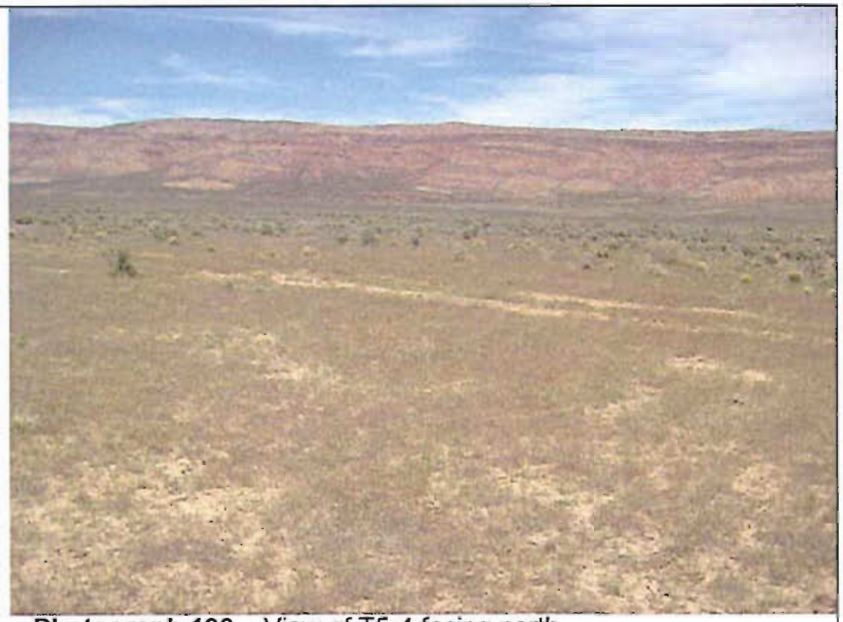


Photograph 128 – View of T5-2 facing north.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088 Photos Taken: 05/19/08	Piñon Ridge property 16910 Highway 90 Bedrock, CO 81411	**Spring Site Photographs**	**Appendix C**



Photograph 129 – View of T5-3 facing north.



Photograph 130 – View of T5-4 facing north.

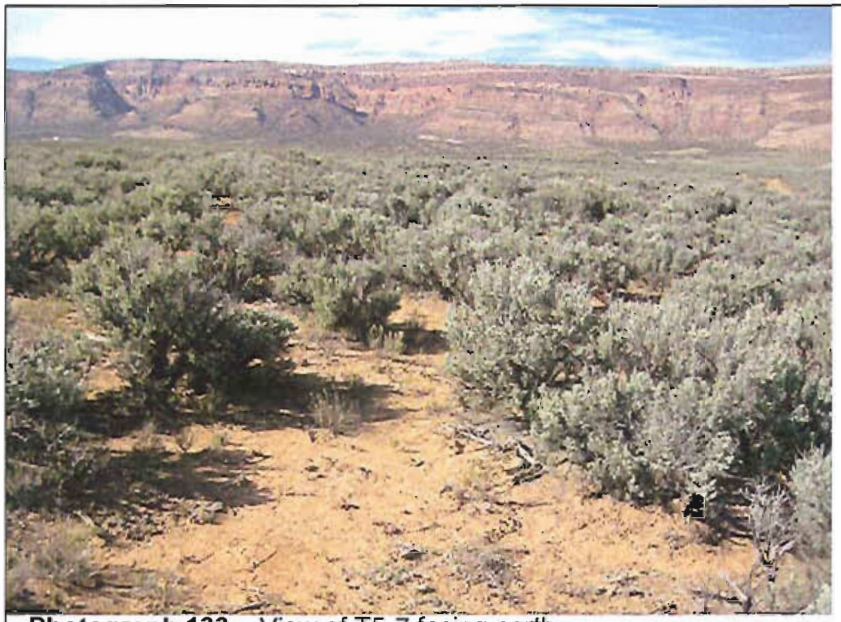


Photograph 131 – View of T5-5 facing north.



Photograph 132 – View of T5-6 facing north.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088 Photos Taken: 05/19/08	Piñon Ridge property 16910 Highway 90 Bedrock, CO 81411	**Spring Site Photographs**	**Appendix C**



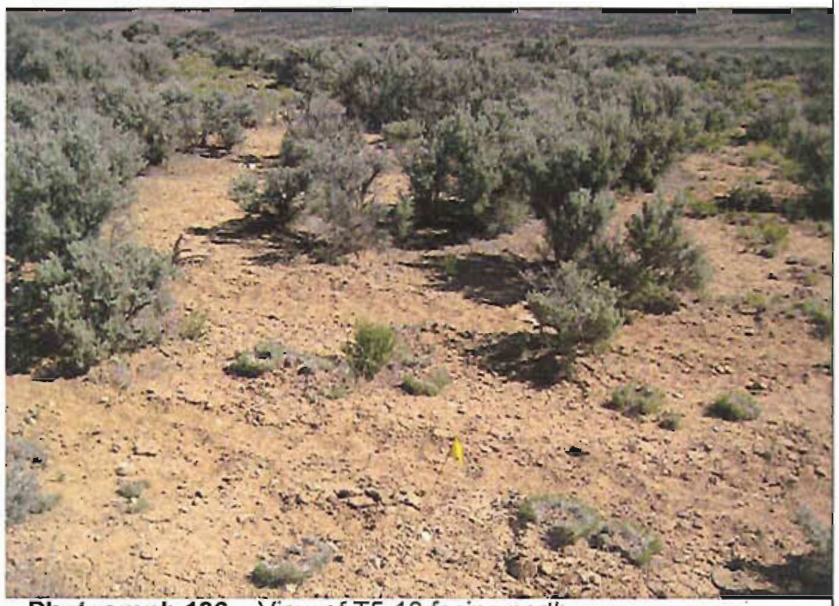
Photograph 133 – View of T5-7 facing north.



Photograph 134 – View of T5-8 facing north.



Photograph 135 – View of T5-9 facing north.



Photograph 136 – View of T5-10 facing north.

KLEINFELDER
Bright People. Right Solutions.

Project Number: 83088 Photos Taken: 05/19/08

Piñon Ridge property
16910 Highway 90
Bedrock, CO 81411

Spring Site Photographs

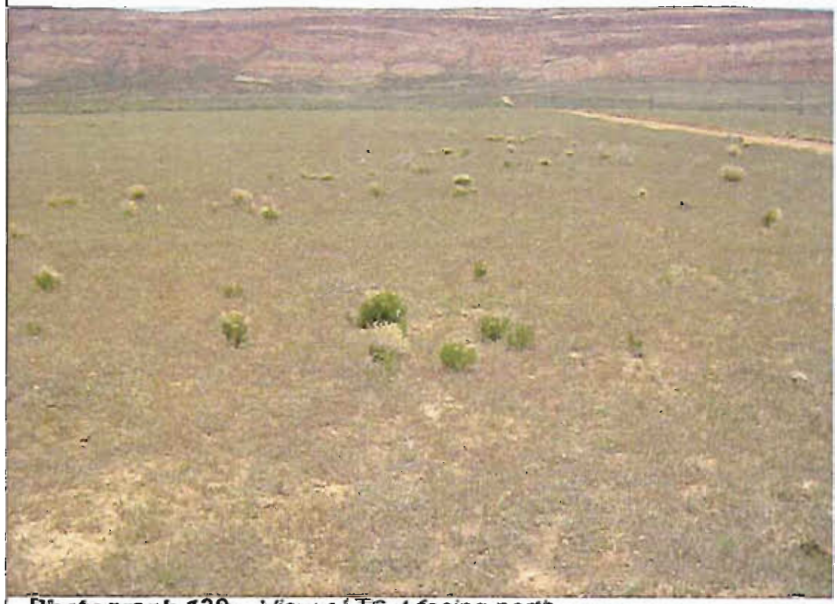
Appendix C



Photograph 137 – View of T6-2 facing north.



Photograph 138 – View of T6-3 facing north.

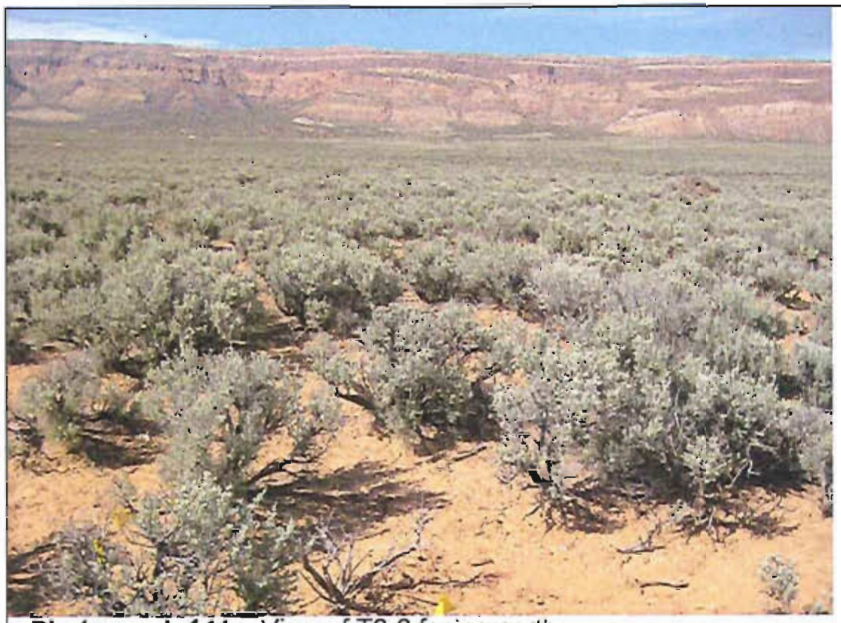


Photograph 139 – View of T6-4 facing north.



Photograph 140 – View of T6-5 facing north.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088 Photos Taken: 05/19/08	Piñon Ridge property 16910 Highway 90 Bedrock, CO 81411	**Spring Site Photographs**	**Appendix C**



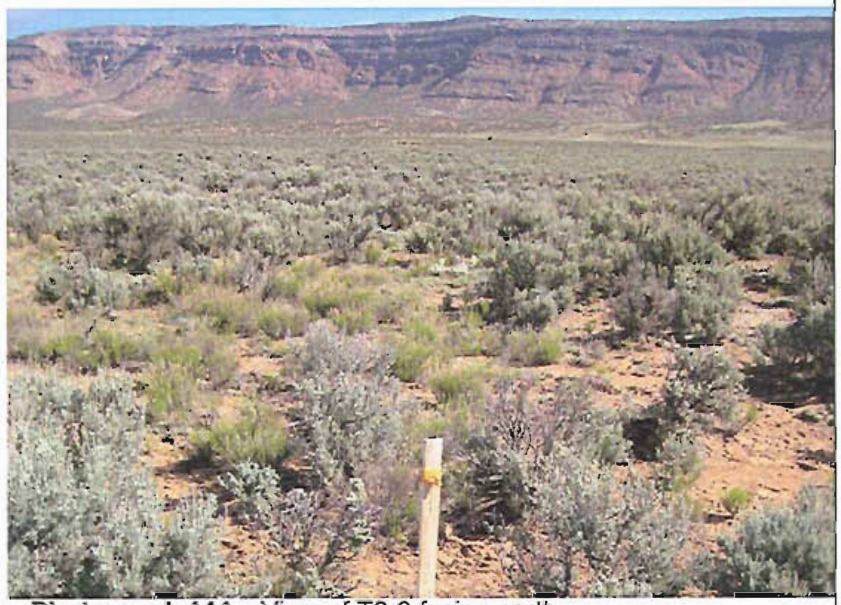
Photograph 141 – View of T6-6 facing north.



Photograph 142 – View of T6-7 facing north.

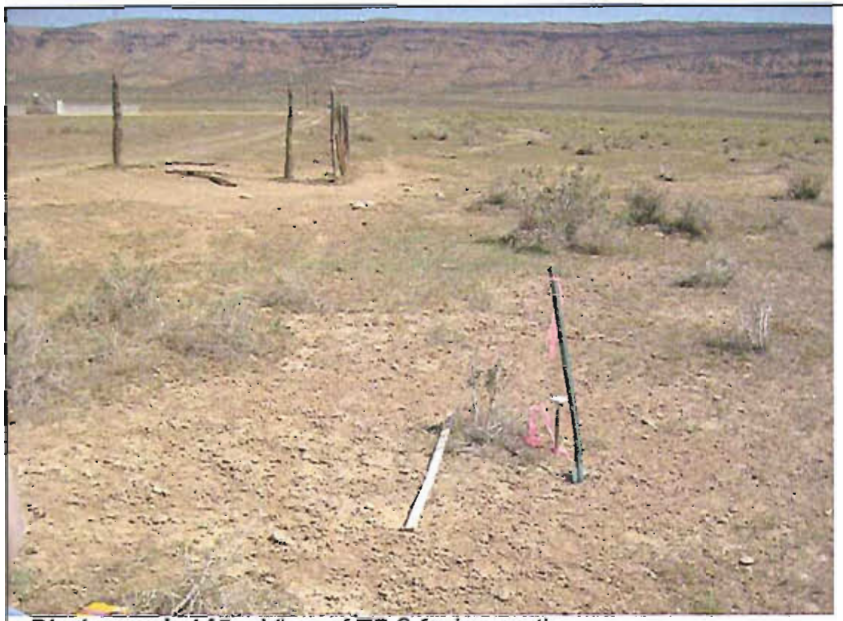


Photograph 143 – View of T6-8 facing north.



Photograph 144 – View of T6-9 facing north.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088 Photos Taken: 05/19/08	Piñon Ridge property 16910 Highway 90 Bedrock, CO 81411	**Spring Site Photographs**	**Appendix C**



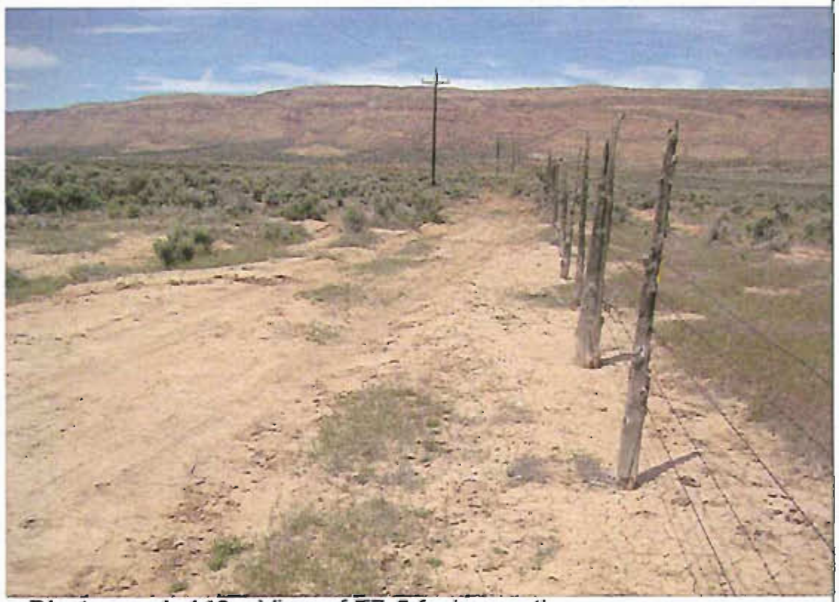
Photograph 145 – View of T7-2 facing north.



Photograph 146 – View of T7-3 facing north.



Photograph 147 – View of T7-4 facing north.



Photograph 148 – View of T7-5 facing north.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088 Photos Taken: 05/19/08	Piñon Ridge property 16910 Highway 90 Bedrock, CO 81411	**Spring Site Photographs**	**Appendix C**



Photograph 149 – View of T7-6 facing north.



Photograph 150 – View of T7-7 facing north.



Photograph 151 – View of T7-8 facing north.



Photograph 152 – View of T7-9 facing north.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088 Photos Taken: 05/19/08	Piñon Ridge property 16910 Highway 90 Bedrock, CO 81411	**Spring Site Photographs**	**Appendix C**



Photograph 153 – Stream leaving the northwest corner of the study area. Facing west with large Big Sage growing and Russian thistle debris.



Photograph 154 – Stream located east of center within the study area. Facing north.



Photograph 155 – Stream located east of center within the study area. Facing north.



Photograph 156 – Stream leaving the east portion of the study area. Facing northeast to the border of the study area.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088 Photos Taken: 04/08/08	Piñon Ridge property 16910 Highway 90 Bedrock, CO 81411	**Arroyos Photographs**	**Appendix C**



Photograph 157 – Stream leaving the east portion of the study area. Facing northeast with large Big Sage and four-wing saltbush growing in the base.



Photograph 158 – One of the canyon streams. Facing southeast.



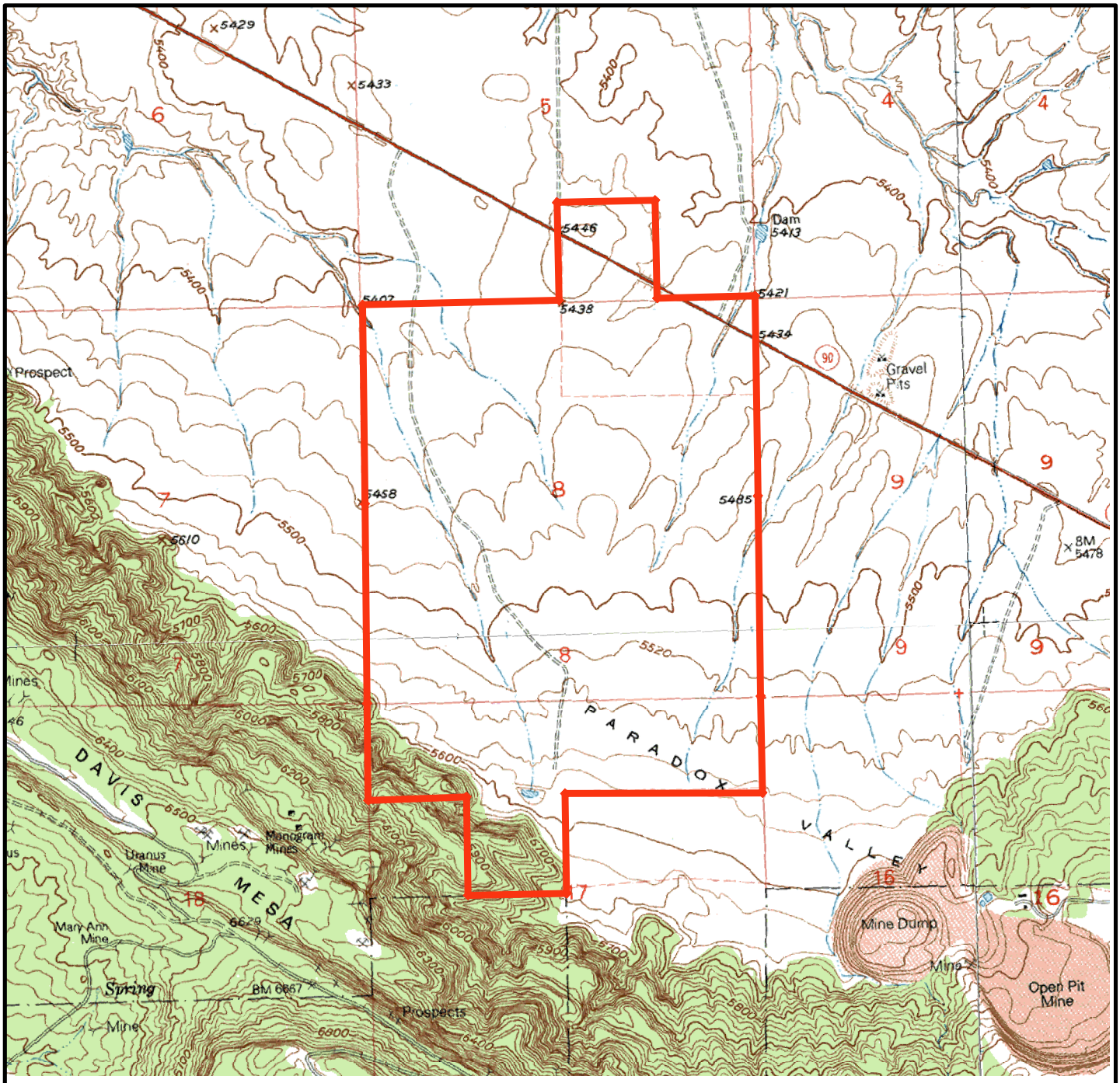
Photograph 159 – One of the canyon streams. Facing south.



Photograph 160 – One of the canyon streams. Facing northeast.

KLEINFELDER Bright People. Right Solutions. Project Number: 83088 Photos Taken: 04/08/08	Piñon Ridge property 16910 Highway 90 Bedrock, CO 81411	**Arroyos Photographs**	**Appendix C**

FIGURES



Legend

Project Boundary

N

1 inch equals 2,000 feet

2,000 1,000 0 2,000 4,000

Feet



The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.

DNC No. 83088.5.J-ALB08RP001

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.	83088
DRAWN:	8/14/08
DRAWN BY:	JJ Meyer
CHECKED BY:	C Jarvis
FILE NAME:	SiteVeg_Figure1_02-04-09

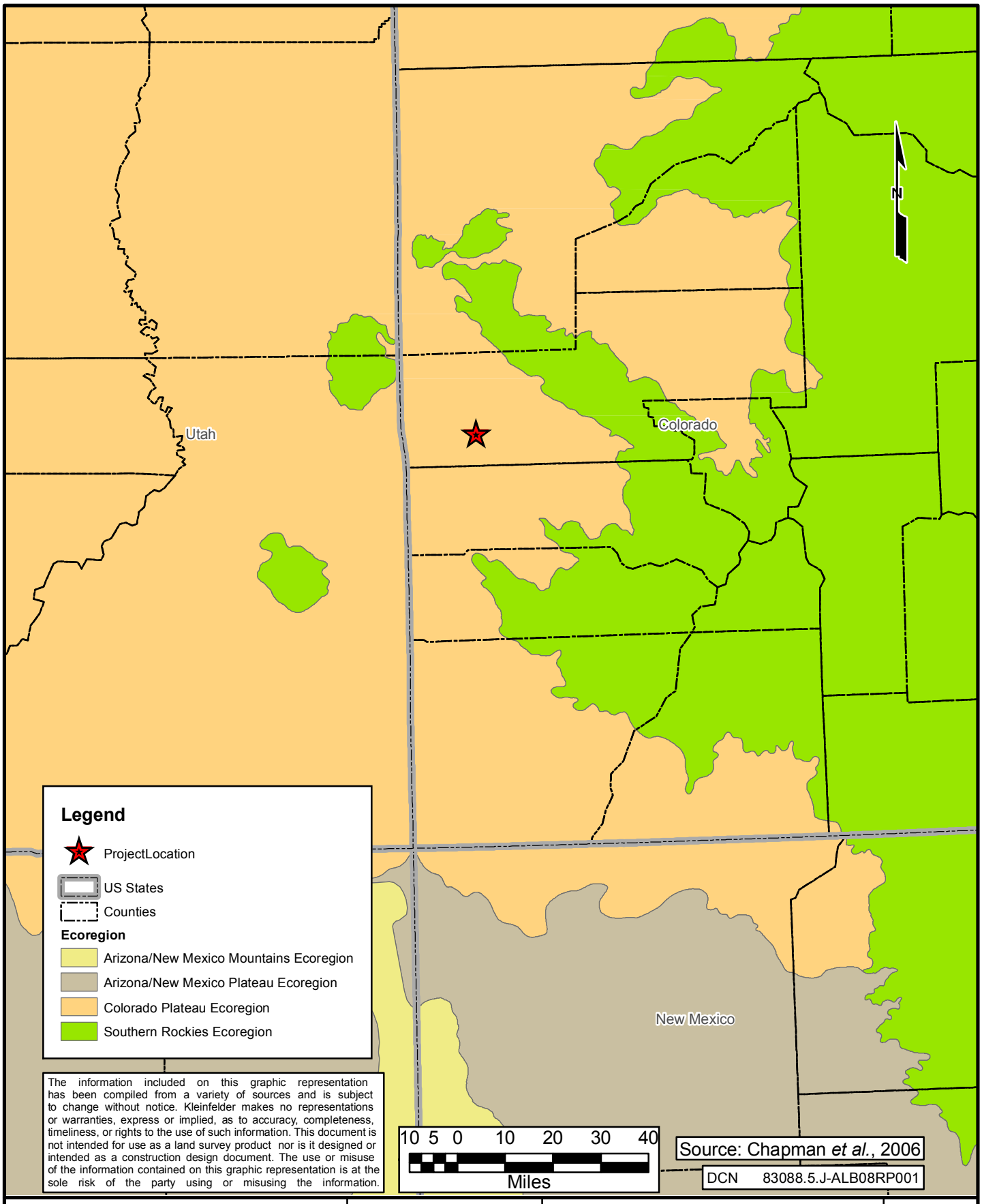
Site Location

ENERGY FUELS RESOURCES
PIÑON RIDGE MILL SITE
MONTROSE COUNTY, COLORADO

ORIGINATOR:	JJ Meyer
APPROVED BY:	C Jarvis

FIGURE

1



The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.	83088
DRAWN:	01/28/09
DRAWN BY:	JJ Meyer
CHECKED BY:	LJBridges
FILE NAME:	Level3Eco_Figure2_02-04-09

Level III Ecoregions of the Four Corners Area

ENERGY FUELS RESOURCES
PINON RIDGE MILL SITE
MONTROSE COUNTY, COLORADO

ORIGINATOR: JJ Meyer
APPROVED BY: C Jarvis

FIGURE
2



The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.	83088
DRAWN:	01/28/09
DRAWN BY:	JJ Meyer
CHECKED BY:	LJBridges
FILE NAME:	Level4Eco_Figure3_02-04-09

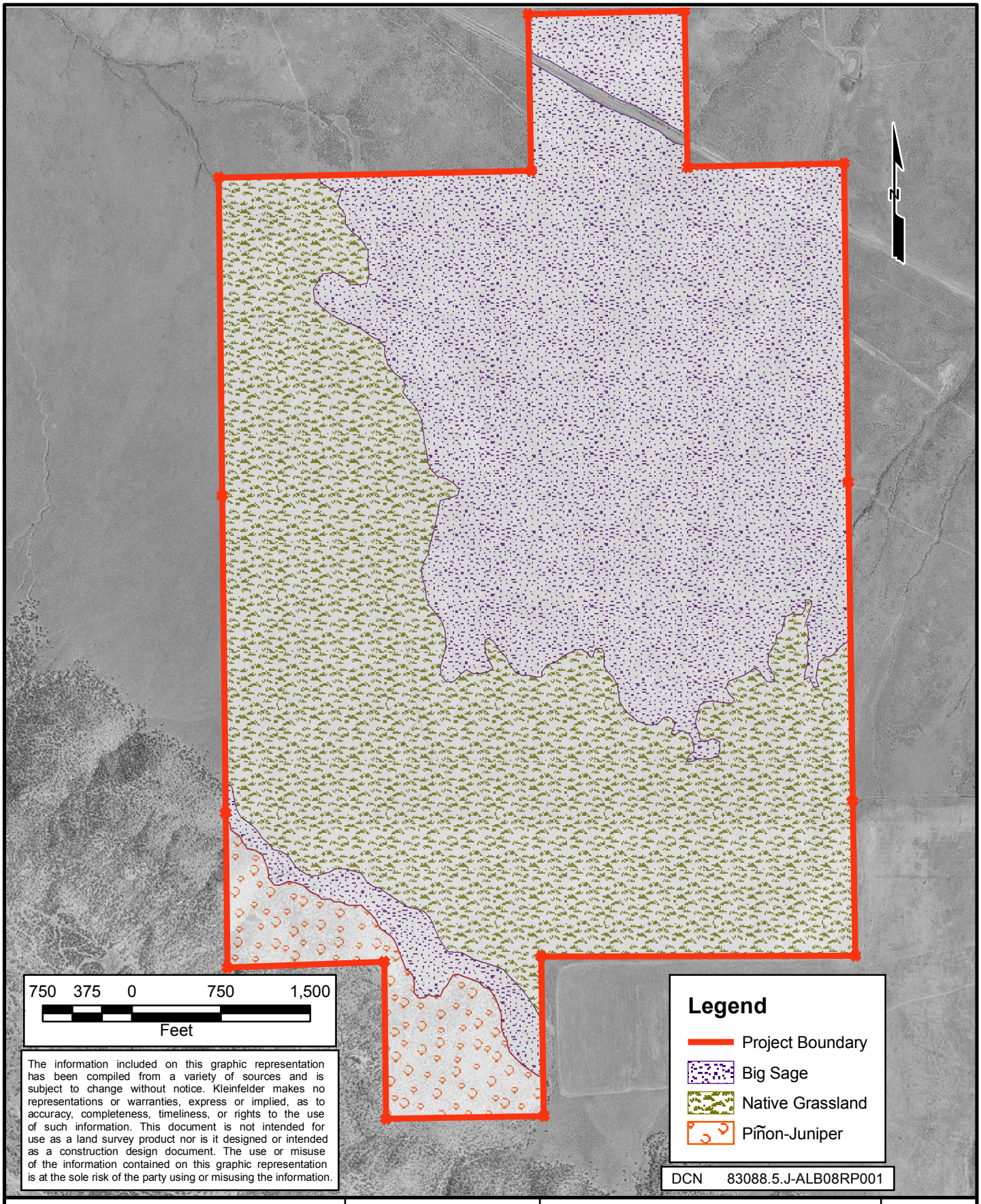
Level IV Ecoregions of Southwest Colorado

ENERGY FUELS RESOURCES
PIÑON RIDGE MILL SITE
MONTROSE COUNTY, COLORADO

ORIGINATOR:	JJ Meyer
APPROVED BY:	C Jarvis

FIGURE

3



The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.

DCN 83088.5.J-ALB08RP001

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.	83088
DRAWN:	8/14/08
DRAWN BY:	JJ Meyer
CHECKED BY:	C Jarvis
FILE NAME:	Ecotone_Figure4_02-04-09

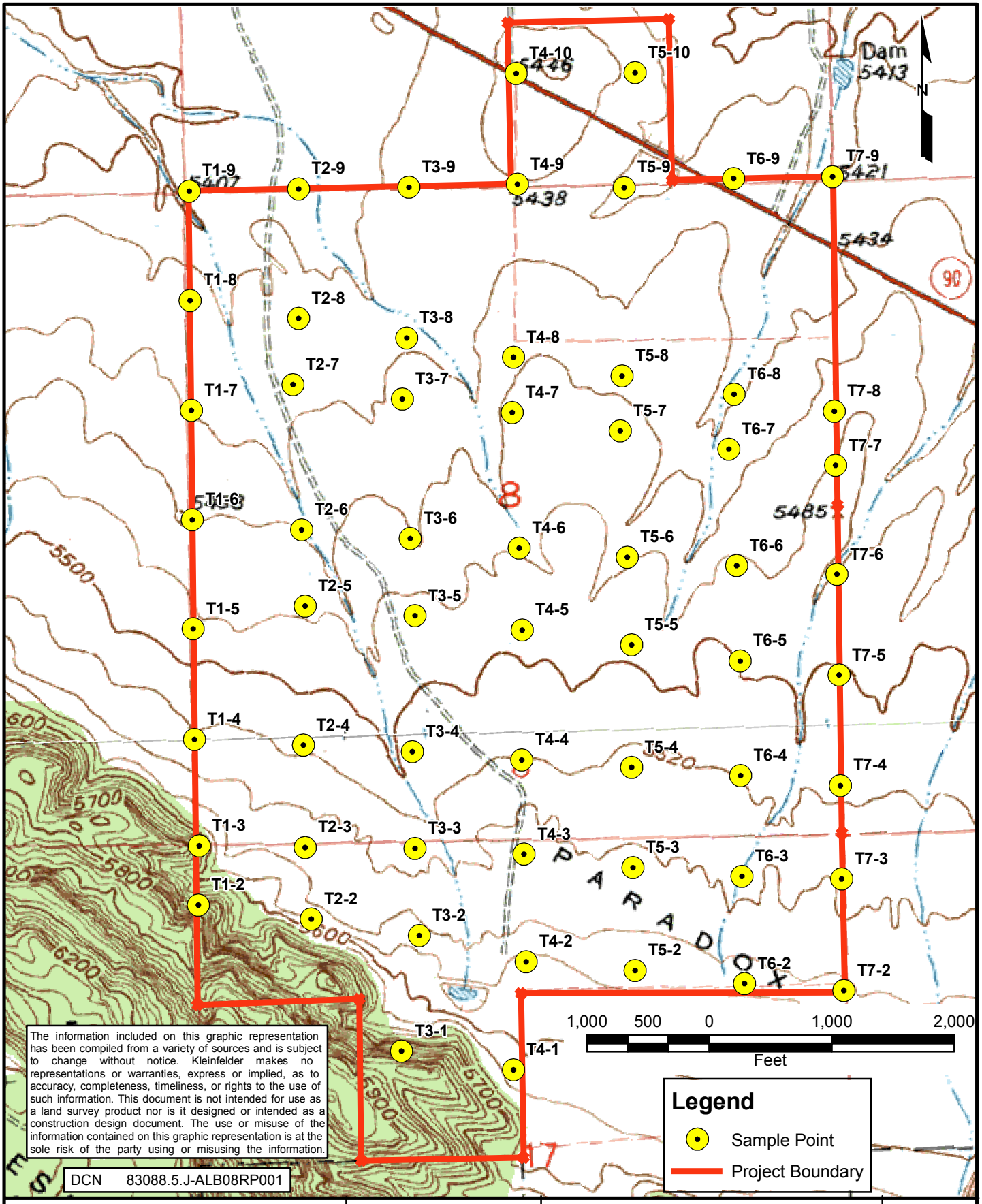
Ecotone Map

ENERGY FUELS RESOURCES
PIÑON RIDGE MILL SITE
MONTROSE COUNTY, COLORADO

ORIGINATOR:	JJ Meyer
APPROVED BY:	C Jarvis

FIGURE

4



KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.	83088
DRAWN:	8/14/08
DRAWN BY:	JJ Meyer
CHECKED BY:	C Jarvis
FILE NAME:	HabitatAssess _Figure5_02-04-09

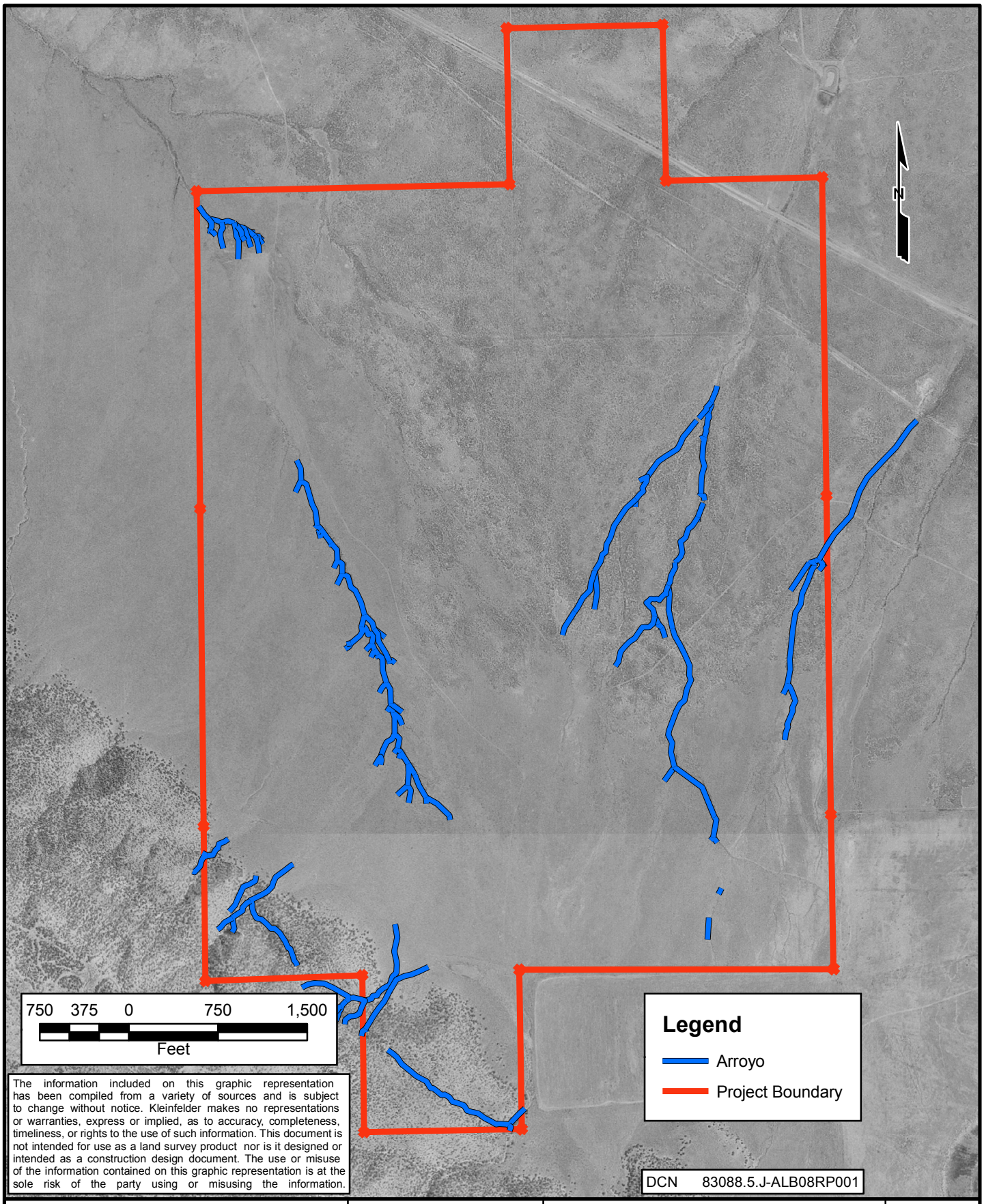
Habitat Assessment Sample Points

ENERGY FUELS RESOURCES
PIÑON RIDGE MILL SITE
MONTROSE COUNTY, COLORADO

ORIGINATOR:	JJ Meyer
APPROVED BY:	C Jarvis

FIGURE

5



The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.

DCN 83088.5.J-ALB08RP001

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.	83088
DRAWN:	8/14/08
DRAWN BY:	JJ Meyer
CHECKED BY:	C Jarvis
FILE NAME:	Arroyo_Figure6_02-04-09

Arroyo Location Map

ENERGY FUELS RESOURCES
PIÑON RIDGE MILL SITE
MONTROSE COUNTY, COLORADO

ORIGINATOR:	JJ Meyer
APPROVED BY:	C Jarvis

FIGURE

6

Wildlife Survey

Rev. 1 **Date:** 02/12/09

OF THE

ENVIRONMENTAL REPORT

IN SUPPORT OF THE APPLICATION FOR LICENSE FOR SOURCE MATERIAL MILLING

PIÑON RIDGE URANIUM MILL

Montrose County, Colorado

Submitted to:

Radiation Management Unit
Colorado Department of Public Health and Environment

Prepared for:

Energy Fuels Resources

44 Union Blvd., Suite 600
Lakewood, Colorado 80228

Prepared by:

Kleinfelder
8300 Jefferson NE, Suite B
Albuquerque, NM 87113

Project No. 83088
DCN 83088.5.K-ALB08RP001

Wildlife Survey

Rev. 1

OF THE

ENVIRONMENTAL REPORT

IN SUPPORT OF THE APPLICATION FOR A LICENSE FOR SOURCE MATERIAL MILLING

PIÑON RIDGE URANIUM MILL

Montrose County, Colorado

Submitted to:

Radiation Management Unit
Colorado Department of Public Health and Environment

Prepared for: **Energy Fuels Resources**
Lakewood, Colorado

Prepared by: **Kleinfelder**
Albuquerque, New Mexico

Author: Louis Bridges by AKKuhn
Louis J. Bridges, Principal Professional

Approved: Alan K. Kuhn
Alan K. Kuhn, Project Manager

Project No. 83088
DCN 83088.5.K-ALB08RP001
Date: 02/12/2009

Copyright 2009, Kleinfelder

TABLE OF CONTENTS

SECTION **PAGE**

1.0 INTRODUCTION 1
1.1 Site Location 1
1.2 Ecological Setting 1
1.2.1 Shale Deserts and Sedimentary Basins 2
1.2.2 Semiarid Benchlands and Canyonlands 3
1.3 Habitat Ecotones 4
1.4 Wildlife Species of Concern 4
1.4.1 Federally Threatened and Endangered Species 4
1.4.2 Colorado Species of Concern 5
1.4.3 Migratory Birds 7
1.5 Wildlife Resources 10
2.0 PURPOSE AND SCOPE 11
3.0 METHODS 11
3.1 Pedestrial Wildlife Survey 12
3.2 Spotlight Survey 12
3.3 Bird Survey 13
3.3.1 Point Count Bird Surveys 13
3.3.2 Western Burrowing Owls 13
4.0 RESULTS 14
4.1 Summer Survey 14
4.2 Fall Survey 15
4.3 Winter Survey 16
4.4 Spring Survey 16
4.5 Threatened and Endangered Species 18
4.6 State Species of Concern 25
5.0 CONCLUSIONS 29
5.1.1 Mammals Observed 30
5.1.2 Birds Observed 30
5.1.3 Reptiles 30
5.1.4 Insects and Spiders 30
5.2 Species of Federal and State Concern 31
6.0 LIMITATIONS 31
7.0 REFERENCES 31

TABLES

Table 1	Federally Listed Threatened, Endangered and Candidate Species Occurring in the State of Colorado (USFWS, 2008)
Table 2	Colorado Species of Concern Listed as Known or Likely to Occur in Montrose County, Colorado (CDOW, 2008)
Table 3	Colorado Species of Concern Likely to Occur on Site

Copyright 2009, Kleinfelder

FIGURES

Figure 1	Site Location Map
Figure 2	Level III Ecoregions of the Four Corners Area
Figure 3	Level IV Ecoregions of Southwest Colorado
Figure 4	Night Observation and Bird Survey Points

APPENDICES

Appendix A	Point Count Survey Results
Appendix B	Point Count Bird Census Forms

Copyright 2009, Kleinfelder

1.0 INTRODUCTION

Energy Fuels Resources Corporation (EFR) proposes to license, construct, and operate a conventional acid leach uranium and vanadium mill at the Piñon Ridge Mill site (the Site) in western Montrose County, Colorado. Site facilities will include an administration building, a 17-acre mill, tailing ponds totaling 90 acres, an 80-acre evaporation pond, a 5-acre ore storage pad, and an access road. The mill will process ore produced from mines within a reasonable truck-hauling distance. The mill will process up to 500 tons of ore per day but is designed to accommodate subsequent expanded production capacity of up to 1,000 tons per day. The expected operating life of the mill is 20 to 40 years.

The Piñon Ridge Mill is subject to regulation by the State of Colorado, and the mill license (Radioactive Source Material License) will be issued and administered by the Colorado Department of Public Health and Environment (CDPHE). The activities described in this document were performed as part of the baseline characterization required for the Environmental Report (ER) in accordance with Section 3.8.8, Part 3, 6 CCR 1007-1 (NRC, 2003). This report presents the results of the wildlife surveys conducted by Kleinfelder for EFR in support of the mill license application.

1.1 Site Location

The Site is located in the Paradox Valley at 16910 Highway 90, approximately 14 miles west of Naturita, near Bedrock in Montrose County, Colorado. The Site's legal description is the Southwest ¼ of the Southeast ¼ of Section 5, all of Section 8, the North ¼ of Section 17, and the Southeast ¼ of the Northwest ¼ of Section 17, Township 46 North, Range 17 West, of the New Mexico Principal Base and Meridian. The Site is located on both the Davis Mesa Quadrangle (1994) and Bull Canyon Quadrangle (1994) 1:24,000 United States Geological Survey (USGS) topographic/geologic maps. The Site location with respect to major topographic features is shown in Figure 1.

The Site is located within the migratory bird Pacific Flyway. The Pacific flyway is the geographic area west of the continental divide to the Pacific Ocean. Montrose County, Colorado is located within the Principal Western Route (see Section 1.4.3) of the Pacific flyway. The Dolores River is located northwest of the Site within a few miles. Additionally, Paradox Creek is just north of the Site within one mile. Most waterways and water courses are utilized by wildlife species as travel corridors. Therefore, isolated occurrences of transitory species (i.e. terrestrial wildlife, eagles, hawks, owls, shorebirds, waterfowl and near-arctic birds) migrating through the Site would be expected to occur in addition to the wildlife species that occupy the Site.

1.2 Ecological Setting

The United States Forest Service (USFS) has developed a mapping framework to help understand the hierarchical order of all ecosystems. This framework is called the National Hierarchical Framework of Ecological Units (ECOMAP, 1993; Cleland et al., 1997). All ecosystems are recognized by differences in climatic regime. Therefore, parts of the same geographic areas may be located in different ecosystems due to differences in climatic regime. The underlying premise is that climate, as a source of energy and moisture, acts as the primary control for the ecosystem. The Site lies within the Colorado Plateau Ecoregion as shown in Figure 2.

Copyright 2009, Kleinfelder

The Colorado Plateau Ecoregion (Colorado Plateau) is classified as a Level III Ecosystem (Figure 2). This ecoregion is a physiographic province encompassing 130,000 square miles or 83.2 million acres of the Four Corners states, including Utah's southeastern quarter. The Colorado Plateau is a complex of badlands, sheer-walled canyons, buttes, mesas, plains, dunes, and isolated mountain ranges. It is characterized by its high elevation and arid to semi-arid climate. The Colorado Plateau has developed great relief through the erosive action of high-gradient, swift-flowing rivers that have down-cut and incised the plateau. Approximately 90 percent of the plateau is drained by the Colorado River and its tributaries. The Colorado, Little Colorado, San Juan, and Escalante Rivers carve large canyons as they pass through the Plateau.

The Colorado Plateau contains mostly public and tribal lands. Elevations range from 1,200 feet above Mean Sea Level (MSL) within the Grand Canyon to 12,700 feet above MSL in the La Sal Mountains. This wide range of elevations produces diverse habitats for wildlife species. The Plateau is bounded on the east by the southern Rocky Mountains, on the north by the central Rocky Mountains, and on the south and west by the Basin and Range Province.

The more prevalent habitats are piñon-juniper/juniper savanna, riparian, big sagebrush shrublands, steppe, and grasslands. The region has conspicuous but irregular vegetation zones. The woodland zone is the most extensive, dominated by what is often called a pygmy forest of piñon pine (Pinus edulis) and several species of juniper (Juniperus spp.). Between the trees, the ground is sparsely covered by gramma (Bouteloua spp.), other grasses, herbs, and various shrubs, such as big sagebrush (Artemisia tridentata) and mountain mahogany (Cercocarpus montanus) (Tuhy et al., 2002).

The mountain zone extends over broad areas on the high plateaus and mountains, but is actually much smaller than the piñon-juniper zone. The vegetation varies considerably, from ponderosa pine (Pinus ponderosa) in the south to lodgepole pine (P. contorta var. latifolia) and aspen (Populus tremuloides) farther north. Northern Arizona contains four distinct Douglas-fir (Pseudotsuga menziesii) habitat types (Hermann, 1982).

The lowest zone by elevation has arid grasslands but with many bare areas, as well as xeric shrubs and sagebrush. Several kinds of cacti and yucca are common at low elevations in the south.

The climate of the Colorado Plateau is often described as “desert” because annual precipitation averages less than 10 inches. Most of precipitation occurs in the winter as snow and subsequently infiltrates the soil (Tuhy et al., 2002). West (1983) suggests that most of the surface water comes from flows generated at higher, wetter elevations. Contribution to streamflow within the sagebrush semi-desert comes from the rapid melting of snow over frozen surface soil or intense rainfall (West, 1983).

1.2.1 Shale Deserts and Sedimentary Basins

The Site is located within the Shale Deserts and Sedimentary Basin ecoregion, a sub-region (Level IV Ecoregion) of the Colorado Plateau that encompasses 1,870,720 acres (Figure 3). Elevations range from 4,900 to 8,000 feet above MSL (Chapman et al., 2006). The Shale Deserts and Sedimentary Basins prevalent physiography is nearly level to rolling plains and basins with benches, low rounded hills, and badlands (Chapman et al., 2006).

Copyright 2009, Kleinfelder

Climate for the Shale Deserts and Sedimentary Basins includes a mean annual precipitation of 8 to 15 inches. The mean temperature in degree Fahrenheit (˚F) in January is 6/36 (min/max) and in July the mean temperature ˚F is 48/92 (min/max). This ecoregion has a mean annual 90 to 120 frost free days (Chapman et al., 2006).

The more prevalent vegetation community in the Shale Deserts and Sedimentary Basins is a sparse cover of mat saltbrush, shrubland, and salt desert scrub: shadscale (Atriplex confertifolia), Nuttall's saltbrush (A. nuttallii), fourwing saltbrush (A. canescens), blackbrush (Coleogyne ramosissima), Wyoming big sagebrush (Artemisia tridentata ssp. wyomingensis), desert trumpet (Eriogonum inflatum), galleta grass (Pleuraphis rigida), and other associated grasses. Floodplain areas support greasewood or creosotebush (Larrea tridentata), alkali sacaton (Sporobolus airoides), seepweed (Suaeda suffrutescens), and shadscale. Badland areas have little to no vegetation cover (Chapman et al., 2006).

Land uses and land cover include shrubland, rangeland, and areas of dryland and irrigated cropland with winter wheat, small grains, forage crops, and pinto beans. Orchards of apples, peaches, pears, and apricots line the Gunnison and Colorado River valleys. Shrublands provide important winter habitat for wildlife (Chapman et al., 2006).

1.2.2 Semiarid Benchlands and Canyonlands

The Site exhibits characteristics of Semiarid Benchlands and Canyonlands ecoregion as a sub-region (Level IV Ecoregion) of the Colorado Plateau that encompasses 5,810,560 acres within the Colorado Plateau (Figure 3). Elevations range from 5,400 to 9,200 feet above MSL (Chapman et al., 2006). The Semiarid Benchlands and Canyonlands prevalent physiography is benches, mesas, cuestas, alluvial fans, hillsides, cliffs, arches, and canyons with a few isolated peaks. The areas of low relief alternate with the areas of high relief (Chapman et al., 2006).

The southern portion of the Site has representative features that are prevalent to this sub-region of the Colorado Plateau. The features of this sub-region exhibited on the Site are benches, mesas, alluvial fans, cliffs and areas of low relief that alternate with areas of high relief.

Climate for the ecoregion includes a mean annual precipitation of 10 to 18 inches with 20 to 25 inches at the highest elevations. The mean temperature ˚F in January is 8/40 (min/max) and in July the mean temperature ˚F is 48/88 (min/max). This ecoregion has a mean annual 60 to 120 frost free days (Chapman et al., 2006).

The more prevalent vegetation community is the piñon/juniper woodland, Gambel oak woodland, and sagebrush steppe with black sagebrush (Artemsia nova), winterfat (Krascheninnikovia lanata), Mormon tea (Ephedra virdis), four-wing saltbrush, shadscale, galleta grass, and blue gramma (Bouteloua gracilis) (Chapman et al., 2006).

Land uses and land cover include woodland and shrubland, rangeland, recreation, coal mining, oil and gas production, and oil shale extraction (Chapman et al., 2006).

Historical land use of the Site exhibits characteristics of agricultural practices and cattle grazing on the flat portions of the Site. Past and current mining activities continue to the southeast and southwest of the Site. These activities are visually evident by road cuts, excavations, and overburden piles located adjacent to the Site.

Copyright 2009, Kleinfelder

1.3 Habitat Ecotones

Three ecotones (areas where two distinctly different habitats converge) are relevant to the ecology and wildlife species of the Site. These ecotones include a piñon-juniper habitat along the bluffs in the southwest portion of the Site; a joining, narrow strip of big sage habitat; a native grassland habitat abuts both the big sage habitats throughout the central portion of the site extending centrally from the northwest corner of the site to the southwest portion of the Site; and another big sage habitat occupies the northeast half of the Site. Refer to the Vegetation Survey (Kleinfelder, 2009) for details of each ecotone and habitat found on the Site.

Habitat types are indicative of wildlife species expected to occupy those habitats. Terrestrial wildlife such as elk, deer, bear, coyote, fox, etc. prefers habitats that provide seasonal food, cover, and water. Avian species occupy habitats that provide nesting and fledging habits and adjacent feeding areas. Raptors i.e. eagles, hawks and owls prefer habitats that provide prey species for food and other habitats for nesting. The Site provides habitats and ecotones for wildlife that are associated with the big-sage habitat and grassland habitat. No waterfowl is expected to occur on the site due to the lack of perennial water or preferred nesting habitat. It would not be uncommon for types of waterfowl such as ducks to visit the site after a rain event to rest on ponded water.

1.4 Wildlife Species of Concern

1.4.1 Federally Threatened and Endangered Species

The purpose of the Endangered Species Act of 1973 (ESA) is to conserve “the ecosystems upon which endangered and threatened species depend” and to conserve and recover listed species. Under the law, species may be listed as either “endangered”, ”threatened”, or a “candidate” species. Endangered means a species is in danger of extinction throughout all or a significant portion of its range. Threatened means a species is likely to become endangered within the foreseeable future. Candidate means a species is likely to decline in numbers due to habitat loss and that additional data are needed to warrant listing as an endangered or threatened species. All species of plants and animals, except pest insects, are eligible for listing as endangered or threatened.

The Federally listed threatened and endangered species list was updated for the State of Colorado in February of 2008. The current federally listed species in Colorado are provided in Table 1.

Copyright 2009, Kleinfelder

Table1. Federally Listed Threatened, Endangered and Candidate Species Occurring in the State of Colorado (USFWS, 2008)

FEDERALLY LISTED SPECIES THAT OCCUR IN COLORADO		
Status	**Common Name**	**Scientific Name**
Birds		
FE	Southwestern willow flycatcher	*Empidonax traillii extimus*
FE	Whooping crane	*Grus americana*
FE	Least interior tern	*Sterna antillarum*
FT	Piping plover	*Charadrius melodus*
FT	Mexican spotted owl	*Strix occidentalis lucida*
Fish		
FE	Humpback chub	*Gila cypha*
FE	Bonytail chub	*Gila elegans*
FE	Colorado pikeminnow	*Ptychocheilus lucius*
FE	Razorback sucker	*Xyrauchen texanus*
FT	Greenback cutthroat trout	*Oncorhynchus clarki stomias*
C	Arkansas darter	*Etheostoma cragini*
Insects		
FE	Uncompahgre fritillary butterfly	*Boloria acrocnema*
FT	Pawnee montane skipper	*Hesperia leonardus montana*
C	Coral Pink Sand Dunes tiger beetle,	*Cicindela albissima*
Mammals		
FE	Gray wolf	*Canis lupus*
FE	Black-footed ferret	*Mustela nigripes*
FT	Canada lynx	*Lynx canadensis*
FT	Preble's meadow jumping mouse	*Zapus hudsonius preblei*
C	Gunnison's prairie dog	*Cynomys gunnisoni*

*Status Codes:
FE = Federally Endangered
FT = Federally Threatened
C = Candidate Species

Descriptions of these species and their range can be found in Section 4.5

1.4.2 Colorado Species of Concern

The State of Colorado has also identified species of wildlife that are of concern. Table 2 lists the Colorado State species of concern, which are known to historically or currently reside in Montrose County.

Copyright 2009, Kleinfelder

Table 2. Colorado Species of Concern Listed as Known or Likely to Occur in Montrose County, Colorado (CDOW, 2008)

SPECIES LISTED IN MONTROSE COUNTY, COLORADO			
Status*	**Common Name**	**Scientific Name**	**Occurrence in County[a]**
Amphibians			
SE	Boreal toad	*Bufo boreas boreas*	Likely to Occur
SC	Northern leopard frog	*Rana pipiens*	Known to Occur
Birds			
FE, SE	Southwestern willow flycatcher	*Empidonax traillii extimus*	Known to Occur
FE, SE	Whooping crane	*Grus americana*	Known to Occur
FT, ST	Mexican spotted owl	*Strix occidentalis lucida*	Known to Occur
SE	Plains sharp-tailed grouse	*Tympanuchus phasianellus jamesii*	Known to Occur
ST	Western burrowing owl	*Athene cunicularia*	Known to Occur
ST	Bald eagle	*Haliaeetus leucocephalus*	Known to Occur
SC	Ferruginous hawk	*Buteo regalis*	Known to Occur
SC	Gunnison sage grouse	*Centrocercus minimus*	Known to Occur
SC	Western snowy plover	*Charadrius alexandrinus*	Known to Occur
SC	American peregrine falcon	*Falco perigrinus anatum*	Known to Occur
SC	Greater sandhill crane	*Grus canadensis tabida*	Known to Occur
SC	Long-billed curlew	*Numenius americanus*	Known to Occur
Fish			
SC	Colorado roundtail chub	*Gila robusta*	Known to Occur
Insects			
FE	Uncompahgre fritillary butterfly	*Boloria acrocnema*	Likely to Occur
Mammals			
FE, SE	Black-footed ferret	*Mustella nigripes*	Likely to Occur
FT, SE	Canada lynx	*Lynx canadensis*	Known to Occur
SE	Wolverine	*Gulo gulo*	Likely to Occur
C	Gunnison's prairie dog	*Cynomys gunnisoni*	Known to Occur
SE	Kit fox	*Vulpes macrotis*	Known to Occur

Copyright 2009, Kleinfelder

SPECIES LISTED IN MONTROSE COUNTY, COLORADO			
Status*	**Common Name**	**Scientific Name**	**Occurrence in County[a]**
ST	River otter	*Lontra canadensis*	Known to Occur
SC	Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	Known to Occur
SC	Botta's pocket gopher	*Thomomys bottae rubidus*	Known to Occur
SC	Northern pocket gopher	*Thomomys talpoides macrotis*	Known to Occur
Reptiles			
SC	Midget faded rattlesnake	*Crotalus virdis concolor*	Known to Occur
SC	Longnose leopard lizard	*Gambelia wislizenii*	Likely to Occur

[a]According to Natural Diversity Inventory Source (NDIS)
*Status Codes:
FE = Federally Endangered
FT = Federally Threatened
C = Candidate
SE = State Endangered
ST = State Threatened
SC = State Special Concern (not a statuary category)

Species likely to occur on the Site can be found in Table 3 (see Section 4.6). Detailed descriptions of those species that are likely to occur on the Site can be found following Table 3.

1.4.3 Migratory Birds

The Migratory Bird Treaty Act (16 U.S.C. 703-712) (MBTB) is the cornerstone for migratory-bird conservation and protection in the U.S. The MBTB was established in response to the unregulated and indiscriminate taking of birds.

Wording in the MBTB makes it very clear that most actions that result in "taking" or possession (permanent or temporary) of a protected species can be a violation. Specifically, the MBTB states:

> *Unless and except as permitted by regulations . . . it shall be unlawful at any time, by any means, or in any manner to pursue, hunt, take, capture, kill...possess, offer for sale, sell...purchase...ship, export, import . . .transport or cause to be transported . . . any migratory bird, any part, nest, or eggs of any such bird . . . included in the terms of the conventions between the United States and Great Britain (acting for Canada)...the United States and the United Mexican States . . . and the United States and the Government of Japan" (emphasis added (USGS, 2009)).*

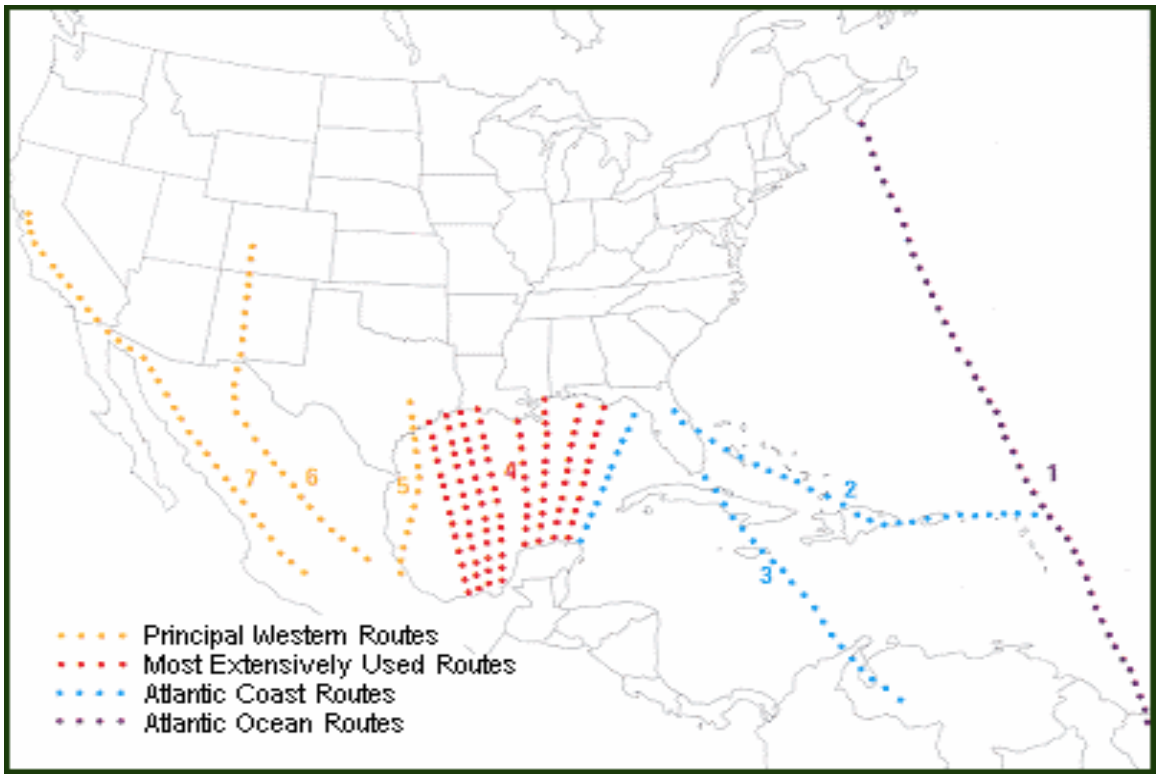
Among the 1,043 bird species naturally occurring in the U.S. and its possessions, 868 species (83 percent) are protected by the MBTB, 75 species or subspecies (9 percent) are protected in all or a portion of their range by the Endangered Species Act (16 U.S.C.1531) (ESA), and 43 species (5 percent) are protected by both laws (USGS, 2009). All of the 175 species not protected by either the MBTB or the ESA belong to groups not covered by any of the migratory-bird treaties (e.g., all of the Galliformes and introduced species as well as island species belonging to groups not covered by the MBTB) (USGS, 2009).

Copyright 2009, Kleinfelder

Galliformes is a large and diverse group comprising about 70 genera and more than 250 species. Taxa within Galliformes are commonly referred to as 'gallinaceous birds' (meaning chicken-like) or game birds (as many species are hunted) (USGS, 2009).

Migratory Bird Routes

USGS (2009) identified seven generalized routes for birds leaving the United States on their way to various wintering grounds see illustration below (USGS, 2009). Route 4 is the one used most extensively while only a few species make the 2,400 mile flight down Route 1 from Nova Scotia to South America. The routes by which birds return northward in the spring are not as well known.



USGS, 2009

The Site is located within route six (Principal Western Route) in the above illustration. Fall migration begins in southwest Colorado for Route 6. The southward route of long-distance migratory landbirds of the Pacific area (west of the continental divide) extends chiefly through the interior of California to the mouth of the Colorado River and on to winter quarters in western Mexico (USGS, 2009).

Migration Patterns

Migration timing is species specific but spring migration generally begins in late March with fall migration beginning in late summer. Both length and duration of migratory journeys vary greatly between families, species, or populations within a species. Most woodpeckers that are likely to be observed on or near the Site are largely nonmigratory and considered year round residents. These species may live out their entire existence without going more than 10 miles from the nest where they were hatched.

Song sparrows, western meadowlarks, and scrub jays such as those observed on or near the Site make such short migrations that the movement is difficult to detect because individuals, possibly not the same ones, may be found in one area throughout the year while other individuals that move south may be replaced by individuals from the north (USGS, 2009).

Among many migratory species there is considerable variation among individuals and populations with respect to distances moved. Certain populations like the American crow observed on the Site may be quite sedentary while others are strongly migratory, and certain individuals in the same population can be more migratory than others. In dark-eyed juncos, adult females migrate the farthest south, while young males winter the farthest north. Adult male and young female dark-eyed juncos may winter at intermediate distances such as those observed on the Site during the winter point count survey.

Short Distance Migration

Some species such as dusky flycatcher, mourning dove sparrows, and loggerhead shrike have extensive summer ranges. These were observed on the Site during the summer and fall season and concentrate during the winter season in the southern part of the breeding range or occupy additional territory only a short distance farther south. The entire species may thus be confined within a restricted area during winter, but with the return of warmer weather, the species spreads out to reoccupy the much larger summer range.

Long Distance Migration

More than 300 breeding species leave the United States and Canada and spend the winter in the West Indies, Central America, or South America. Common species that are expected to occur at or near the Site, such as the barn swallows and cliff swallows may occupy the same general winter quarters in Brazil, but other barn swallows go farther south. Of all North American landbirds, these species probably travel the farthest; they are found north in summer to the Yukon Territory and Alaska, and south in winter to Argentina, 7,000 miles away (USGS, 2009).

Topography Influence on Migration

Distinct features in the landscape, including rivers, mountain ridges, desert rims, or peninsulas appear to influence migratory travel by providing a landscape reference for orientation, especially when it is necessary to compensate for wind drift (USGS, 2009).

Thermal updrafts along the Dolores River, Paradox Creek, and canyon corridors such as those topographic features that characterize the area provide guiding lines for migratory birds. These conditions will often concentrate eagles and migrating hawks such as broad-winged, rough-legged, red-shouldered, and red-tailed hawks. It has been observed that maximum hawk flights occur when winds are from 10 to 25 miles per hour, but when winds exceed 35 miles per hour good soaring conditions are curtailed and hawk migration ceases (USGS, 2009). Mountain ridges that parallel the line of flight offer updrafts to soaring birds. The highest and longest ridges deflect the horizontal winds upward better than the shorter ridges less than 1,000 feet high and more birds are seen, on the average, along these higher ridges (USGS, 2009). It can be expected to see more soaring birds along the south portion of the Site or off the north portion of the Site where Paradox Creek is located.

For migrants not dependent upon soaring flight like passerines (sparrows, song birds, etc.) and near-arctic birds, topographic features such as the Dolores River and Paradox Creek do not

Copyright 2009, Kleinfelder

influence their migratory journey other than to provide resting and loafing areas during the migration (USGS, 2009).

In summary, topography may help or deter a migrant in its passage. It affects different birds in different ways. In North America, migratory movements are continent wide, and no evidence indicates any particular part of the landscape influences all birds in the same manner. Certain bird populations may use regular geographic routes during migration, but they are usually not rigidly restricted to them because of topography.

1.5 Wildlife Resources

The literature and database review showed that the Site is located within four identified and important wildlife habitat resource areas (CDOW, 2008, Knowles, 2002, USFWS, 2008). The important wildlife resource occurring on the Site include: severe winter range for mule deer and elk; potentially suitable Gunnison's sage grouse habitat; potentially suitable western burrowing owl habitat; and potentially occurring Gunnison's prairie dog and its associated habitat (Knowles, 2002). In February 2008 the USFWS (2008) listed the Gunnison's prairie dog as a candidate species. This listing provides protection under the ESA until a final ruling has been issued.

- Severe winter range for mule deer and elk as identified by the CDOW

  The CDOW (2008) identified the Site as an area of severe winter range for mule deer and elk. Severe winter range is an area where mule deer and elk migrate to during severe winter conditions when snow depths at higher elevations are deeper than winter averages and force these wildlife species to lower elevations. The severe winter range is essential to the survival of the mule deer and elk. The severe winter range typically contains piñon-juniper, sagebrush, and grassland habitats. Wildlife typically concentrate in these areas until snow depths decrease in the higher elevations. Both deer and elk were observed on the Site during the Winter 2007/08 and Spring 2008 survey seasons, but not in high concentrations or during the point count surveys.

- Potentially suitable Gunnison sage grouse habitat as identified by the CDOW

  The CDOW (2008) has identified potentially suitable habitat for the Gunnison's sage grouse in Colorado. The CDOW (2008) indicated that the Site is located within the potentially suitable habitat range of the Gunnison's sage grouse. A viable population of Gunnison's sage-grouse is located to the south and west of the Site on Monogram Mesa. Typical habitats preferred by this species are large expanses of sagebrush within grassland interfaces. The Site exhibits both of these characteristics. However, no Gunnison's sage grouse were observed on Site.

- Potentially suitable habitat for the western burrowing owls

  Western burrowing owls (WBO) were observed adjacent to the Site. However, no WBO were observed on the Site. WBO prefer to utilize existing burrows dug by other small wildlife such as ground squirrel, rabbits and prairie dogs for nesting and fledging. WBO prefer grassland habitat. Both grassland habitat and existing small wildlife burrows were observed on the Site, but no WBO were observed.

Copyright 2009, Kleinfelder

- Potentially suitable habitat for the Gunnison's prairie dog

  The FWS listed the Gunnison's prairie dog as a candidate species in February 2008. Knowles (2002) identified the range of the Gunnison's prairie dog to include the Paradox valley. The Site is centrally located in the Paradox valley and contains potential habitat for the Gunnison's prairie dog. However, the Gunnison's prairie dog was not observed on the Site. No prairie dog burrows, either active or abandoned, were observed on the Site.

2.0 PURPOSE AND SCOPE

The four season wildlife surveys are intended to address and characterize the environmental conditions present on the Site. As part of the mill licensing process, a wildlife survey is required by Section 5.3.5 of NUREG 1748, Environmental Guidance for Licensing Actions with NMSS Programs (NRC, 2003) to characterize principal ecological features of the site and vicinity, transportation corridors, and region, with emphasis on the plant and animal communities that may be affected by the proposed action.

The purpose of the wildlife survey was to identify potential environmental impacts to wildlife species associated with construction and operation of the proposed mill, and to provide a baseline for the current, pre-operational conditions of the site.

Section 2.5 of the Regulatory Guide 3.8, *Preparation of Environmental Reports for Uranium Mills* (NRC, 1982) requires wildlife survey information for inclusion in the Environmental Report (ER). The ER is required to be submitted to the Radiation Management Program of the CDPHE.

Field investigations were conducted in accordance with applicable Kleinfelder standard operating procedures (SOP), Quality Procedures (QP), and the work plan (Kleinfelder, 2007).

3.0 METHODS

The baseline ecological field data collected throughout the four seasons began in August 2007 (summer season) and continued through May 2008 (spring season).

The Kleinfelder team established and walked transects across the Site to observe and identify naturally occurring ecological resources. Both vegetation and wildlife observations were made during the transect observations. Kleinfelder biologists performed various field survey methods to collect site data. The methods included: wildlife spotlight surveys, continual wildlife observations while on the Site, point count bird surveys, and western burrowing owl surveys in accordance with the protocols set forth by the Colorado Division of Wildlife (CDOW, 2007).

Field activities were completed in accordance with Kleinfelder's SOP and Work Plan. A Health and Safety Plan (HASP) was reviewed and signed by all Kleinfelder representatives before entering the Site.

Copyright 2009, Kleinfelder

3.1 Pedestrial Wildlife Survey

Pedestrial surveys were accomplished by walking established transects (Figure 4). Seven transects were systematically established north to south 300 yards apart from east to west. Sample points were positioned every 300 yards on each transect for a total of 60 sample points making up a sampling grid (Figure 4). Sample points were marked with yellow flagging and marked on a GPS device. All seven transects were observed during each of the four seasons. Half of the sample points were visited at each seasonal assessment, except during the Spring 2008 survey when all sample points were visited and data collected. During the Spring 2008 survey, all point count surveys were completed to determine seasonal variation.

The presence of wildlife and/or sign was documented continually while Kleinfelder biologists were onsite. Birds, mammals, reptiles, amphibians, and butterflies were observed along the survey routes and were identified to species (if possible) either by sight, call, song, tracks, or scat. The identification, location, and time of observation for wildlife were documented in a field book (Meyer, 2008).

3.2 Spotlight Survey

Night-time observation points were located at each corner of the Site and one in the middle of the Site (Figure 4). Surveys were conducted during the Fall 2007 season, Winter 2007/08 season and Spring 2008 season. A handheld spotlight with the capability to illuminate up to 1,000,000 foot candles (fc) was utilized. A spotter completed a 360-degree sweep with the handheld spotlight, while a second field worker documented the results behind the spotter, saving the documenters' night vision.

Copyright 2009, Kleinfelder

3.3 Bird Survey

3.3.1 Point Count Bird Surveys

A bird survey was conducted each season by means of point count surveys. Point counts allow for determination of species diversity. The point count survey methods outlined in Bibby et al. (1992) were followed for the Site point count surveys. The bird counts were split into three timed counts, 0-3 minutes, 3-5 minutes, and 5-10 minutes. Kleinfelder biologists identified the birds by sight and and/or calls. The position of each bird was recorded on a data form with respect to the observation point up to 100 yards away. Distances were visually estimated. Surveys were completed in the morning and late afternoon when birds are at their optimum activity levels (Bibby et al., 1992).

Point count survey data collected were used to determine biological diversity of the birds visiting the Site over four seasons. Two main factors are taken into account when measuring biological diversity: species richness and species evenness (OWWT, 2007). The number of species within a sample is the species richness. Species evenness is the relative abundance with which each species is represented in an area (OWWT, 2007). An ecosystem where all the species are represented by evenly distributed numbers of individuals has high species evenness. An ecosystem where some species are represented by many individuals, and other species are represented by very few individuals has low species evenness (OWWT, 2007). As species richness and evenness increases, diversity increases.

The Simpson's Diversity Reciprocal Index was utilized to determine the measure of biological diversity of birds found at the Site. The Simpson Diversity Reciprocal Index accounts for the number of bird species present, as well as the relative abundance of each bird species (OWWT, 2007). .

3.3.2 Western Burrowing Owls

The WBO survey was performed in accordance with the Colorado Division of Wildlife's "*Recommended Survey Protocol and Actions to Protect Nesting Burrowing Owls When Conducting Prairie Dog Control"* (CDOW, 2007).

WBO typically arrive on breeding grounds in Colorado in late March or early April, with nesting beginning a few weeks later. WBO surveys are required between 15 March and 31 October. Active nesting and fledging has been recorded and may be expected from late March through early August (CDOW, 2007). Adults and young may remain at nesting grounds until migrating to wintering grounds in late summer or early autumn (CDOW, 2007).

WBOs are active throughout the day; however, peaks in activity in the morning and evening make these the best times for conducting surveys (Conway and Simon, 2003). Surveys were conducted in the early morning (one half hour before sunrise until 2 hours after sunrise) and early evening (2 hours before sunset until one half hour after sunset).

To increase the likelihood of detecting WBO, if present, call-broadcast methods are used in WBO surveys. Conway and Simon (2003) detected 22% more WBO at point-count locations by broadcasting the primary male (*coo-coo*) and alarm (*quick-quick-quick*) calls during surveys. Although call-broadcast may increase the probability of detecting WBO, most owls will still be detected visually (CDOW, 2007).

Copyright 2009, Kleinfelder

Kleinfelder biologists scanned the area for WBO during the Summer 2007 season and Spring 2008 season survey periods. Calls were broadcasted from a portable CD player using the following recommended 10-minute timeline for incorporating call-broadcast methods (CDOW, 2007):

- 3 minutes of silence
- 30 seconds call-broadcast of primary call (*coo-coo*)
- 30 seconds silence
- 30 seconds call-broadcast of primary call (*coo-coo*)
- 30 seconds silence
- 30 seconds call-broadcast of alarm call (*quick-quick-quick*)
- 30 seconds silence
- 4 minute delay before repeating the sequence.

4.0 RESULTS

4.1 Summer Survey

Kleinfelder biologists were on site from August 20, 2007 through August 24, 2007, to establish survey transects and complete point count surveys for birds. A pedestrial survey of the southwestern bluffs was conducted to observe available habitats of the Site and to establish the survey transects. Spotlight surveys were not conducted during the Summer 2007 survey.

Wildlife Observations

Wildlife observed during the summer survey included black-tailed jackrabbits (*Sylvilagus floridanus*), eastern cottontails (*Sylvilagus floridanus*), coyotes (*Canis latrans*), a sharp-shinned hawk (*Accipiter striatus*), and various passerine (song) birds including lark sparrows (*Chondestes grammacus*), dusky flycatchers (*Empidonax oberholseri*), cliff swallows (*Petrochelidon pyrrhonota*), western meadowlarks (*Sturnella neglecta*), and mourning doves (*Zenaida macroura*). Reptiles and insects observed included eastern fence lizards (*Sceloporus undulatus*), five-lined skinks (*Eumeces fasciatus*), a greater short horned lizard (*Phrynosoma hernandesi*), and red harvester ants (*Pogonomyrmex barbatus*).

Point Count Surveys

Eight bird species were identified on site during the summer survey (Appendix A). These eight species are used as the baseline for the diversity rating. If additional species are observed the species richness count increases. The Simpson's Diversity Reciprocal Index yielded a 2.12 on a scale that ranges from zero to eight for the summer survey. This result suggests that the diversity of birds on the Site is low during the summer, as an index of one represents a population of one species.

There were 57 individual birds observed at 12 sample point locations during the summer observations (Appendix A). A total of 17 ten-minute point count surveys were completed (Appendix B).

The eight species observed during the point count surveys were lark sparrows, dusky flycatchers, cliff swallows, western scrub-jays (*Aphelocoma californicus*), ruby-throated hummingbird (*Archilochus columbris)*, western meadowlarks, loggerhead shrike (*Lanius ludovicianus*) and mourning doves.

WBO Surveys

Kleinfelder biologists conducted WBO surveys on the Site two hours before sunset to a half hour after sunset on August 23 and a half hour before sunrise to two hours after sunrise on August 24. No prairie dog burrows were observed on the Site, however, suitable rabbit burrow habitat was observed. Due to available WBO habitat, the WBO survey point was located approximately 414 feet north of sample point T1-8 centered in a group of rabbit burrows (Figure 4). Counts were conducted by sight observations every 10 minutes until one half hour after sunset. No WBO were observed (Meyer, 2008, p. 8-11)

4.2 Fall Survey

Kleinfelder biologists were on site from September 17, 2007 through September 19, 2007, to conduct a pedestrial survey along established transects, complete point count surveys for birds and conduct spotlight surveys.

Wildlife Observations

Kleinfelder biologists conducted a pedestrial survey of the Site while moving between point count survey points (Meyer, 2008, p. 13-14). Wildlife observed during the fall survey included eastern cottontails, black-tailed jackrabbits, cliff swallows, lark sparrows, American crows (*Corvus brachyrhynchos*), red harvester ants, banded Argiope spiders (*Argiope trifasciata*), and a praying mantis (*Stagmomantis carolina*).

Point Count Surveys

Eight bird species were identified on site during the summer survey (Appendix A). These eight species are used as the baseline for the diversity rating. There were no new species observed during the fall survey. There were 13 individual birds observed at seven sample point locations (Appendix A). A total of 13 ten-minute point count surveys were completed (Appendix B). The two bird species observed during the fall survey were lark sparrow and cliff swallow.

The Simpson's Diversity Reciprocal Index yielded a 1.99 on a scale that ranges from zero to eight for the fall survey. This result suggests that the diversity of birds on site is low during the fall, as an index of one represents a population of one species.

WBO Surveys

A WBO survey was not conducted during this field session due to seasonal timing. WBO migration to wintering grounds occurs in late summer and early fall (CDOW, 2007). It was not expected that WBO would be present in mid fall.

Spotlight Survey

Kleinfelder biologists conducted spotlight surveys of the Site on September 17, 2007. The spotlight surveys were conducted after sunset to identify wildlife. Wildlife observed included black-tailed jackrabbits, eastern cottontails, and two unidentified bats most likely from the Families Vespertilionidae and Molossidae (Meyer, 2008, p. 12).

Copyright 2009, Kleinfelder

4.3 Winter Survey

Kleinfelder biologists were on site January 16 and 17, 2008 to conduct a pedestrial survey along established transects, complete point count surveys for birds and conduct spotlight surveys.

Wildlife Observations

Wildlife observed during the winter survey included eastern cottontails, black-tailed jackrabbits, three dark-eyed juncos (*Junco hyemalis*), numerous elk (*Cervus canadensis*), mule deer (*Odocoileus hemionus*), and small mammal tracks.

A single bald eagle (*Haliaeetus leucocephalus*) was observed flying along the portion of State Highway 90 (Figure 1) that transects the northern portion of the Site. It is suspected that the bald eagles occurrence was incidental due to the lack of habitat. The bald eagle observation occurred while driving to the entrance of the Site and is not included as an observation during the point count survey,

Point Count Surveys

Eight bird species were identified onsite during the summer survey. During the winter survey, Kleinfelder biologists observed an additional species, the dark-eyed juncos, increasing the species richness count to nine (Appendix A). There were three individual birds observed at one sample point location (Appendix A). A total of 17 ten-minute point count surveys were completed (Appendix B).

The dark-eyed junco was the only species observed during the winter survey. The Simpson's Diversity Reciprocal Index yielded a 1.0 on a scale that ranges from zero to nine for the winter survey. This result suggests that the diversity of birds on site is very low during the winter, as an index of one represents a population of one species.

WBO Surveys

A WBO survey was not conducted during winter season. Migration to the wintering grounds occurs in late summer and early fall (CDOW, 2007). It was not expected that WBO would be present in the winter.

Spotlight Survey

Kleinfelder biologists conducted spotlight surveys of the Site on January 17, 2008. The spotlight survey yielded few results. The wildlife observed included eastern cottontails and black-tailed jackrabbits.

4.4 Spring Survey

Kleinfelder biologists were on site from May 19 through May 20, 2008 to conduct a pedestrial survey along established transects, complete point count surveys for birds and conduct spotlight surveys.

Copyright 2009, Kleinfelder

Wildlife Observations

Wildlife observed during the spring survey included eastern cottontails, black-tailed jackrabbits, coyote, mourning doves, western meadow larks, lark sparrows, European starling (*Sturnus vulgaris*), American crows , eastern fence lizards, thirteen-lined skink and red harvester ants.

Point Count Surveys

The nine bird species identified onsite during the summer, fall, and winter surveys were used as the baseline for the diversity rating during the 2008 spring survey. Kleinfelder biologists observed two additional bird species, the American crow and European starling. With the observation of these two additional species, the richness count increased to 11 (Appendix A). There were 123 individual birds observed at 30 sample point locations. A total of 30 ten-minute point count surveys were completed (Appendix B). The five species observed were lark sparrow, American crow, European starling, western meadow larks, and mourning doves.

The Simpson's Diversity Reciprocal Index yielded a 2.91 on a scale that ranges from zero to eleven for the spring survey. This result suggests that the diversity of birds on site is higher in the spring than in the summer, fall, and winter seasons, since those seasons yielded a diversity index of 2.12, 1.99, and 1.0, respectively. Overall, the Simpson's Diversity Reciprocal Index is still low, as an index of one represents a population of one species.

WBO Surveys

Kleinfelder biologists conducted WBO surveys on the Site two hours before sunset to a half hour after sunset on May 19, 2008. The survey point was located at the same location as the summer survey (Figure 4). No WBO were observed on the Site, however, three WBO were heard broadcasting in response to the CDOW call-broadcast compact disc. The WBO were heard between one-eighth mile and one-half mile west to southwest of the observation point, off site (Meyer, 2008, p.23-25).

Spotlight Survey

Kleinfelder biologists conducted spotlight surveys of the Site on May 20. Wildlife observed on the Site included a cow elk, eastern cottontails, black-tailed jackrabbits, kangaroo rats (*Dipodomys* spp.), and mice (*Peromyscus* spp.) (Meyer, 2008, p. 26).

Summary

The four-season point count bird survey provided 196 individual birds observed at 30 sample point locations. In a total of 77 ten-minute point count surveys, the species observed were lark sparrows, dusky flycatchers, cliff swallows, western scrub-jays, a ruby-throated hummingbird, western meadowlarks, a loggerhead shrike, mourning doves, dark-eyed juncos, American crows, and a European starling.

The Simpson's Diversity Reciprocal Index yielded a 3.05 for the combined observations during the four seasonal surveys. The spring survey yielded a 2.91 on a scale that ranges from zero to eleven. This result suggests that the diversity of birds on site is higher in the spring than in the summer, fall, and winter seasons, because they yielded 2.12, 1.99, and 1.0, respectively.

Copyright 2009, Kleinfelder

4.5 Threatened and Endangered Species

In accordance with Section 7 of the ESA (1973), specific attention was given to observations of federally threatened, endangered and candidate species for the county of Montrose, Colorado (USFWS, 2008). The list was previously provided in Table 1. The following species were evaluated during all four of the seasonal surveys.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

The southwestern willow flycatcher (willow flycatcher) is a small passerine neotropical migratory bird that breeds in the riparian habitats of seven southwestern states including New Mexico, Arizona, California, Utah, Nevada, Colorado, and Texas (Sogge, 1997), and winters in Central and South America (NDOW, 2008).

Dense vegetation near watercourses or inundated wetlands is required for nesting, thus the species is considered a riparian obligate breeder. Preferred vegetation consists of willows (*Salix spp*.), cottonwoods (*Populus spp*.), tamarisk (*Tamarix spp.*), and Russian olive (*Elaeagnus angustifolia*), among others. Preferred watercourses may include rivers, streams, springs or marshes. At some sites the water source may be ephemeral over the course of a year, but the habitat must support riparian vegetation during the breeding season (NDOW, 2008).

Kleinfelder did not observe the presence of southwestern willow flycatcher on the Site. The Site is vegetated with arid halophytes and big sage, atypical of willow flycatcher habitat. Based upon the current conditions of the Site, Kleinfelder has determined that it is unlikely that southwest willow flycatcher habitat currently exists on site.

Whooping Crane (*Grus amer*icana)

The whooping crane was listed as Endangered on March 11, 1967. Historically, the whooping crane nested over a wide area from Lake Michigan northward to the Arctic coast, and wintered along the coast of Texas and Louisiana. Populations decreased dramatically throughout the 1800's and into the 1900's, mainly because of the loss of nesting and wintering habitat (USFWS, 2008). By 1941 the species had declined to about 16 individuals in a single wild flock that migrated between Canada and coastal Texas. Several factors contributed to the historic decline of the species, including habitat loss and alteration, coastal and marine pollution, illegal hunting, disease, predation, collision with utility lines, loss of genetic diversity within the population, and vulnerability to natural and human caused disturbances. Whooping crane habitat includes mudflats around reservoirs and in agricultural areas. While wintering, they live on salt flats that are dominated by coastal salt grass. Their nesting grounds are wetland communities dominated by bulrush.

Kleinfelder did not identify the presence of the whooping crane on the Site during the field activities. The migration path of the whooping crane is located in eastern Colorado (USFWS, 2008). Due to the arid habitat and lack of open water on the Site, potential whooping crane habitat is not present. Due to lack of habitat and based upon the known migration path of the whooping crane, no whooping cranes are anticipated to occur within the Site.

Copyright 2009, Kleinfelder

Least Interior Tern (*Sterna antillarum*)

The least interior turn was listed as endangered on May 28, 1985 (50 Fed. Reg. 21792), primarily due to the loss of nesting habitat as a result of dramatic alterations (channelization and impoundment) of important river systems. Water level fluctuations, vegetation of nesting habitat and disturbance (from people, pets, predators, and livestock) continue to jeopardize nesting success (PRESP, 2008). Least terns are the smallest member of the gull and tern family. They are approximately 9 inches in length. Unlike gulls, terns will dive into the water for small fish. The body of least terns is predominately gray and white, with black streaking on the head. Least terns have a forked tail and narrow pointed wings. Least terns less than a year old have less distinctive black streaking on the head and less of a forked tail (USFWS, 2008).

The interior least tern historically nested along the Colorado (in Texas), Red, Rio Grande, Arkansas, Missouri, Ohio, and Mississippi River systems. It currently nests in the Mississippi and Rio Grande River basins from Montana south to Texas and from eastern New Mexico and Colorado to Indiana and Louisiana. This species is thought to overwinter in Central and South America. Approximately 400 least terns nest along the Cheyenne and Missouri Rivers in South Dakota, with the majority concentrated below the Gavins Point and Fort Randall Dams (PRESP, 2008).

Kleinfelder did not identify the presence of the least interior tern on the Site during the field activities. Due to the arid habitat and lack of open water on the Site, no least interior tern habitat is present on the Site.

Piping Plover (*Charadrius melodus*)

Piping plovers *(Charadrius melodus)* are small shorebirds approximately seven inches long with sand-colored plumage on their backs and crown and white underparts. Breeding birds have a single black breastband, a black bar across the forehead, bright orange legs and bill, and a black tip on the bill. During winter, the birds lose the black bands, the legs fade to pale yellow, and the bill becomes mostly black (USFWS, 2008).

Piping plover populations were federally listed as threatened and endangered in 1986 (50 Fed. Reg. 50720-.50733). The Northern Great Plains and Atlantic Coast populations are threatened, and the Great Lakes population is endangered (USFWS, 2008). The piping plover can be found on lakeshores and river sandbars. It nests on gravel shores of shallow, saline lakes and on the sandy shores of larger prairie lakes. It tends to use only unvegetated or sparsely vegetated areas for nesting.

Kleinfelder did not identify the presence of the piping plover on the Site during the field activities. Due to the arid habitat and lack of water in the arroyos, potential piping plover habitat is not present.

Mexican Spotted Owl (*Strix occidentalis lucida*)

The Mexican spotted owl was listed as threatened on April 15, 1993 (58 Fed. Reg. 14248).The Mexican spotted owl is an ashy-chestnut brown color with white and brown spots on its abdomen, back and head. The spots of this subspecies of spotted owl are bigger than the spots of the other two subspecies, California and Northern spotted owls, making the Mexican spotted owls appear lighter than their relatives. Their brown tails are marked with thin white bands. This owl is one of the largest owls in North America (USFWS, 2008).

The Mexican spotted owl has the largest geographic distribution of any of the *S. occidentalis* subspecies (Heck 1993) Historically, the owl ranged from the southern Rocky Mountains in Colorado; the Colorado Plateau in southern Utah; southward through Arizona, New Mexico, and far western Texas; in Mexico through the Sierra Madre Occidental and Oriental mountains and the southern end of the Mexican Plateau. Presently, the owl's range reflects the historic range, but owl numbers are much reduced and habitat is patchy (USFWS, 2008).

The Mexican spotted owl inhabits canyon and montane forest habitats across a range that extends from southern Utah and Colorado, through Arizona, New Mexico, and west Texas, to the mountains of central Mexico (USFWS, 2008).

Kleinfelder did not identify the presence of the Mexican spotted owls on the Site during the field activities. Kleinfelder believes Mexican spotted owl do not occur on the Site due to the lack of habitat.

Humpback Chub (*Gila cypha*)

The humpback chub was added to the US list of endangered species on April 23, 1980 (59: Fed. Reg. 13375-13400). The humpback chub lives primarily in canyons with swift currents and white water. The pronounced hump behind its head gives the humpback chub a striking, unusual appearance. Like the Colorado pikeminnow and bonytail, the humpback chub is a member of the minnow family. It has an olive-colored back, silver sides, a white belly, small eyes and a long snout that overhangs its jaw. These fish spawn as young as 2-3 years and at lengths as small as 5 inches. Their spawning season is between March and July (CSU, 2008). Historically, it inhabited canyons of the Colorado River and four of its tributaries: the Green, Yampa, White and Little Colorado rivers. Now, there are two populations near the Colorado/Utah border - one at Westwater Canyon in Utah and one in an area called Black Rocks, in Colorado. Though now smaller in number than they were historically, the two populations seem to be fairly stable in these two areas. Smaller numbers have been found in the Yampa and Green rivers in Dinosaur National Monument, Desolation and Gray canyons on the Green River in Utah, Cataract Canyon on the Colorado River in Utah and the Colorado River in Arizona The largest known population is in the Little Colorado River in the Grand Canyon, where there may be up to 10,000 fish. There are no population estimates available for the rest of the upper Colorado River basin (CDOW, 2008).

Kleinfelder did not identify the presence of the humpback chub on the Site during the field activities, as there are no perennial streams on the Site.

Bonytail Chub (*Gila elegans*)

The bonytail chub was added to the US list of endangered species on April 23, 1980 (59 Fed. Reg. 13375-13400). The bonytail chub can grow to over 2 feet long. Like many other desert fishes, its coloring tends to be darker above and lighter below, serving as a camouflage. Breeding males have red fin bases. They have a streamlined body and a terminal mouth. The bonytail chub was once found in many states, including Arizona, California, Colorado, New Mexico, Utah, and Wyoming. This fish species experienced the most abrupt decline of any of the long-lived fishes native to the main-stems of the Colorado River system and, because no young individuals have been found in recent years, has been called functionally extinct. Bonytail chubs were one of the first fish species to reflect the changes that occurred in the Colorado River basin after the construction of Hoover Dam; the fish was extirpated from the lower basin between 1926 and 1950. They may still be found in the Green River of Utah and perhaps in the

larger Colorado River water bodies (CDOW, 2008). The species has been re-introduced to parts of its native range from captive stocks.

Kleinfelder did not identify the presence of the bonytail chub on the Site during the field activities, as there are no perennial streams on the Site.

Colorado Pikeminnow (*Ptychocheilus lucius*)

The Colorado pikeminnow chub was added to the US list of endangered species on March 11, 1967 (32 Fed. Reg. 4001). The Colorado pikeminnow (formerly Colorado squawfish) is a torpedo-shaped fish with an olive-green and gold back, silver sides and white belly. These fish spawn between late June and early September and when they are 5-6 years old and at least 16 inches long. Similar to salmon, Colorado pikeminnow can migrate more than 200 miles to spawn (CSU, 2008). Colorado pikeminnow grow up to five feet in length and can be found in the Colorado River basin as well as in southern Nevada. They have compressed bodies and their heads comprise nearly one quarter of their length. Their coloring ranges from a bluish-gray above to a silvery gold below. Squawfish are the largest fish in the minnow family. One of several endangered native species of fish, the Colorado pikeminnow is part of the Recovery Program agreement that was signed in 1988 (USFWS, 2008). The squawfish has become endangered for several reasons including the loss of habitat due to reservoirs, blockage of migration routes, the introduction of non-native fish, and changes in water temperature and stream flow (CDOW, 2008).

Kleinfelder did not identify the presence of the Colorado pikeminnow on the Site during the field activities, as there are no perennial streams on the Site.

Razorback sucker (*Xyrauchen texanus*)

The razorback sucker was placed on the U.S. federal list as endangered on October 23, 1991 (See, 56(205): 54957-54967). One of the largest suckers in North America, the razorback sucker can grow to up to 13 pounds and lengths exceeding 3 feet. The razorback is brownish-green with a yellow to white-colored belly and has an abrupt, bony hump on its back shaped like an upside-down boat keel (USFWS. 2008). The razorback sucker was once widespread throughout most of the Colorado River Basin from Wyoming to Mexico. In the upper Colorado River Basin, they are now found only in the upper Green River in Utah, the lower Yampa River in Colorado and occasionally in the Colorado River near Grand Junction. Small numbers of razorback suckers also have been found in Lake Powell at the mouths of the Dirty Devil, San Juan, and Colorado rivers. In the lower Colorado River Basin, razorback suckers have been found primarily in Lake Mohave, with smaller numbers in the Colorado River below Hoover Dam (CDOW, 2008).

Kleinfelder did not identify the presence of the razorback sucker on the Site during the field activities, as there are no perennial streams on the Site.

Greenback Cutthroat Trout (*Oncorhynchus clarki stomias*)

Greenback cutthroat trout were listed as threatened on April 18, 1978 (43 Fed. Reg. 16343-16345). Greenback cutthroat trout are coldwater fish belonging to the trout, salmon, and whitefish family. They have dark, round spots on the sides and tail and two colorful blood-red stripes on each side of the throat under the jaw, hence the name "cutthroat." During the spring

Copyright 2009, Kleinfelder

spawning season the entire belly may become crimson red. The greenback was named Colorado's state fish in 1994 (CDOW, 2008).

Greenbacks originally lived in the mountain and foothill areas of the Arkansas and South Platte River systems in Colorado and part of Wyoming. Today, they exist in only about five percent of their original range (CDOW, 2008).

Kleinfelder did not identify the presence of the greenback cutthroat trout on the Site during the field activities, as there are no perennial streams on the Site.

Arkansas Darter (*Etheostoma cragini*)

The Arkansas darter, a candidate species, is a small perch. Arkansas darters live in shallow, clear, usually spring-fed streams with sandy bottoms. They prefer slow currents of cool water, partially overgrown with rooted aquatic vegetation, such as watercress. Localized populations occur in the Arkansas drainage in eastern Colorado, southern Kansas, northeastern and north-central Oklahoma, southwestern Missouri and northwestern Arkansas.

The species is uncommon across its range. Distribution of the Arkansas darter is shrinking in the western and central parts of the range. It is susceptible to habitat loss resulting from irrigation diversions and through lowering of the water table caused by ground water pumping associated with irrigation and other water uses. The Site does not support adequate habitat for this species.

Kleinfelder did not identify the presence of the Arkansas darter on the Site during the field activities, as there are no perennial streams on the Site.

Uncompahgre Fritillary Butterfly (*Boloria improba acrocnema*)

The Uncompahgre fritillary is a small butterfly with a wingspan of 1 1/8 to 1 3/8 inches (3 - 3.5 cm). This species is believed to be broadly distributed near glacial margins during the Wisconsin glaciation, the Uncompahgre fritillary is now confined to small patches of habitat above 13,000 ft in the San Juan Mountains of southwestern Colorado where glacier-like environments have persisted from the Holocene to the present.

Suitable habitat for the Uncompahgre fritillary butterfly was not observed on the Site.

Pawnee Montane Skipper (*Hesperia leonardous montana*)

The Pawnee montane skipper is a member of the Hesperiidae family. The upper side of the wing is brownish red with distinct yellowish spots near the outer margins. Underside is brown with cream spots.

Pawnee montane skippers inhabit dry, open Ponderosa pine woodlands with sparse understory at 6,000 to 7,500 feet. Blue gramma grass (*Bouteloua gracilis*), the larval food plant and prairie gay feather, the primary nectar plant, are two necessary components of the ground cover. The Pawnee montane skipper occurs only on the Pikes Peak Granite Formation in the South Platte River drainage system in Colorado involving portions of Jefferson, Douglas, Teller, and Park counties. The total known habitat within the range is estimated to be 37.9 square miles.

No suitable occurs on the Site for the Pawnee montane skipper.

Coral Pink Sand Dunes Tiger Beetle (*Cicindela albissima*)

The Coral Pink Sand Dunes tiger beetle, a candidate species, is a subspecies of the tiger beetle *Cicindela limbata*. It has striking coloration; the large wing cases (known as elytra) are predominantly white and much of the body and legs are covered in white hairs. This beetle is only found within the dune system from where it gets its common name, the Coral Pink Sand Dunes, in southern Utah in the United States. The subspecies is endemic to the region and has a highly restricted range in southern Utah. Adults range from the troughs between sand dunes to the upper slopes of the dunes, whilst larvae are found only in the damper, and more protected furrows between the dunes.

Due to the known range of this species, it is not expected to be found on the Site.

Gray Wolf (*Canis lupus*)

The gray wolf ranges across Eurasia and in North America from the Arctic to Mexico and from coast to coast. Once distributed statewide, the wolf is gone from Colorado. The last ones were killed by about 1940 (CDOW, 2008). Sometimes called "timber wolf," to distinguish it from coyotes, or "prairie wolf," wolves actually occupy a wide range of habitats (CDOW, 2008).

Gray wolves have been eradicated from Colorado since the mid-1930s (CDOW, 2008). Over the past decade, the USFWS has reintroduced gray wolves into Wyoming, Idaho, Montana, New Mexico, and Arizona, and some observers believe it is only a matter of time before wolves start migrating into Colorado from the north and south (CDOW, 2008). In June 2004, a female gray wolf was hit and killed on Interstate 70 near Idaho Springs, Colorado. A radio collar showed that the wolf had migrated from Yellowstone National Park. There have been no confirmed sitings of gray wolves in Colorado in recent years.

Kleinfelder did not identify the presence of the gray wolves during the field activities.

Black-footed Ferret (*Mustela nigripes*)

The black-footed ferret was federally listed on March 11, 1967 (32 Fed. Reg. 4001,). The black-footed ferret is 18 to 24 inches long, including a 5 to 6 inch tail. It weighs only one-and-a-half to two-and-a-half pounds, with males slightly larger than females. The black-footed ferret is well adapted to its prairie environment. Its color and markings blend so well with grassland soils and plants that it is hard to detect until it moves. It is a slender, wiry animal with a black face mask, black feet, and a black-tipped tail. The rest of its short, sleek fur is a yellow-buff color, lighter on the belly and nearly white on the forehead, muzzle, and throat. It has short legs with large front paws and claws developed for digging. The ferret's large ears and eyes suggest it has acute hearing and sight, but smell is probably its most important sense for hunting prey underground in the dark (USFWS, 2008).

Black-footed ferrets rely on prairie dogs for food and shelter. Prairie dogs make up 90% of their diet. Ferrets hunt mostly at night, so they are rarely seen. They live in burrows made by prairie dogs. Ferrets require about 100 acres of prairie dog colony to support one ferret family (a female and her young). Predators such as owls, eagles, hawks, coyotes, badgers, foxes, and bobcats are the main cause of death for wild ferrets (CDOW, 2008).

Copyright 2009, Kleinfelder

Kleinfelder did not identify the presence of the black-footed ferrets on the Site during the field activities. Due to lack of habitat and prairie dogs as a prey species onsite, the black-footed ferret is not anticipated to occur on the Site.

Canada lynx (*Lynx canadensis*)

On March 24, 2000, the contiguous U.S. population of the Canada lynx was listed as threatened under the Endangered Species Act (See, 65 Fed. Reg. 16052-16086). The Canada lynx is a large, bob-tailed cat, three feet long with a black-tipped tail only about one-eighth the total length, and only about half the length of its huge hind foot. Weights are 20-30 pounds. The coat is grayish, with obscure spots. The magnificent ear tufts may be nearly as long as the actual ears (CDOW, 2008).

The lynx lives in North America and Eurasia. Lynx may have disappeared from Colorado by about 1973 (CDOW, 2008). Sightings prior to that time were few, scattered throughout mountainous areas of the state. In 1999, an ambitious program of lynx restoration began in the remote San Juan Mountains, and by 2005 more than 200 animals had been released, a number of litters of kittens had been born, and lynx were expanding throughout the high country and occasionally beyond.

Throughout the year, Engelmann spruce/subalpine fir was the dominant cover used by lynx. A mix of Engelmann spruce, subalpine fir and aspen (*Populus tremuloides*) was the second most common cover type used throughout the year. Various riparian and riparian-mix areas were the third most common cover type where lynx were found during the daytime flights (Shenk, 2008).

Kleinfelder did not identify the presence of the Canada lynx on the Site during the field activities. Canada lynx has been reintroduced in the San Juan Mountain Range to the southeast of the Site. The piñon-juniper habitat combined with the semi arid big sage habitat is atypical of Canada lynx.

Preble's meadow jumping mouse (*Zapus hudsonius preblei*)

The Preble's meadow jumping mouse is a relatively small rodent with an extremely long tail, large hind feet and long hind legs. It inhabits the foothills in southeastern Wyoming, southward along the eastern edge of the front range of Colorado to Colorado Springs. It has a distinct dark, broad stripe on its back that runs from head to tail and is bordered on either side by gray to orange-brown fur. The hair on the back of all jumping mice appears coarse compared to other mice. The underside is white and much finer in texture. Total length of an adult Preble's mouse is approximately 8-10 inches with over 60 percent of its length in its tail (USFWS, 2008). On May 13, 1998, the contiguous U. S. population of the Preble's meadow jumping mouse (PMJM) was listed as threatened under the Endangered Species Act (63 Fed. Reg. 26517-26530).

Typical habitat for the PMJM is comprised of well-developed plains riparian habitat with a dense understory of shrubs. Such areas include daybed and feeding habitat consisting of dense riparian shrubs adjacent to grassland communities (Choate et al., 1991). The riparian habitat must be adjacent to relatively undisturbed upland areas, which can be variable, ranging from grassland communities to ponderosa pine (*Pinus ponderosa*) woodlands (Corn et al., 1995). Understory shrubs that PMJM prefers include, but are not limited to, willow (*Salix* sp.), gray alder (*Alnus incana*), Gamble's oak (*Quercus gambelii*), three-leafed sumac (*Rhus trilobata*), dogwood (*Cornus cericea*), hawthorn (*Crataegus* spp.), river birch (*Betula fontinalis*), and

Copyright 2009, Kleinfelder

chokecherry (*Prunus virginiana*). It is thought the abundance of PMJM is not driven by the diversity of the plant species, but by the density of the riparian vegetation (Bakeman, 1997).

Meadow jumping mice are among the smallest mammals that hibernate. The PMJM usually begins hibernating in mid-September to mid-October and does not emerge until mid-May, after a potential hibernation period of 210 days (Meaney et al., 2003). The PMJM cannot travel long distances since it is only active for 155 days, and it is dependent on a highly diverse plant community for feeding purposes.

Kleinfelder did not identify the presence of the PMJM on the Site during the field activities. PMJM habitat is specific to the front range of Colorado and Wyoming.

Gunnison's prairie dog (*Cynomys gunnisoni*)

The Gunnison's prairie dog was listed as a candidate species in February of 2008. The Gunnison's prairie dog is one of the three species of prairie dogs that occurs in Colorado (Hoogland, 1995). The Gunnison's prairie dog occurs in the Four Corners area of Arizona, New Mexico, Colorado, and Utah and is considered a keystone species of the sagebrush habitat. Knowles (2002) mapped the Paradox valley as suitable habitat for the Gunnison's prairie dog.

The Gunnison's prairie dog habitat is located in montane habitats of Colorado, which includes the Gunnison, South Park, San Luis Valley, and Southeast population areas. The La Plata/Archuleta and Southwest population areas are considered prairie habitat. Montane habitat comprises 80 percent of all available habitats in the state and prairie habitat comprises 20 percent. Gunnison's prairie dog populations have declined across their Colorado range, in part due to historic and current poisoning and shooting, sylvatic plague (*Yersinia pestis*), and habitat destruction (Miller *et al.*, 1994).

The Site is located within suitable habitat for the Gunnison's prairie dogs and is mapped as suitable habitat by (Knowles, 2002). Kleinfelder did not observe the presence of the Gunnison's prairie dog on the Site or burrows that showed activity or historic use by this species.

4.6 State Species of Concern

The State of Colorado has also identified species of wildlife that are of concern. Table 3 lists Colorado Species of Concern likely to occur on the Site.

Copyright 2009, Kleinfelder

Table 3. Colorado Species of Concern Likely to Occur on Site

SPECIES LISTED IN MONTROSE COUNTY, COLORADO			
Status*	**Common Name**	**Scientific Name**	**Occurrence**
		Birds	
ST	Western burrowing owl	*Athene cunicularia*	Likely to occur, not observed on the Site
ST	Bald eagle	*Haliaeetus leucocephalus*	Likely to occur, not observed on the Site
SC	Ferruginous hawk	*Buteo regalis*	Likely to occur, not observed on the Site
SC	Gunnison sage-grouse	*Centrocercus minimus*	Likely to occur, not observed on the Site
SC	Western snowy plover	*Charadrius alexandrinus*	Likely to occur, not observed on the Site
SC	American peregrine falcon	*Falco perigrinus anatum*	Likely to occur, not observed on the Site
		Mammals	
SC	Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	Likely to occur, not observed on the Site
SC	Botta's pocket gopher	*Thomomys bottae rubidus*	Likely to occur, not observed on the Site
SC	Northern pocket gopher	*Thomomys talpoides macrotis*	Likely to occur, not observed on the Site
		Reptiles	
SC	Midget faded rattlesnake	*Crotalus virdis concolor*	Likely to occur, not observed on the Site
SC	Longnose leopard lizard	*Gambelia wislizenii*	Likely to occur, not observed on the Site

*Status Codes:
ST = State Threatened
SC = State Special Concern (not a statuary category)
SE = State Endangered

Western Burrowing Owl (*Athene cunicularia*)

The western burrowing owl is one of the smallest species of owls. Unlike many forest-dwelling owls, burrowing owls are found in open, dry grasslands and inhabit the abandoned underground burrows of other animals, such as the ground squirrels rabbits or prairie dogs. They can dig their own burrows, but usually prefer the deserted excavations of other animals. The owls commonly perch on fence posts or on top of mounds outside their burrows.

There is suitable habitat on the western side of the Site, but no western burrowing owls were observed on the Site. Western burrowing owls were observed on the property adjacent to the west side of the Site.

Bald Eagle (*Haliaeetus leucocephalus*)

Bald eagles live near large bodies of open water such as lakes, marshes, seacoasts and rivers, where there are plenty of fish to eat and tall trees for nesting and roosting. Bald eagles have a presence in every U. S. state except Hawaii. Bald eagles use a specific territory for nesting, winter feeding or a year-round residence. Its natural domain is from Alaska to Baja, California, and from Maine to Florida. Bald eagles that reside in the northern U. S. and Canada migrate to the warmer southern climates of the U. S. during the winter months to obtain easier access to food, especially fish. Some bald eagles that reside in the southern U. S. migrate slightly north during the hot summer months.

Copyright 2009, Kleinfelder

A bald eagle was observed passing through the Site during the winter survey along Highway 90, but no suitable habitat for foraging or nesting was observed.

Ferruginous Hawk (*Buteo regalis*)

The ferruginous hawk is the largest buteo in North America. Ferruginous hawks are birds of open country and occur in semiarid grasslands with scattered trees, rocky mounds or outcrops, and shallow canyons that overlook open valleys. They may occur along streams or in agricultural areas during migration.

No ferruginous hawks were observed on the Site, although suitable foraging habitat was present.

Gunnison Sage Grouse (*Centrocercus minimus*)

The Gunnison sage grouse is a newly-classified, unique species of sage grouse found south of the Colorado River. Historically, the Gunnison sage grouse were found throughout the southwestern portion of Colorado and southeastern Utah. Approximately 3,500 breeding Gunnison sage-grouse occur among seven separate populations throughout southwestern Colorado and southeastern Utah. The largest population, about 2,500 birds, inhabits the Gunnison Basin. The separate populations in Colorado are: Pinion Mesa, Crawford, San Miguel Basin, Gunnison Basin, Dove Creek and Poncha Pass. The Utah population is near Monticello. The Gunnison sage grouse requires a variety of habitats such as large expanses of sage with a diversity of grasses and forbs and healthy riparian ecosystems.

According to the CDOW (2008), the Site is within potentially suitable habitat for the Gunnison sage grouse. No Gunnison sage grouse or leks (breeding grounds) were observed on the Site.

Western Snowy Plover (*Charadrius alexandrinus nivosus*)

The western snowy plover is a small, threatened shorebird, approximately the size of a sparrow. During the breeding season (March through September), plovers can be seen nesting along the shores, peninsulas, offshore islands, bays, estuaries, and rivers of the United States' Pacific Coast.

No suitable habitat was observed on the Site.

American Peregrine Falcon (*Falco perigrinus anatum*)

The peregrine falcon is a medium to large bird of prey, or raptor. The falcon’s breeding range in North America extends from Alaska east to Baffin Island, southern Greenland, and northern Newfoundland and south along mountain ranges and urban areas to South America. The peregrine falcon winters from southern Canada to South America. These falcons naturally nest on cliffs; however, other nest sites may include old raptor or raven nests.

Suitable habitat for nesting was observed on the southern portion of the Site, but no peregrine falcons were observed.

Copyright 2009, Kleinfelder

Townsend's Big-Eared Bat (*Corynorhinus townsendii pallescens*)

The Townsend's big-eared bat can be distinguished from all other vespertilionids by the presence of prominent, bilateral nose lumps and large "rabbit-like" ears. Distribution is strongly correlated with the availability of caves and cave-like roosting habitat, including abandoned mines. Population centers occur in areas dominated by exposed, cavity or caverniculous forming rock and/or historic mining districts. Its habit of roosting pendant-like on open surfaces makes it readily detectable, and it can be the species most readily observed, when present (commonly in low numbers) in caves and abandoned mines throughout its range.

Although there is suitable habitat in abandoned mines in the vicinity of the Site to the southwest, Townsend's big-eared bats were not observed on the Site.

Botta's Pocket Gopher (*Thomomys bottae rubidus*)

The Botta's pocket gopher is a medium-sized rodent. The Botta's pocket gopher occurs in southern Colorado, where several local species have evolved. This species can be found in a variety of vegetation types, including agricultural, grassland, along roadsides, parks, piñon-juniper woodlands, open montane forest, montane shrublands, and semidesert shrublands.

There is suitable habitat on the Site, but no Botta's pocket gophers were observed.

Northern Pocket Gopher (*Thomomys talpoides macrotis*)

The color of this small gopher varies geographically from dark brown to grayish yellow. This gopher is found in many different habitat types including agricultural and pasture lands, semi-desert shrublands, and grasslands at lower elevations upwards into alpine tundra.

Although there is suitable habitat on the Site, no northern pocket gophers were observed.

Midget Faded Rattlesnake (*Crotalus virdis concolor*)

The midget faded rattlesnake is a subspecies of the western rattlesnake that is found in western Colorado, eastern Utah, and southern Wyoming. Midget faded rattlesnakes are primarily found on the ground, but will occasionally climb into trees and shrubs. When inactive during cold weather, individuals occupy mammal burrows, crevices, or caves, where they sometimes congregate in large numbers. This rattlesnake is typically tan, cream, or yellowish in color, with faint oval blotches on the back. The midget faded rattlesnake is usually less than 24 inches in length.

Although there is suitable habitat on the Site, no midget faded rattlesnakes were observed.

Longnose Leopard Lizard (*Gambelia wislizeni*)

Longnose leopard lizards have large muscular heads and bodies. They have granular scales with a light cream or tan ground color dorsally, and this is marked by a pattern of brown or black spots. The dark spots form two rows, which become more apparent on the long rounded tail. The tail can be more than twice the lizard's body length. The coloration of longnose leopard

Copyright 2009, Kleinfelder

lizards can vary dramatically depending on the time of day (or their temperature). When cool, they appear very dark, and the dark spots are less prominent while light transverse lines become much more apparent. The ventral surface has a light coloration of white or cream that contrasts with the dark lines on the throat. The inside lining of the mouth and throat are black and when threatened, these lizards will readily reveal this by gaping their mouth and attempting to bite. Longnose leopard lizards inhabit arid regions of the Northwest. The soil is generally sandy, but may be other types (e.g. gravel or loess) as long as numerous rodent burrows are available. These lizards utilize burrows frequently and if the soil is suitable, they are capable of digging their own burrows. The surrounding vegetation is usually sparse and consists of desert shrubs and patchy clumps of grass. These lizards run after their prey and consequently thick vegetation is an impediment.

Although there is suitable habitat on the Site, no longnose leopard lizards were observed.

5.0 CONCLUSIONS

A four-season survey for wildlife and other natural resources began in the summer of 2007 and was completed in the spring of 2008 for the Site. In addition, a literature and database review was conducted to identify species common to the natural habitats occurring on the Site. No federally threatened, endangered or candidate species were observed during the surveys. In addition, no State species of concern were observed on the Site. A bald eagle was observed flying along the portion of Highway 90 that bisects the northern portion of the Site.

Four habitats of interest to the CDOW were located and identified on the Site that are of importance to the area's wildlife resources:

- Severe winter range for mule deer and elk as identified by the CDOW;
    - The CDOW (2008) identified the Site as an area of severe winter range for mule deer and elk. Severe winter range is an area where mule deer and elk migrate to during severe winter conditions when snow depths at higher elevations are deeper than winter averages and force these wildlife species to lower elevations. The severe winter range is essential to the survival of the mule deer and elk. The severe winter range typically contains piñon-juniper, sagebrush, and grassland habitats. Wildlife typically concentrate in these areas until snow depths decrease in the higher elevations. Both deer and elk were observed on the Site during the Winter 2007/08 and Spring 2008 survey seasons, but not in high concentrations or during the point count surveys.
- Potentially suitable Gunnison sage grouse habitat as identified by the CDOW;
    - The CDOW (2008) has identified potentially suitable habitat for the Gunnison's sage-grouse in Colorado. The CDOW (2008) indicated that the Site is located within potentially suitable habitat of the Gunnison's sage grouse. A viable population of Gunnison's sage-grouse is located to the south and west of the Site on Monogram Mesa. Typical habitats preferred by this species are large expanses of sagebrush within grassland interfaces. The Site exhibits both of these characteristics. However, no Gunnison's sage grouse were observed on Site.

Copyright 2009, Kleinfelder

- Potentially suitable habitat for the WBO.
    - Western burrowing owls were observed adjacent to the Site. However, no WBO were observed on the Site. WBO prefer to utilize existing burrows dug by other small wildlife such as ground squirrel, rabbits and prairie dogs for nesting and fledging. WBO prefer grassland habitat. Both grassland habitat and existing small wildlife burrows were observed on the Site, but no WBO were observed.
- Potentially suitable habitat for the Gunnison's prairie dog;
    - The FWS listed the Gunnison's prairie dog as a candidate species in February 2008. Knowles (2002) identified the range of the Gunnison's prairie dog to include the Paradox valley. The Site is centrally located in the Paradox valley and contains potential habitat for the Gunnison's prairie dog. However, the Gunnison's prairie dog was not observed on the Site. No prairie dog burrows, either active or abandoned, were observed on the Site.

5.1.1 Mammals Observed

Mammals observed during the four season surveys include coyotes, black-tailed jackrabbit, eastern cottontail, elk, mule deer, and domestic cattle. The above listed mammals are typical for the habitat and ecosystems found on the Site.

5.1.2 Birds Observed

Birds observed during the four-season point count survey include lark sparrows, dusky flycatchers, cliff swallow, western meadowlarks, mourning dove, western scrub-jay, ruby-throated hummingbird, loggerhead shrike, dark-eyed junco, European starling and American crow. The above listed birds are typical for the habitat and ecosystem found on the Site.

The above listed birds are seasonal visitors or resident birds of the Site. No species of concern was observed on the Site. However, the bald eagle and the WBO were both observed near the Site, but not during the point count bird survey. Therefore, the bald eagle and the WBO are not included in the survey but they are mentioned as observations.

Overall, the data collected during the four seasons of point count surveys revealed that the Simpson's Diversity Reciprocal Index is low in relation to diversity.

5.1.3 Reptiles

Reptiles observed during the four season surveys included Eastern fence lizard, five-lined skink, and greater short horned lizard. The above listed reptiles are typical for the habitat and ecosystem found on the Site.

5.1.4 Insects and Spiders

Insects and spider observed during the four season surveys included red harvester ant, praying mantis, and Argiope spider. The above listed insects and spider are typical for the habitat and ecosystem on the Site.

Copyright 2009, Kleinfelder

5.2 Species of Federal and State Concern

No federal threatened, endangered or candidate species (see Table 1) were observed on the Site. No Colorado Species of Concern (see Table 3) were observed on the Site. The literature and database review and the four season surveys support this finding.

6.0 LIMITATIONS

Kleinfelder prepared this report in accordance with generally accepted standards of care that exist in Montrose County, Colorado at this time. This report may be used only by Energy Fuels Resources Corporation and only for the purposes stated. All information gathered by Kleinfelder is considered confidential and will be released only upon written authorization by Energy Fuels Resources Corporation or as required by law. Non-compliance with these requirements by Energy Fuels Resources Corporation or anyone else, unless specifically agreed to in advance by Kleinfelder in writing, will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party and Energy Fuels Resources Corporation agrees to defend, indemnify, and hold harmless Kleinfelder from any claim or liability associated with such unauthorized use or non-compliance.

7.0 REFERENCES

Bakeman, M. E., ed. 1997, Report on habitat findings of the Preble's meadow jumping mouse. Report to the U. S. Fish and Wildlife Service and the Colorado Division of Wildlife, 91pp.

Bibby, C. J. et al., Bird Census Techniques. Elsevier Science and Technology, Amsterdam: 1992.

Chapman, S.S., Griffith, G.E., Omernik, J.M., Price, A.B., Freeouf, J., and Schrupp, D.L., 2006, Ecoregions of Colorado (color poster with map, descriptive text, summary tables, and photographs), Reston, Virginia, U.S. Geological Survey (map scale 1:1,200,000).

Choate, J. R., D. W. Moore and J. K. Frey. 1991, Dispersal of the meadow jumping mouse in northern Kansas, Prairie Naturalist 23(3): 127-130.

Cleland, D.T., P.E. Avers, W.H. McNab, M.E. Jensen, R.G. Bailey, T. King, and W.W. Russell. 1997, National Hierarchical Framework of Ecological Units; In: M.S. Boyce and A. Haney (eds.), Ecosystem Management: Applications for Sustainable Forest and Wildlife Resources, New Haven, CT: Yale University Press. p. 181-200.

Clippinger, N.W, 2002, Biogeography, community ecology, and habitat of Preble's meadow jumping mouse (*Zapus hudsonius preblei*) in Colorado, Ph.D. Thesis, University of Colorado. 162 pp.

Colorado Division of Wildlife (CDOW), 2008, Letter correspondence, Mr. Renzo DelPiccolo (CDOW) to Mr. Steve White, Land Use Director, Montrose County, August 15, 2008.

Colorado Division of Wildlife (CDOW), 2008, Wildlife Profiles and Information, Accessed September 11, 2008, <http://wildlife.state.co.us/WildlifeSpecies/Profiles/>

Colorado Division of Wildlife (CDOW). August 15, 2008. Letter correspondence.

Colorado Division of Wildlife (CDOW), 2007, Recommended Survey Protocol and Actions to protect Nesting Burrowing Owls. 3/2007. Copies can be found at: <http://www.cde.state.co.us/artemis/nr1_2/nr12b942007internet.pdf >

Colorado State University (CSU), 2008, Colorado Water Knowledge: Excellence in Water Resources at Colorado State University, Accessed September 10, 2008, <http://waterknowledge.colostate.edu/default.htm>

Colorado Partners in Flight, 2008, Land Bird Conservation Plan-Physiographic Area 87, http://www.rmbo.org/pif/bcp/phy87/pj.htm>

Conway, C. J. and J. C. Simon, 2003, Comparison of detection probability associated with Burrowing Owl survey methods, Journal of Wildlife Management 67:501-511.

ECOMAP, 1993, National Hierarchical Framework of Ecological Units, Washington, DC: USDA Forest Service. 20 pp.

Hermann, R. K., 1982, The Genus Pseudotsuga Historical Records and Nomenclature, Corvallis, Oregon, Forest Research Laboratory.

Hoogland, J. L., 1995, The black-tailed prairie dog: Social life of a burrowing mammal. University of Chicago Press, Chicago, Illinois, 562 pp.

Kleinfelder, 2009, Vegetation Survey Report, Albuquerque, New Mexico. February 1, 2009.

Kleinfelder, 2007, Work Plan: Ecological Baseline Site Characterization, Albuquerque, New Mexico, August 15, 2007.

Knowles, Craig, 2002, Status of the White-tailed and Gunnison's Prairie Dog. Accessed January 30, 2009, <http://bsi.montana.edu.prairiemap/files/Gunnisonprairiedogreport.pdf> p.6.

Major, J., 1963, A climatic index to vascular plant activity, Ecology, 44: 485-497.

Meaney, C.A., A.K. Ruggles, B. Lubow, N. Clippinger, 2003, Abundance, survival, and hibernation in Preble's meadow jumping mice (*Zapus hudsonius preblei*) in Boulder County, Colorado, The Southwestern Naturalist, 48(4):610-623.

Meyer, J. J., 2008, Field Notebook, Kleinfelder West, Inc.

Miller, B., G. Ceballos, and R. Reading, 1994, The prairie dog and biotic diversity. Conservation Biology 8: 677–681.

Nevada Department of Wildlife (NDOW), 2008, Southwestern Willow Flycatcher and Yellow-Billed Cuckoo Survey Monitoring at Select Sites in Southern Nevada, 2007 Annual Report. Wildlife Diversity Division, 2007 Job Progress Report.

Offwell Woodland Wildlife Trust (OWWT), 2007, Simpson's Diversity Index, Accessed October

17, 2007. <http://www.countrysideinfo.co.uk/simpsons.htm>

Platte River Endangered Species Partnership (PRESP), “The Interior Least Tern (*Sterna antillarum athalassos*)” Accessed September 9, 2008, <http://www.platteriver.org/backgr/tern.htm>

Robbie, W., 1993, USFWS, Ecological Subregions of the United States, Southwest Region, Accessed July 27, 2008, <http://www.fs.fed.us/land/pubs/ecoregions/ch36.html>

Shenk, T., 2008, Lynx Update August 27, 2008, Released by the Colorado Division of Wildlife. Accessed on September 9, 2008, http://wildlife.state.co.us/WildlifeSpecies/SpeciesOfConcern/Mammals/Lynx/LynxOverview.htm.

Tuhy, J.S., P. Comer, D. Dorfman, M. Lammert, J. Humke, B. Cholvin, G. Bell, B.Neely, S. Silbert, L. Whitham, and B. Baker, 2002, A Conservation Assessment of the Colorado Plateau Ecoregion, The Nature Conservancy, Moab, Utah, 110 p. + appendices.

United States Fish and Wildlife Services (USFWS), 2008, Mountain-Prairie Region, Colorado, Species list by county, Accessed September 11, 2008, <http://www.fws.gov/mountain-prairie/endspp/countylists/colorado.pdf>

United States Geological Service (USGS), 2009, Migratory birds, Accessed January 30, 2009, <http://www.npwrc.usgs.gov/resource/birds/migratio/intro.htm>.

United States Nuclear Regulatory Commission (NRC), 2003, Environmental Review Guidance for Licensing Actions Associated with NMSS Programs, Final Report. Office of Nuclear Material Safety and Safeguards. Washington, D.C.

United States Nuclear Regulatory Commission (NRC), 1982, Regulatory Guide 3.2: Preparation of Environmental Reports for Uranium Mills. Revision 2. Office of Nuclear Regulatory Research. Washington, D.C.

Vale, T. R., 1975, Presettlement vegetation in the sagebrush-grass area of the Intermountain West. Journal of Range Management 28:32-36.

West, N. E., 1983, Great Basin - Colorado plateau sagebrush semi-desert. Pages 331-349 in N. E. West (ed.). Ecosystems of the World 5: Temperate Deserts and Semi-deserts, Sussex, UK, Elsevier Scientific Publ., Ltd.

Copyright 2009, Kleinfelder

APPENDIX A

POINT COUNT SURVEY RESULTS

Appendix A. Point Count Survey Results

		Common Name	lark sparrow	western scrub-jay	ruby-throated hummingbird	loggerhead shrike	American crow	European starling	dusky flycatcher	dark-eyed junco	cliff swallow	western meadowlark	mourning dove	Simpsons Index			Simpsons Index of Diversity	Simpsons Reciprocol
		Scientific Name	Chondestes grammacus	Aphelocoma californica	Archilochus colubris	Lanius ludvocianus	Corvus brachyrhynchos	Sturnus vulgaris	Empidonax oberholseri	Junco hyemalis	Petrochelidon pyrrhonota	Sturnella neglecta	Zenaida macroura					
SUMMER		Code	LASP	WSJA	RTHU	LHSH	AMCR	EUST	DUFL	DEJU	CLSW	WMLA	MODO	$D = \Sigma(n/N)^2$	Sample Point	Habitat	= 1–D	= 1/D
Sample Point	Date	Total Observed	n	n	n	n	n	n	n	n	n	n	n					
T1-3	8/24/2007	22	18								3		1	0.69	T1-3	PJ	0.31	1.45
T1-5	8/23/2007	0												NA	T1-5	Grassland	NA	NA
T1-7	8/23/2007	7	5								2			0.59	T1-7	Grassland	0.41	1.69
T1-9	8/23/2007	0												NA	T1-9	Grassland	NA	NA
T3-1	8/24/2007	2		2										1.00	T3-1	PJ	0.00	1.00
T3-3	8/24/2007	10	4			1					3	1	1	0.28	T3-3	Grassland	0.72	**3.57**
T3-5	8/23/2007	3	3											1.00	T3-5	Grassland	0.00	1.00
T3-7	8/23/2007	4	4											1.00	T3-7	Big Sage	0.00	1.00
T3-9	8/23/2007	0												NA	T3-9	Big Sage	NA	NA
T5-3	8/24/2007	0												NA	T5-3	Grassland	NA	NA
T5-5	8/23/2007	1							1					1.00	T5-5	Big Sage	0.00	1.00
T5-7	8/23/2007	0												NA	T5-7	Big Sage	NA	NA
T5-9	8/23/2007	1	1											1.00	T5-9	Big Sage	0.00	1.00
T7-3	8/24/2007	1										1		1.00	T7-3	Grassland	0.00	1.00
T7-5	8/23/2007	3	1									2		0.56	T7-5	Grassland	NA	1.80
T7-7	8/23/2007	2	1		1									0.50	T7-7	Big Sage	0.50	2.00
T7-9	8/23/2007	1	1											1.00	T7-9	Big Sage	0.00	1.00
Total		57	38	2	1	1	0	0	1	0	8	4	2	0.47			0.53	**2.12**

		Common Name	lark sparrow	western scrub-jay	ruby-throated	loggerhead shrike	American crow	European	dusky flycatcher	dark-eyed	cliff swallow	western	mourning dove	Simpsons Index of Diversity			Simpsons Index of Diversity	Simpsons Reciprocal
		Scientific Name	Chondestes grammacus	Aphelocoma californica	Archilochus colubris	Lanius ludvocianus	Corvus brachyrhynchos	Sturnus vulgaris	Empidonax oberholseri	Junco hyemalis	Petrochelidon pyrrhonota	Sturnella neglecta	Zenaida macroura					
FALL		Code	LASP	WSJA	RTHU	LHSH	AMCR	EUST	DUFL	DEJU	CLSW	WMLA	MODO	$D = \Sigma(n/N)^2$	Sample Point	Habitat	= 1–D	= 1/D
Sample Point	Date	Total Observed	n	n	n	n	n	n	n	n	n	n	n					
T2-2	9/18/2007	6									6			1	T2-2	PJ/Big Sage	0.00	1.00
T2-4	9/18/2007	0												NA	T2-4	Grassland	NA	NA
T2-6	9/18/2007	0												NA	T2-6	Grassland	NA	NA
T2-8	9/18/2007	0												NA	T2-8	Big Sage	NA	NA
T4-2	9/18/2007	1	1											1	T4-2	Grassland	0.00	1.00
T4-4	9/18/2007	0												NA	T4-4	Grassland	NA	NA
T4-6	9/18/2007	1	1											1	T4-6	Big Sage (disturbe	0.00	1.00
T4-8	9/18/2007	1	1											1	T4-8	Big Sage	0.00	1.00
T4-10	9/18/2007	2	2											1	T4-10	Roadside Ditch	0.00	1.00
T6-2	9/18/2007	0												NA	T6-2	Grassland	NA	NA
T6-4	9/18/2007	0												NA	T6-4	Grassland	NA	NA
T6-6	9/18/2007	1									1			1	T6-6	Big Sage	0.00	1.00
T6-8	9/18/2007	1	1											1	T6-8	Big Sage	0.00	1.00
		13	6	0	0	0	0	0	0	0	7	0	0	0.50			0.50	**1.99**

		Common Name	lark sparrow	western scrub-jay	ruby-throated hummingbird	loggerhead shrike	American crow	European starling	dusky flycatcher	dark-eyed junco	cliff swallow	western meadowlark	mourning dove	Simpsons Index of Diversity			Simpsons Index of Diversity	Simpsons Reciprocal
		Scientific Name	Chondestes grammacus	Aphelocoma californica	Archilochus colubris	Lanius ludvocianus	Corvus brachyrhynchos	Sturnus vulgaris	Empidonax oberholseri	Junco hyemalis	Petrochelidon pyrrhonota	Sturnella neglecta	Zenaida macroura					
WINTER		Code	LASP	WSJA	RTHU	LHSH	AMCR	EUST	DUFL	DEJU	CLSW	WMLA	MODO	$D = \Sigma(n/N)^2$	Sample Point	Habitat	= 1–D	= 1/D
Sample Point	Date	Total Observed	n	n	n	n	n	n	n	n	n	n	n					
T1-3	1/16/2008	3								3				1	T1-3	PJ	0.00	1.00
T1-5	1/16/2008	0												NA	T1-5	Grassland	NA	NA
T1-7	1/16/2008	0												NA	T1-7	Grassland	NA	NA
T1-9	1/16/2008	0												NA	T1-9	Grassland	NA	NA
T3-1	1/16/2008	0												NA	T3-1	PJ	NA	NA
T3-3	1/16/2008	0												NA	T3-3	Grassland	NA	NA
T3-5	1/16/2008	0												NA	T3-5	Grassland	NA	NA
T3-7	1/16/2008	0												NA	T3-7	Big Sage	NA	NA
T3-9	1/16/2008	0												NA	T3-9	Big Sage	NA	NA
T5-3	1/16/2008	0												NA	T5-3	Grassland	NA	NA
T5-5	1/16/2008	0												NA	T5-5	Big Sage	NA	NA
T5-7	1/16/2008	0												NA	T5-7	Big Sage	NA	NA
T5-9	1/16/2008	0												NA	T5-9	Big Sage	NA	NA
T7-3	1/16/2008	0												NA	T7-3	Grassland	NA	NA
T7-5	1/16/2008	0												NA	T7-5	Grassland	NA	NA
T7-7	1/16/2008	0												NA	T7-7	Big Sage	NA	NA
T7-9	1/16/2008	0												NA	T7-9	Big Sage	NA	NA
Total		3	0	0	0	0	0	0	0	3	0	0	0	1			0.00	**1.00**

Appendix A. Point Count Survey Results

		Common Name	lark sparrow	western scrub-jay	ruby-throated hummingbird	loggerhead shrike	American crow	European starling	dusky flycatcher	dark-eyed junco	cliff swallow	western meadowlark	mourning dove	Simpsons Index of Diversity			Simpsons Index of Diversity	Simpsons Reciprocol
		Scientific Name	Chondestes grammacus	Aphelocoma californica	Archilochus colubris	Lanius ludvocianus	Corvus brachyrhynchos	Sturnus vulgaris	Empidonax oberholseri	Junco hyemalis	Petrochelidon pyrrhonota	Sturnella neglecta	Zenaida macroura					
SPRING		Code	LASP	WSJA	RTHU	LHSH	AMCR	EUST	DUFL	DEJU	CLSW	WMLA	MODO					
Sample Point	Date	Total Observed	**n**	**n**	**n**	**n**	**n**	**n**	**n**	**n**	**n**	**n**	**n**	**D = Σ(n/N)²**	Sample Point	Habitat	**= 1–D**	**= 1/D**
T1-3	5/19/2008	2	2											1.00	T1-3	PJ	0.00	1.00
T1-5	5/19/2008	2	1									1		0.50	T1-5	Grassland	0.50	2.00
T1-7	5/19/2008	1	1											1.00	T1-7	Grassland	0.00	1.00
T1-9	5/20/2008	2	2											1.00	T1-9	Grassland	0.00	1.00
T2-2	5/19/2008	3	1									1	1	0.33	T2-2	PJ/Big Sage	0.67	3.00
T2-4	5/19/2008	3										3		1.00	T2-4	Grassland	0.00	1.00
T2-6	5/19/2008	4	3				1							0.63	T2-6	Grassland	0.38	1.60
T2-8	5/20/2008	10	8									2		0.68	T2-8	Big Sage	0.32	1.47
T3-1	5/19/2008	6	1					1				2	2	0.28	T3-1	PJ	0.72	3.60
T3-3	5/19/2008	5	1				1					3		0.44	T3-3	Grassland	0.56	2.27
T3-5	5/19/2008	5	2									3		0.52	T3-5	Grassland	0.48	1.92
T3-7	5/19/2008	3	2									1		0.56	T3-7	Big Sage	0.44	1.80
T3-9	5/20/2008	2	2											1.00	T3-9	Big Sage	0.00	1.00
T4-2	5/19/2008	5	2				1					2		0.36	T4-2	Grassland	0.64	2.78
T4-4	5/19/2008	3										3		1.00	T4-4	Grassland	0.00	1.00
T4-6	5/19/2008	5	4									1		0.68	T4-6	Big Sage (disturbe	0.32	1.47
T4-8	5/20/2008	7	5									2		0.59	T4-8	Big Sage	0.41	1.69
T4-10	5/20/2008	3					3							1.00	T4-10	Roadside Ditch	0.00	1.00
T5-3	5/19/2008	6	3				1					1	1	0.33	T5-3	Grassland	0.67	3.00
T5-5	5/19/2008	7	4				1					2		0.43	T5-5	Big Sage	0.57	2.33
T5-7	5/19/2008	6	4				1					1		0.50	T5-7	Big Sage	0.50	2.00
T5-9	5/20/2008	5	3				2							0.52	T5-9	Big Sage	0.48	1.92
T6-2	5/19/2008	6	2				1					3		0.39	T6-2	Grassland	0.61	2.57
T6-4	5/19/2008	5	2				1					2		0.36	T6-4	Grassland	0.64	2.78
T6-6	5/19/2008	4	2				1					1		0.38	T6-6	Big Sage	0.63	2.67
T6-8	5/20/2008	5	4				1							0.68	T6-8	Big Sage	0.32	1.47
T7-3	5/19/2008	3					1					2		0.56	T7-3	Grassland	0.44	1.80
T7-5	5/19/2008	4					1					3		0.63	T7-5	Grassland	0.38	1.60
T7-7	5/19/2008	3	1				1					1		0.33	T7-7	Big Sage	0.67	3.00
T7-9	5/20/2008	9	3				4					2		0.36	T7-9	Big Sage	0.64	2.79
Total		123	55	0	0	0	22	1	0	0	0	41	4	0.34			0.66	**2.91**

		Common Name	lark sparrow	western scrub-jay	ruby-throated hummingbird	loggerhead shrike	American crow	European starling	dusky flycatcher	dark-eyed junco	cliff swallow	western meadowlark	mourning dove	Simpsons Index of Diversity			Simpsons Index of Diversity	Simpsons Reciprocol
		Scientific Name	Chondestes grammacus	Aphelocoma californica	Archilochus colubris	Lanius ludvocianus	Corvus brachyrhynchos	Sturnus vulgaris	Empidonax oberholseri	Junco hyemalis	Petrochelidon pyrrhonota	Sturnella neglecta	Zenaida macroura					
Full Year		Code	LASP	WSJA	RTHU	LHSH	AMCR	EUST	DUFL	DEJU	CLSW	WMLA	MODO					
		Total Observed	**n**	**n**	**n**	**n**	**n**	**n**	**n**	**n**	**n**	**n**	**n**	**D = Σ(n/N)²**	Sample Point	Habitat	**= 1–D**	**= 1/D**
		196	99	2	1	1	22	1	1	3	15	45	6	0.33			0.67	3.05

APPENDIX B

POINT COUNT BIRD CENSUS FORMS

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T1-3			

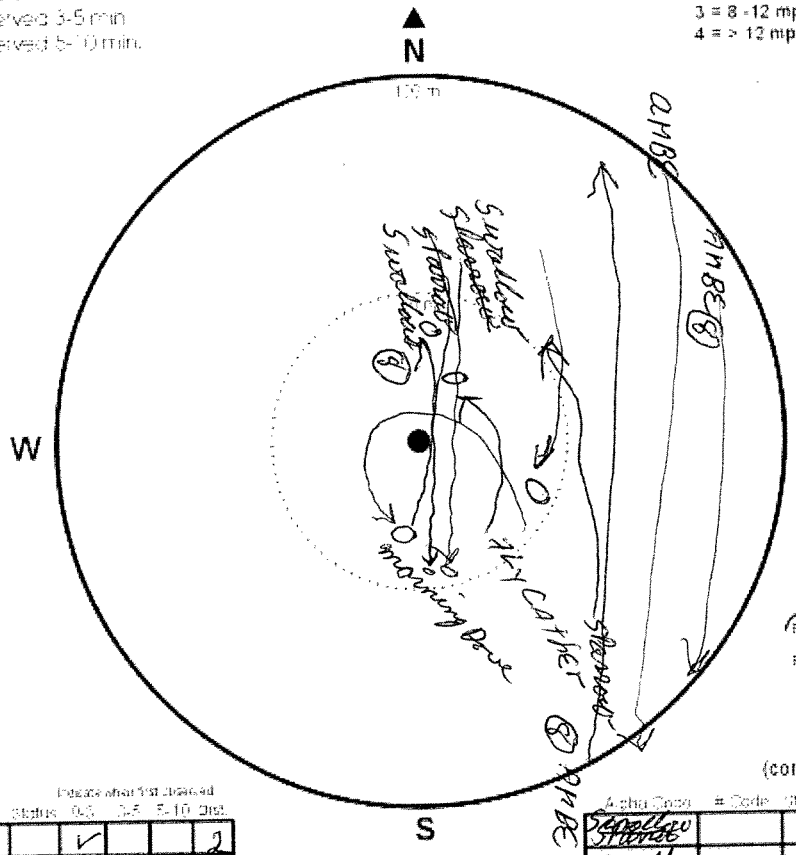
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
8	24	07	08:18		75°	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-2 min
BTBW ✓ = first observed 3-5 min
BTBW ✗ = first observed 5-10 min

Notes:



Status
ground = J
nest = N
flyover = X
observed = O

Alpha Code	# Code	Status	Distance when first observed 0-2	3-5	5-10	Dist.
AMBE			✓			2
AMBE				✓		1
AMBE					✓	2
"					✓	2
"					✓	2
"					✓	2
"					✓	2
"					✓	2
"					✓	2
"						2
Mourning Dove					✓	1
Swallow						

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status
singing male = S
singing female = M
female (juvenile) = F
pair together = P
calling (juv. see...) = C
changes in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-2	3-5	5-10	Dist.
Swallow					✓	1
Sparrow					✓	1
AMBE					✓	2
"					✓	2
"					✓	2
"					✓	2
"					✓	2
"					✓	2
"					✓	2
"					✓	2
"					✓	2
"					✓	2
"						

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T1-5			Grassland

Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
8	23	07	16:36	JM/SB	90°	2	0

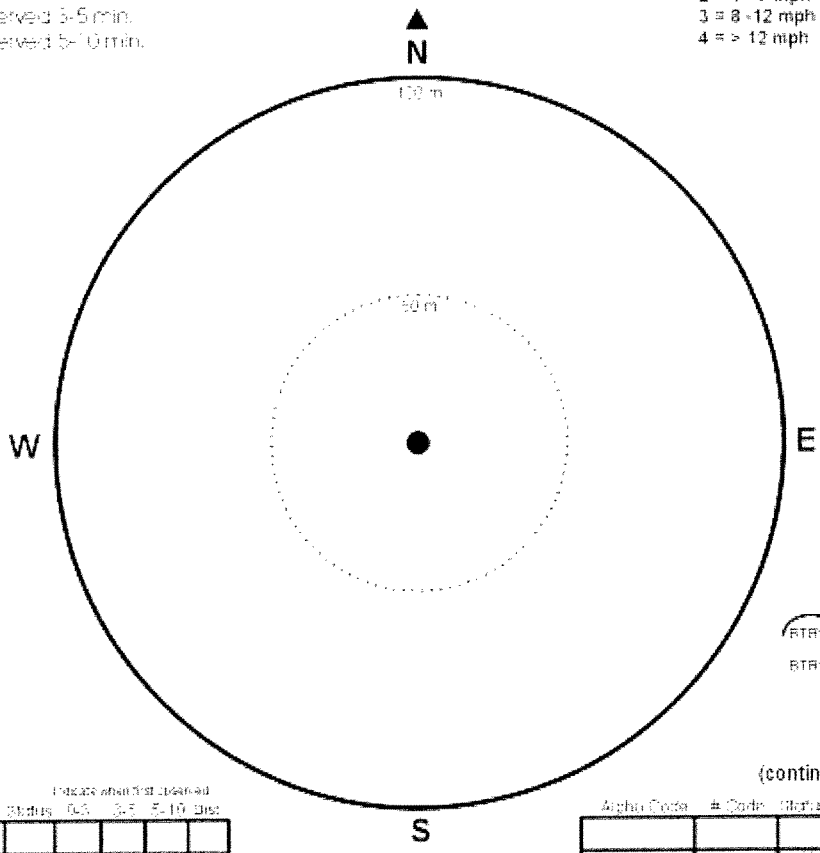
Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:

No Birds observed.



Status
juvenile = J
nest = N
flyover = X
observed = O

Alpha Code	# Code	Status	Dist. (Indicate when first observed) 0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status
singing male = S
mate (visible) = M
female (visible) = F
pair together = P
calling (if seen) = C
chasing in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T1-7			N. Grassland

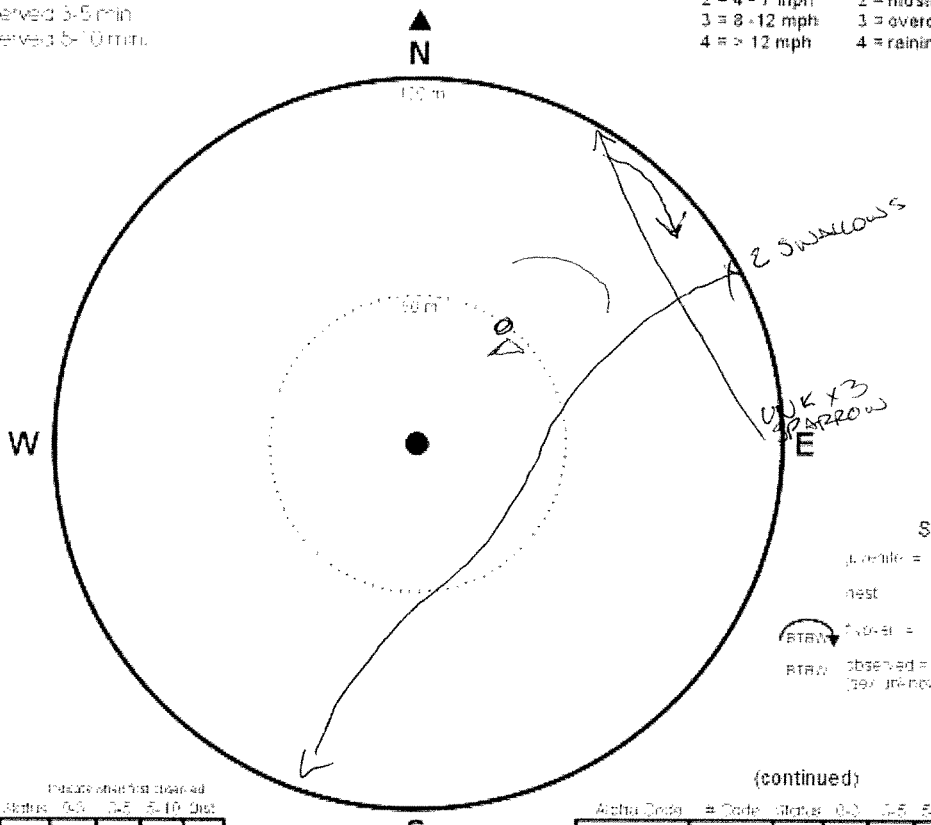
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
8	03	07	13:08		90°	2	0

BTSW = first observed 0-3 min.
BTSW ✓ = first observed 3-5 min
BTSW ✗ = first observed 5-10 min.

0 = none
1 = 1 - 3 mph
2 = 4 - 7 mph
3 = 8 -12 mph
4 = > 12 mph

0 = < 10% clouds
1 = partly cloudy
2 = mostly cloudy
3 = overcast
4 = raining

Notes:



Status
juvenile = J
nest = N
BTBW = X
BTBW observed = O

Alpha Code	# Code	Status	Distance when first observed 0-5	5-8	8-10	Dist.
OB			✓			1
SPATTOWS				✓		2
SPARROW				✓		2
SPARROW				✓		2
SWALLOW					✓	1
SWALLO					✓	1

SWG

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status
singing male = S
mate (female) = M
female (unpaired) = F
pair together = P
calling (? sex) = C
change in position
simultaneous vs song of 2 males

(continued)

Alpha Code	# Code	Status	0-5	5-8	8-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T1-9			Grassland

Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
8	23	07	11:45		88°	3	0

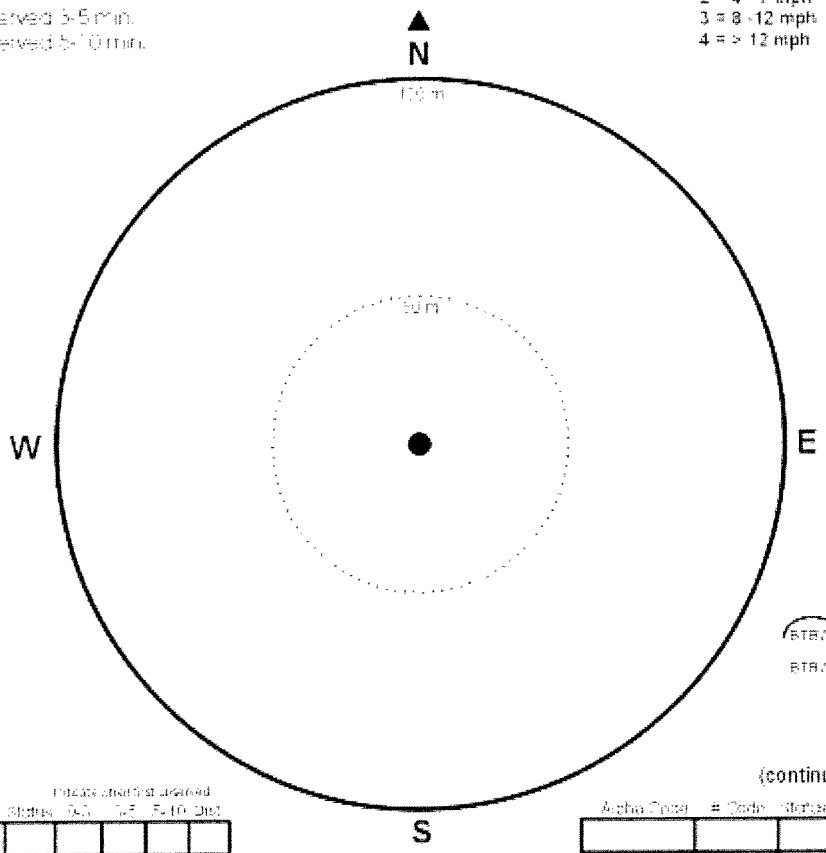
Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:

no Birds Observed



Status
J = juvenile
N = nest
X = first observed
O = observed

Alpha Code	# Birds	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status
S = singing male
M = male (silent)
F = female
P = pair together
C = calling (10 sec.)
= change in position
= simultaneous song of 2 males

(continued)

Alpha Code	# Birds	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T3-1			PJ on 100 205 Type

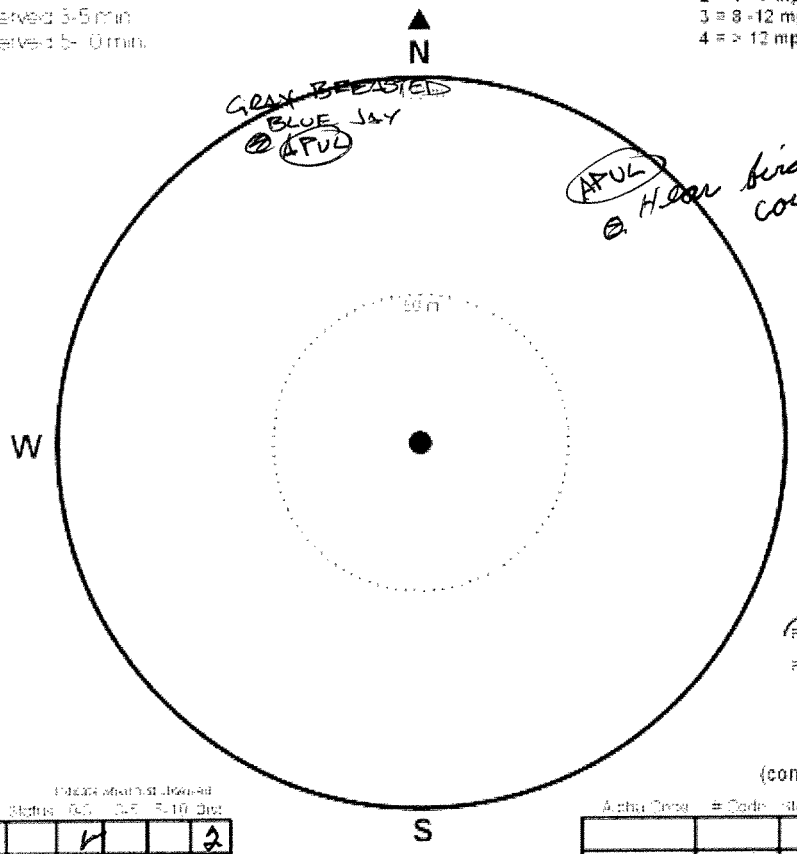
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
8	24	07	11:10	JH/SB	82°F	2	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

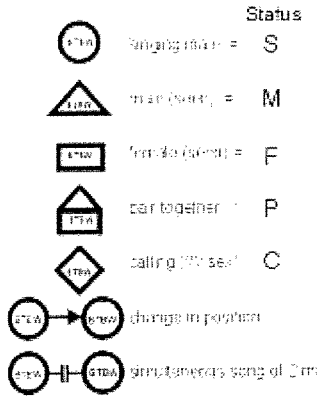
B'SW = first observed 0-3 min
B'SW ✓ = first observed 3-5 min
B'SW ✗ = first observed 5- 10 min

Notes:



Alpha Code	# Code	Status	Flocks Mixed Species Dist: 0-3	3-5	5-10	Dist
UNK			✓			2
APUL				✓		2

Dist. = minimum distance from observer
1 = < 50 m, 2 = 50 - 100 m, 3 = > 100 m



(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist

Dist. = minimum distance from observer
1 = < 50 m, 2 = 50 - 100 m, 3 = > 100 m

Bird Point Census Form

State	Site ID	Latitude	Longitude	Habitat Type
CO	T3-3			Grassland

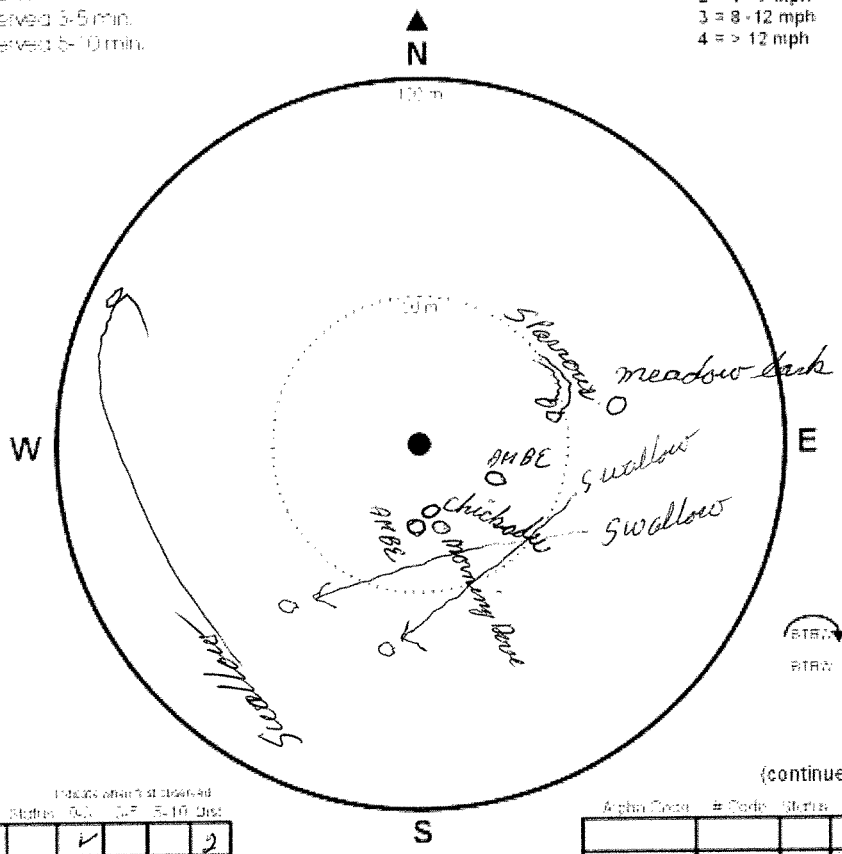
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
8	24	07	9:00	JH/SD	78°	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTSW = first observed 0-3 min.
BTSW ✓ = first observed 3-5 min.
BTSW ✗ = first observed 5-10 min.

Notes:



Status: juvenile = J; nest = N; flyover (BTBW) = X; observed (BTBW) = O (sex or un-known)

Alpha Code	# Code	Status	Distance observed at (0-3)	(3-5)	(5-10)	Dist.
Swallow			✓			2
Swallow			✓			2
BHBE			✓			1
BHBE			✓			1
Mourning D				✓		1
meadow				✓		2
S Sparrow					✓	2
S Sparrow					✓	2
Chickadee					✓	2
Savannah					✓	2

Dist. = minimum distance from observer
1 = < 50 m; 2 = 50 - 100 m; 3 = > 100 m

Status: singing male = S; mate (female) = M; female (female) = F; pair together = P; calling (male or female) = C; change in pair/sex; simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	(0-3)	(3-5)	(5-10)	Dist.

Dist. = minimum distance from observer
1 = < 50 m; 2 = 50 - 100 m; 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	TB-5			Grassland

Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
8	23	07	16:10	JH/SB	90°	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

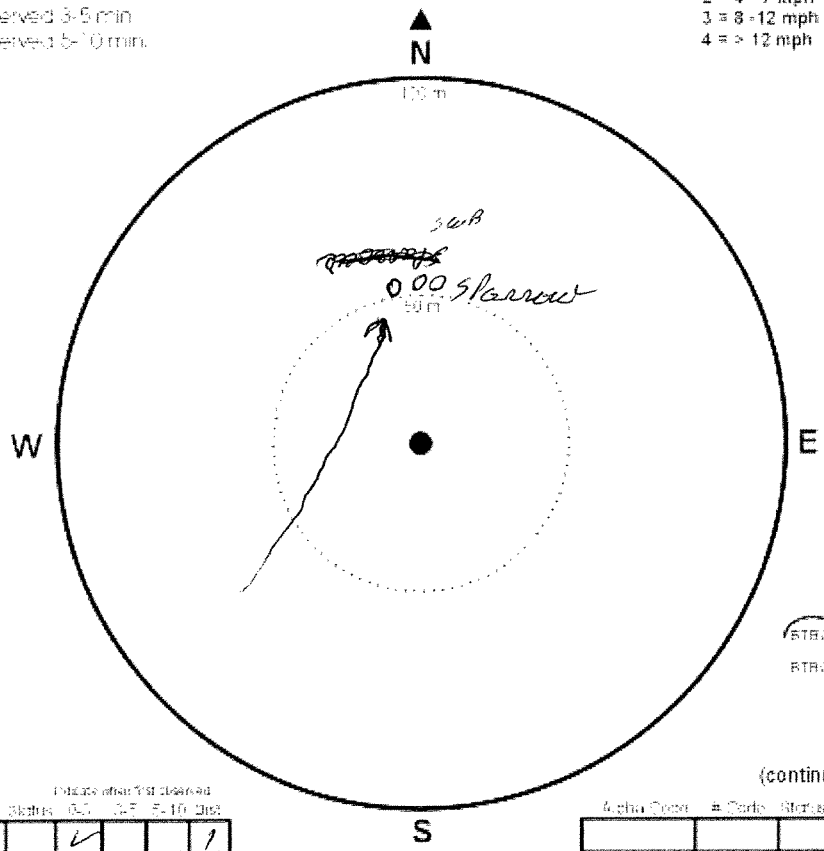
Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min

BTBW ✓ = first observed 3-5 min

BTBW ✗ = first observed 5-10 min

Notes:



Status

- juvenile = J
- nest = N
- BTBW = flyover = X
- BTBW = observed = O (see unknown)

Alpha Code	# Birds	Status	Distance when first detected 0-3	3-5	5-10	Dist.
Sparrow			✓			1
Sparrow			✓			1
Sparrow					✓	1

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status

- singing male = S
- male (visual) = M
- female (visual) = F
- pair together = P
- calling (no see) = C
- BTBW → BTBW change in position
- BTBW = BTBW simultaneous song of 2 males

(continued)

Alpha Code	# Birds	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T3-7			Big Sage

Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
8	23	07	13:35		90°	2	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

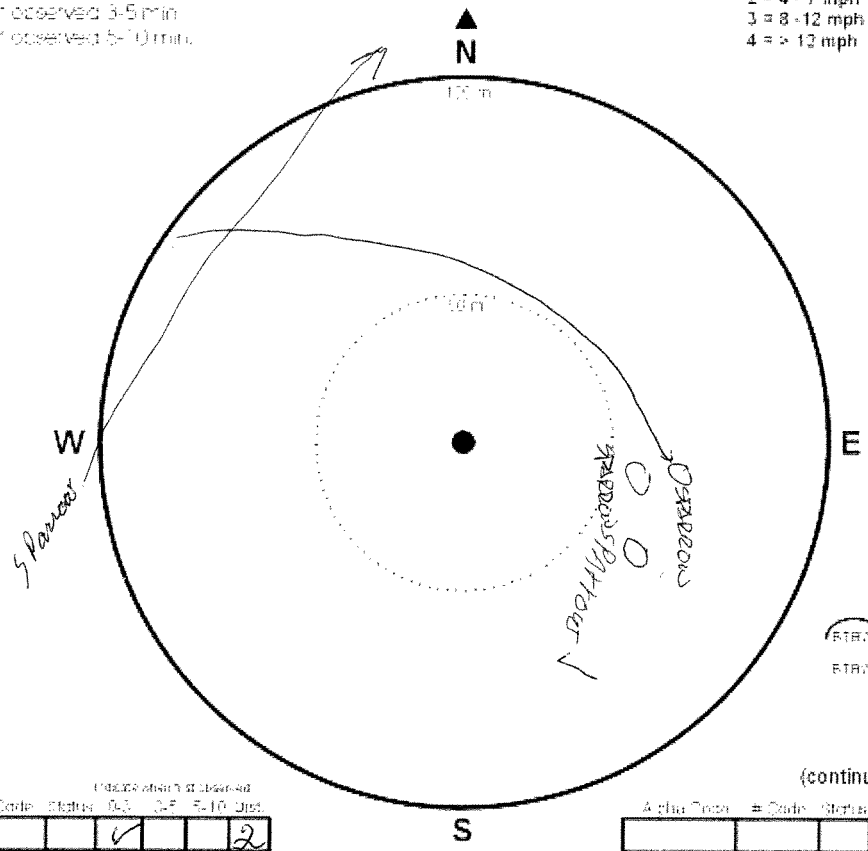
Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min

BTBW ✓ = first observed 3-5 min

BTBW ✗ = first observed 5-10 min

Notes:



Status

juvenile = J

nest = N

flyover = X

BTBW observed = O (singing male = S; territorial male = M; female = F; pair together = P; calling = C; changing perches; singing unseen)

Alpha Code	# Birds	Status	Dist. 0-3	Dist. 3-5	Dist. 5-10	Dist.
Sparrow			✓			2
Sparrow				✓		2
SPARROW					✓	2
SPARROW					✓	2

Dist. = minimum distance from observer: 1 = < 50 m; 2 = 50 - 100 m; 3 = > 100 m

(continued)

Alpha Code	# Birds	Status	Dist. 0-3	Dist. 3-5	Dist. 5-10	Dist.

Dist. = minimum distance from observer: 1 = < 50 m; 2 = 50 - 100 m; 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T3-9			Big Sage

Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
8	23	07	11:06		87°	3	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

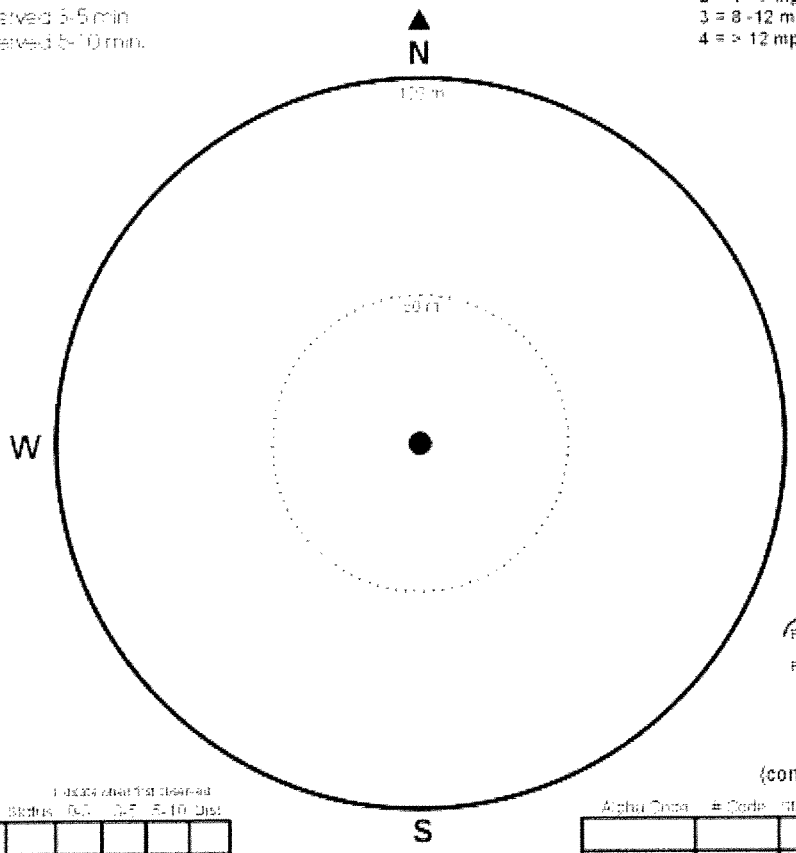
Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min

BTBW ✓ = first observed 3-5 min

BTBW ✗ = first observed 5-10 min.

Notes:



Status

juvenile = J

nest = N

flyover = X

BTBW observed = O

Alpha Code	# Code	Status	Dist. (first observed) 0-3	3-5	5-10	Dist

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status

singing male = S

mist (net) = M

female (nest) = F

pair together = P

calling (no seen) = C

BTBW → BTBW change in position

BTBW = BTBW simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	Dist. (first observed) 0-3	3-5	5-10	Dist

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T5-3			Grassland

Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
8	24	08	9:54	JH/SB	84°	1	0

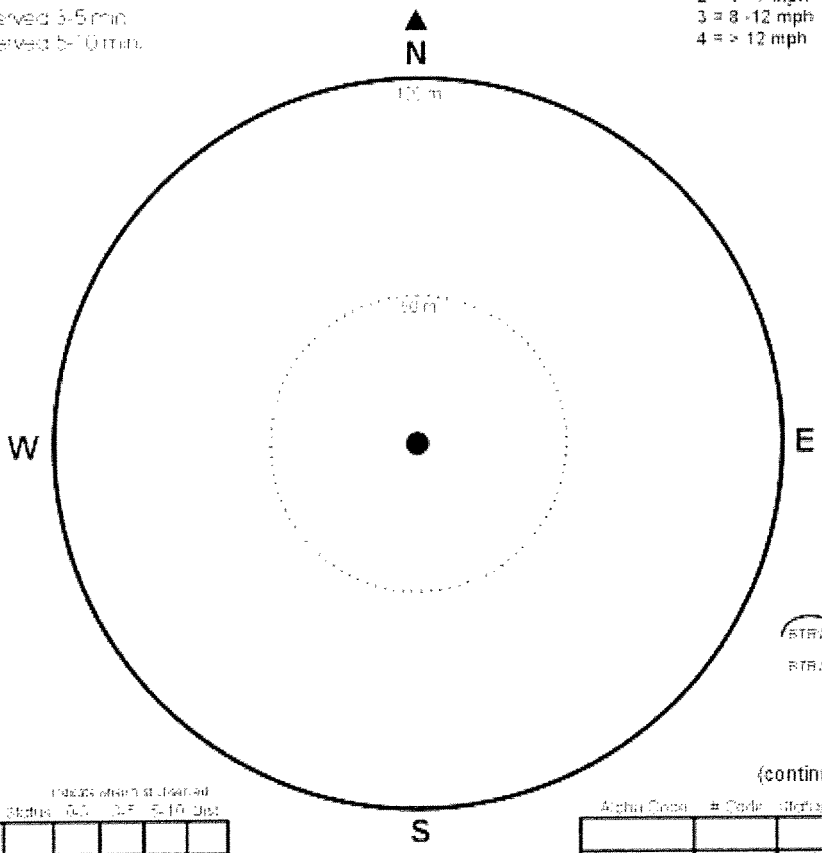
Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min
BTBW ✓ = first observed 3-5 min
BTBW ✗ = first observed 5-10 min

Notes:

No Birds observed



Status
juvenile = J
nest = N
flyover = X
observed = O
(BTBW observed in grassland)

Alpha Code	# Code	Status	Dist. (Dist. = distance observer first observed bird) 0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status
singing male = S
male (silent) = M
female = F
pair together = P
calling (??) = C
change in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	Site ID	Latitude	Longitude	Habitat Type
CO	T5-5			Big Sage

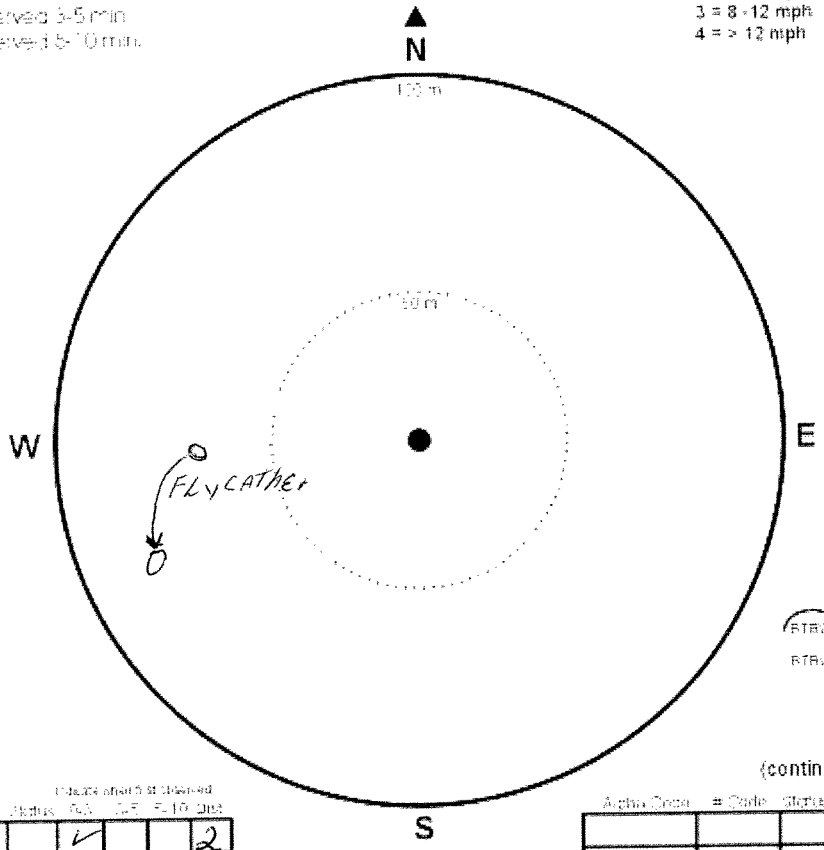
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
8	23	07	15:43	JM / SB	88°	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

B'SW = first observed 0-3 min.
B'SW ✓ = first observed 3-5 min.
B'SW ✗ = first observed 5-10 min.

Notes:



Status
J = juvenile
N = nest
X = observed (BTBW)
O = observed (BTBW) (year unknown)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.
			✓			2

Dist. = minimum distance from observer
1 = < 50 m, 2 = 50 - 100 m, 3 = > 100 m

Status
S = singing male
M = male (silent)
F = female (BTBW)
P = pair together
C = calling (BTBW)
= change in position
= simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m, 2 = 50 - 100 m, 3 = > 100 m

Bird Point Census Form

State	Site ID	Latitude	Longitude	Habitat Type
CO	T5-7			Big Sage

Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
8	23	07	14:09		90°	2	0

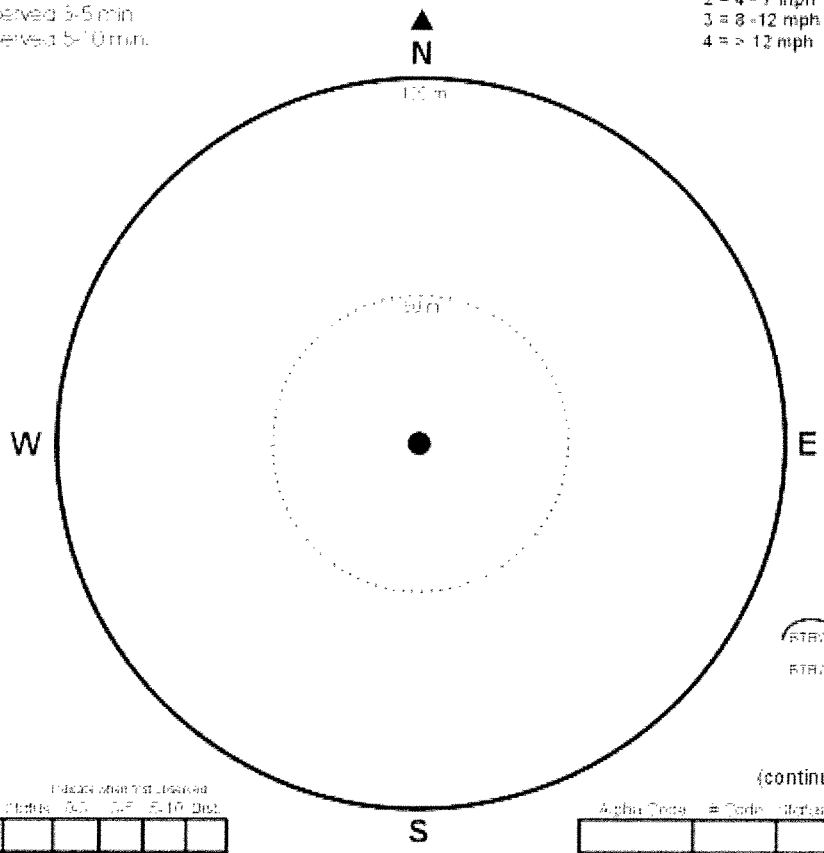
B'SW = first observed 0-3 min
B'SW ✓ = first observed 3-5 min
B'SW ✗ = first observed 5-10 min

0 = none
1 = 1 - 3 mph
2 = 4 - 7 mph
3 = 8 -12 mph
4 = > 12 mph

0 = < 10% clouds
1 = partly cloudy
2 = mostly cloudy
3 = overcast
4 = raining

Notes:

No Birds observed -



Status
J = J
N
X
O

Alpha Code	# Code	Status	Distance when first detected 0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status
S
M
F
P
C
changes in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.
			—			

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T5-9			Big Sage

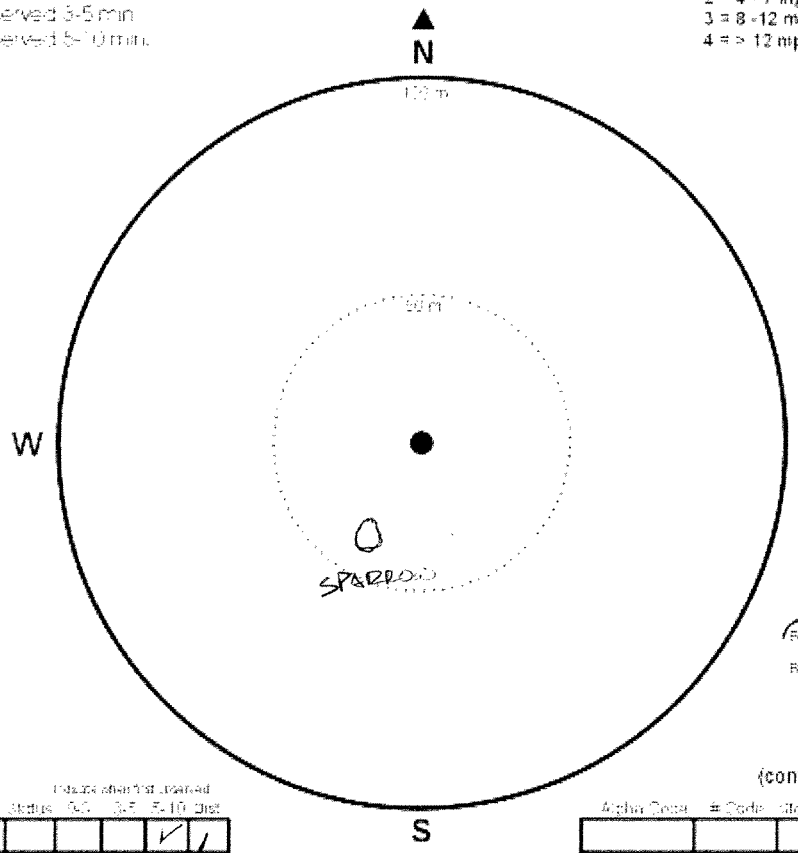
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
8	23	07	10:36	JR, LB, SB	86°	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = bird observed 0-3 min.
BTBW ✓ = bird observed 3-5 min.
BTBW ✗ = bird observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
BTBW flyover = X
BTBW observed = O
(may distinguish)

Alpha Code	# Code	Status	House sheet first counted 0-3	3-5	5-10	Dist.
VHK					✓	1

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status
singing male = S
male (female) = M
female (male) = F
pair together = P
calling (? sex) = C
BTBW → BTBW change in position
BTBW + BTBW simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T7-3			Grassland

Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
8	24	07	10:20	JM/SB	83	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

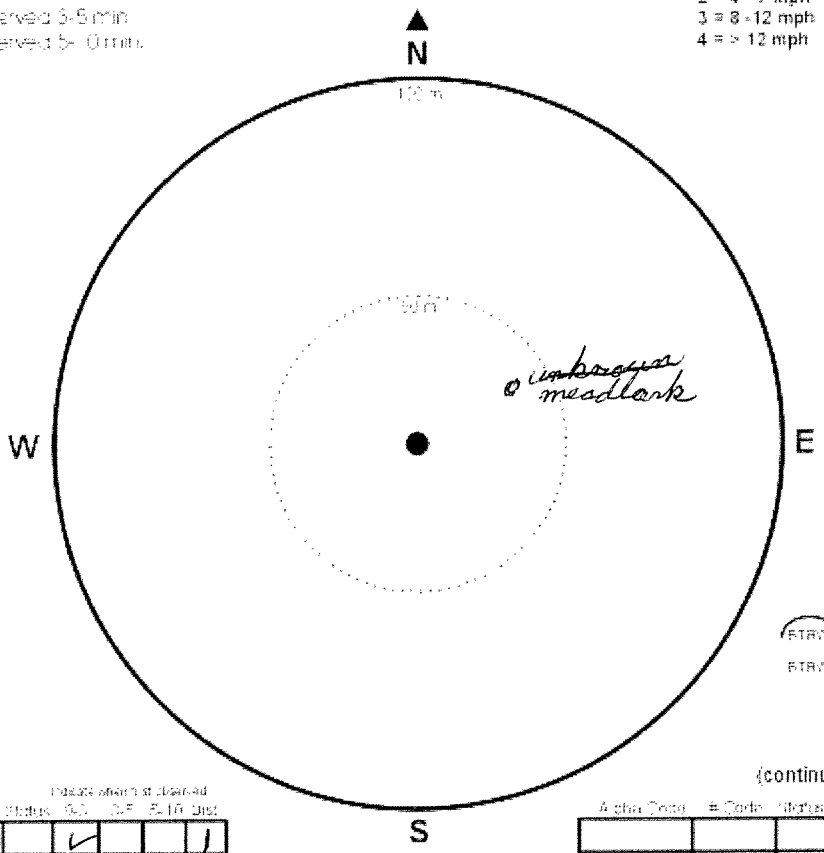
Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

B-SW = bird observed 0-3 min

B-SW ✓ = bird observed 3-5 min

B-SW ✗ = bird observed 5+ 0 min

Notes:



Status

juvenile = J

nest = N

flyover = X

observed = O

meadlark

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.
unbanded			✓			1

Dist. = minimum distance from observer
1 = < 50 m, 2 = 50 - 100 m, 3 = > 100 m

Status

singing male = S

mated pair = M

female (nest) = F

pair together = P

calling (no see) = C

change in position

simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m, 2 = 50 - 100 m, 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T7-5			Grassland

Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
8	23	07	15:14	JH/SB	92°	2	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

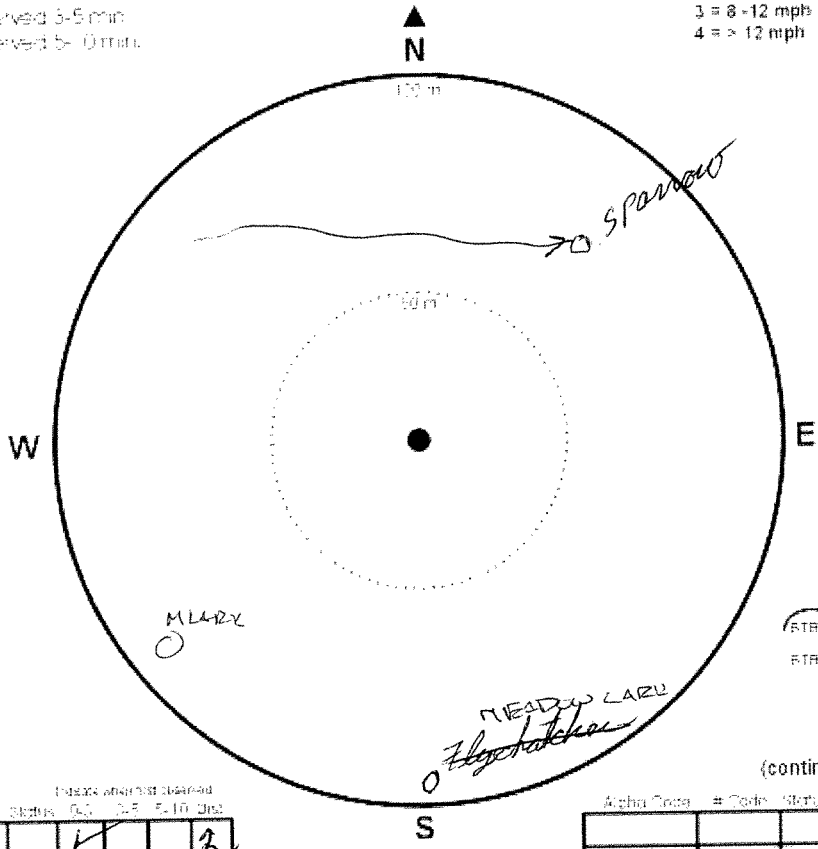
Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

B'BW = first observed 0-3 min

B'BW ✔ = first observed 3-5 min

B'BW ✘ = first observed 5- 10 min.

Notes:



Status

juvenile = J

nest = N

flyover = X

observed = O (perching/roosting)

MLARK

Alpha Code	# Birds	Status	Dists. when first observed 0-3	3-5	5-10	Dist.
Flycatcher			✓			2
Sparrow				✓		1
MLARK				✓		1

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status

singing male = S

male/female pair = M

female (carrying nest material) = F

pair together = P

calling (begging) = C

change in position

simultaneous song of 2 males

(continued)

Alpha Code	# Birds	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	17-7			

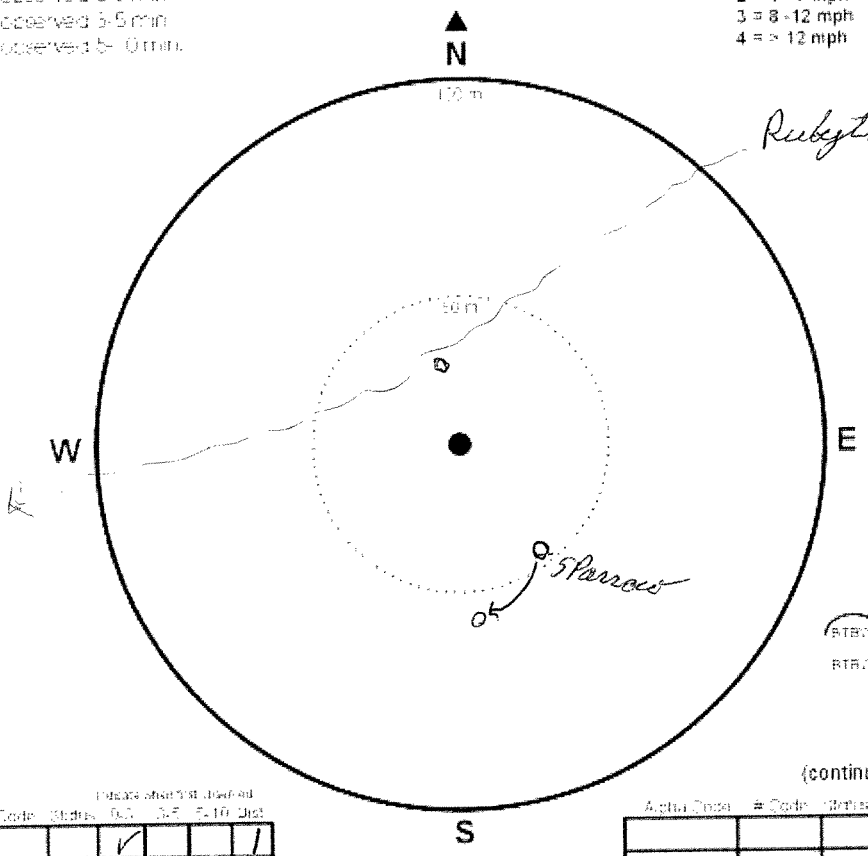
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
8	23	07	14:49		90°	2	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes: Ruby throated hummingbird



Status
Juvenile = J
Nest = N
BTBW flyover = X
BTBW observed = O (perching/singing)

Alpha Code	# Code	Status	Distance when first observed: 0-3	3-5	5-10	Dist
Sparrow			✓			1
Hummg					✓	✗

Dist. = minimum distance from observer: 1 = < 50 m; 2 = 50 - 150 m; 3 = > 150 m

Status
singing male = S
mate (female) = M
female (juvenile) = F
pair together = P
calling = C
change in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist

Dist. = minimum distance from observer: 1 = < 50 m; 2 = 50 - 150 m; 3 = > 150 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	TL-2			PJ / Big Sage

Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
9	18	07	1525	JM, MZ	84°F	2	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

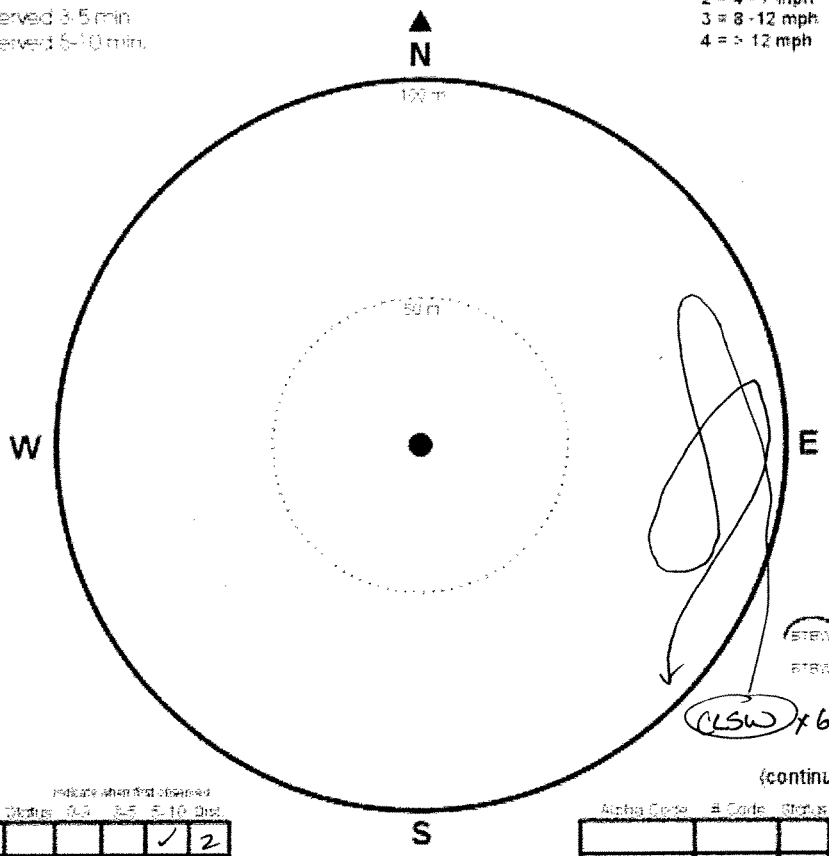
Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min

BTBW ✓ = first observed 3-5 min

BTBW ✗ = first observed 5-10 min

Notes:



Status

- singing male = S
- male (song) = M
- female (view) = F
- pair together = P
- calling (2nd sex) = C
- change in position
- simultaneously sing song of 2 males

Status

- juvenile = J
- nest = N
- flyover = X
- observed = O (see unk. m/f/juv)

Indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.
CLSW					✓	2
CLSW					✓	2
CLSW					✓	2
CLSW					✓	2
CLSW					✓	2
CLSW					✓	2

Dist. = minimum distance from observer
1 = < 50 m; 2 = 50 - 100 m; 3 = > 100 m

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m; 2 = 50 - 100 m; 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	TL-4			NATIVE GRASSLAND

Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
9	18	07	1308	MZ, JM	87°F	1	0

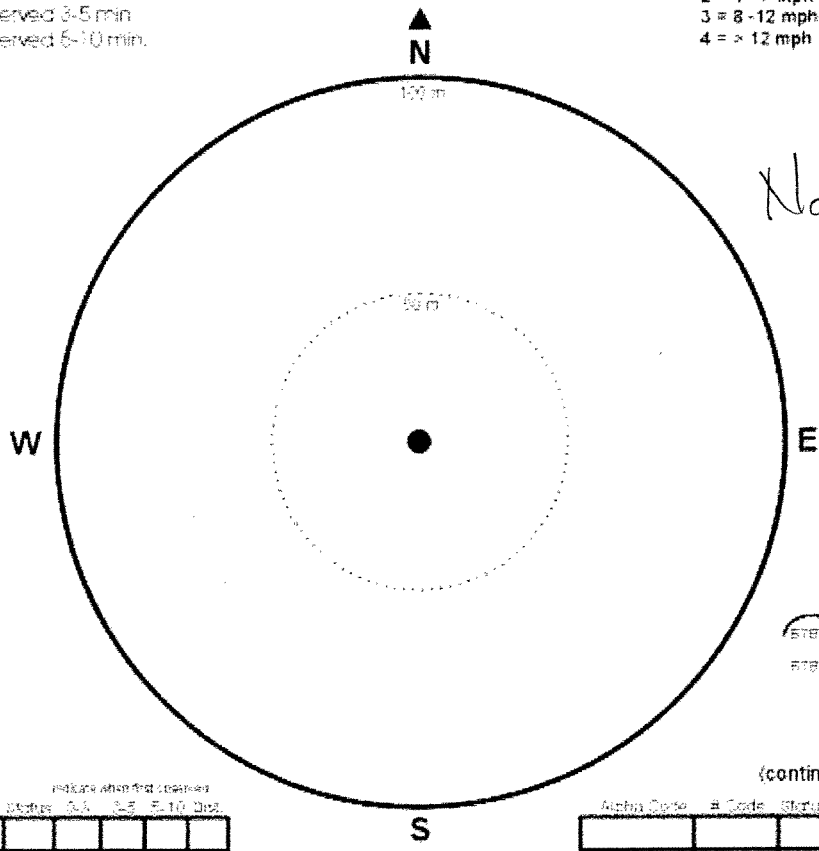
BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

0 = none
1 = 1 - 3 mph
2 = 4 - 7 mph
3 = 8 -12 mph
4 = > 12 mph

0 = < 10% clouds
1 = partly cloudy
2 = mostly cloudy
3 = overcast
4 = raining

Notes:

NONE OBSERVED



Status
juvenile = J
nest = N
flyover = X
observed = O

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status
singing male = S
male (silent) = M
female (silent) = F
pair together = P
calling (2nd sex) = C
change in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T2-6			Native Grassland

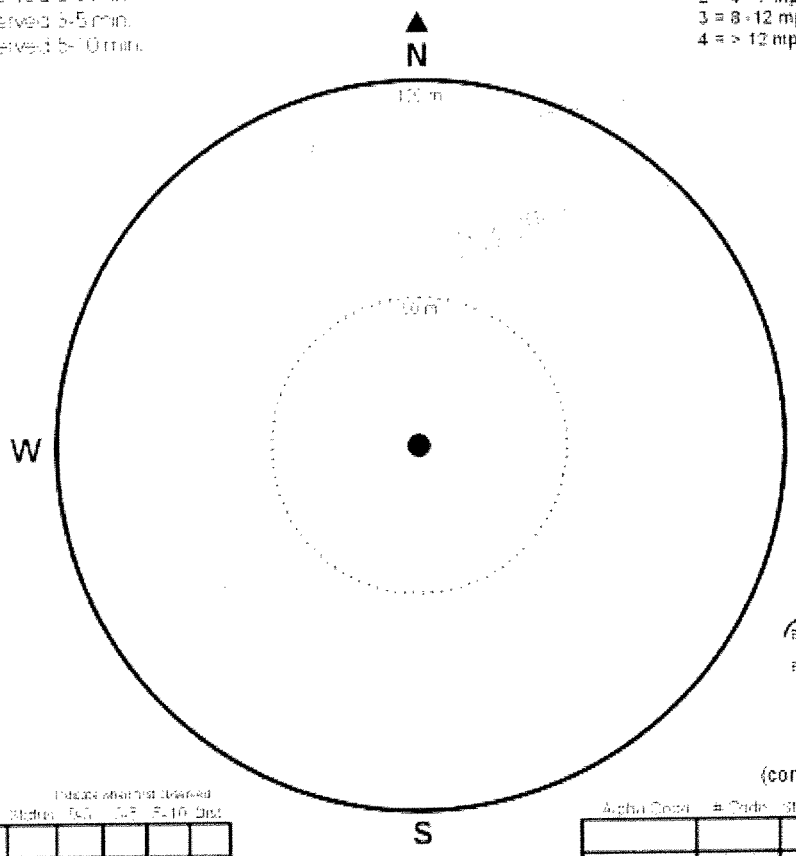
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
9	18	07	1230	MZ, JM	87°F	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



None Observed

Status
Juvenile = J
Nest = N
Flyover = X
BTBW observed = O

Alpha Code	# Code	Status	Dist. 0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status
singing on territory = S
nest building = M
female displaying = F
pair together = P
calling (no visual) = C
changing in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	Dist. 0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T2-8			BIG SAGE

Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
9	18	07	0837	JM MZ	75°F	0	0

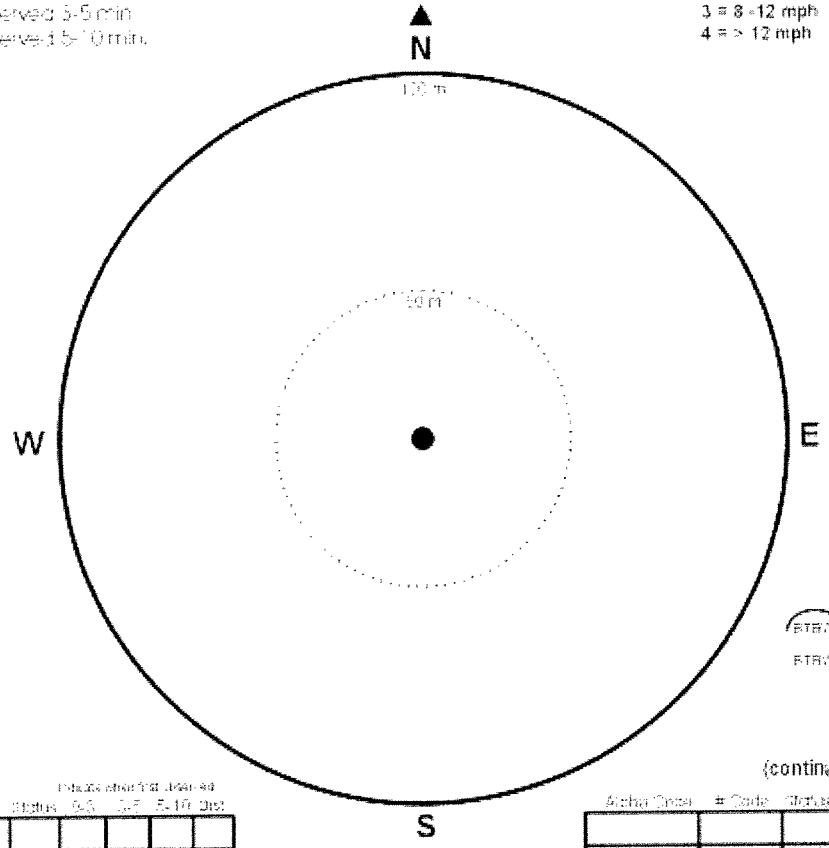
Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:

NO BIRDS OBSERVED



Status
J = fledgling
N = nest
X = flyover
O = observed

Alpha Code	# Code	Status	0-5	5-10	10+	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status
S = singing male
M = male (silent)
F = female
P = pair together
C = calling (30 sec)
= change in position
= simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-5	5-10	10+	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	Site/ID	Latitude	Longitude	Habitat Type
CO	T4-2			NATIVE GRASSLAND

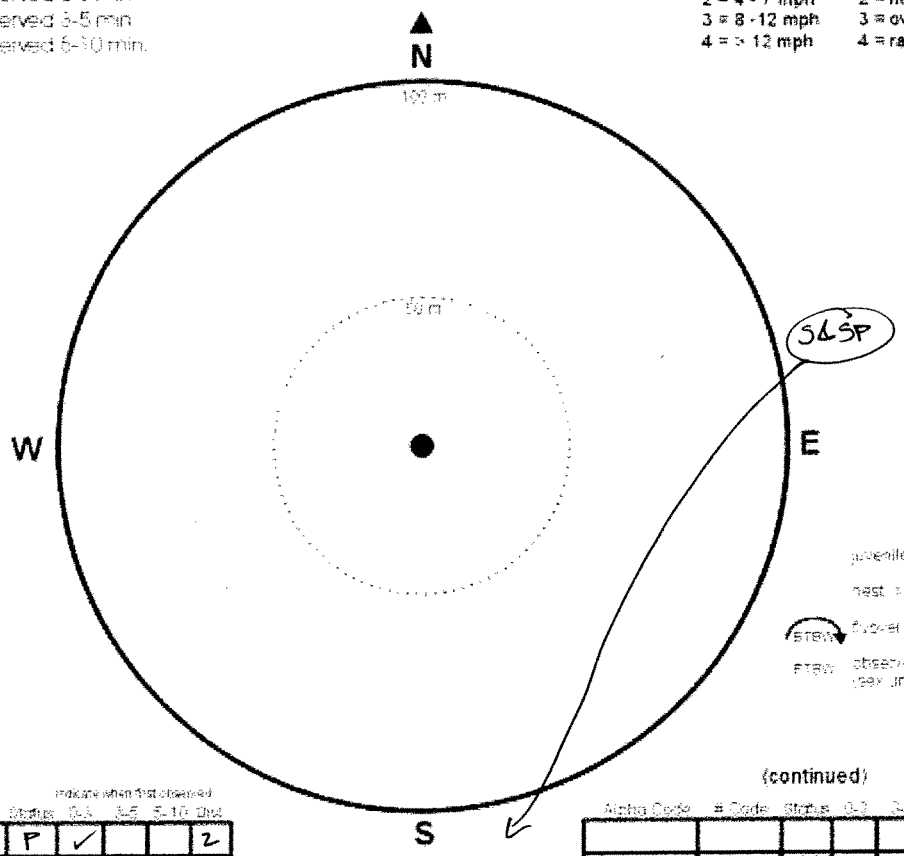
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
9	18	07	1456	JM, ME	87°F	2	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min
BTBW ✓ = first observed 3-5 min
BTBW ✗ = first observed 6-10 min.

Notes:



Status
juvenile = J
nest = N
BTBW = X
BTBW = observed = O (sex unknown)

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.
SASP		P	✓			2

(Indicate when first observed)

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status
singing male = S
female = M
female (given) = F
pair together = P
calling (only sex) = C
change in position
simultaneous song of 2 males

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T4-4			NATIVE GRASSLAND

Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
9	18	02	1334	MZ, JM	87°F	1	0

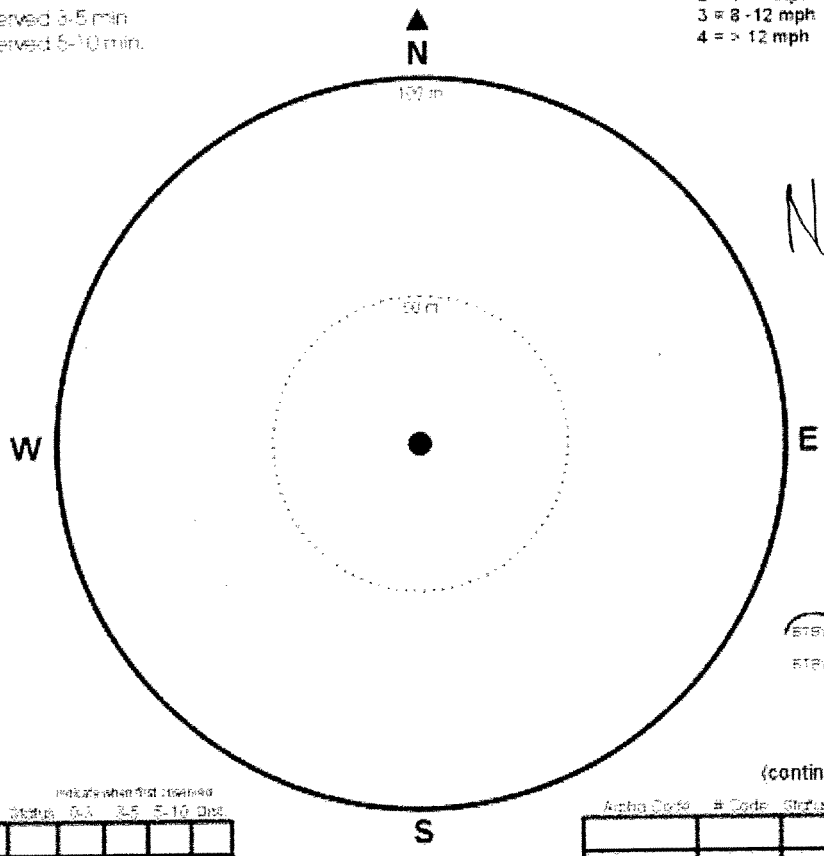
Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min
BTBW ✓ = first observed 3-5 min
BTBW ✗ = first observed 5-10 min.

Notes:

NONE OBSERVED



Status
juvenile = J
nest = N
flyover = X
observed = O
(per unknown)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status
singing male = S
male (silent) = M
female present = F
pair together = P
calling (2nd sex) = C
change in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	TQ-6			DIST. BIG SAGE

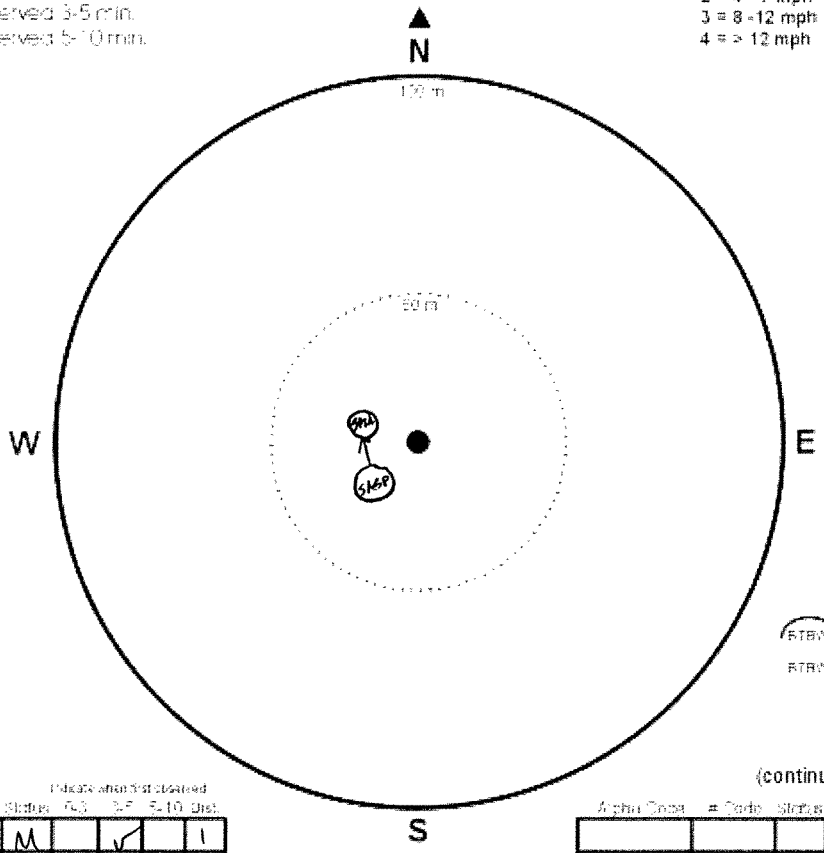
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
9	18	07	1204	MZ, JM	87°F	1	0

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

Notes:



Status
juvenile = J
nest = N
flyover = X
observed = O
(see comments)

Indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.
SASP		M		✓		1

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status
singing male = S
silent male (Solitaire) = M
female (general) = F
pair together = P
calling (Phainopepla) = C
change in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T4-8			BIG SAGE

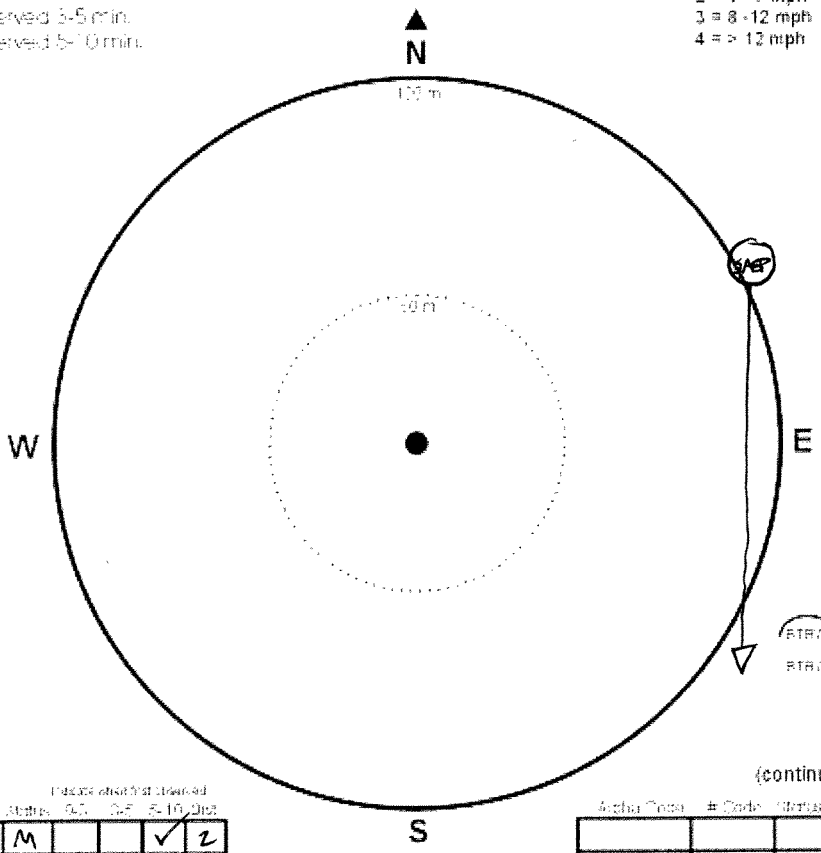
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
9	18	07	0900	JM, MZ	75	0	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
BTBW type-set = X
BTBW observed = O
gear unknown

Alpha Code	# Code	Status	Distance when first observed 0-3	3-5	5-10	Dist.
SASP		M			✓	2

Dist. = minimum distance from observer
1 = < 50 m; 2 = 50 - 100 m; 3 = > 100 m

Status
singing male = S
mated pair = M
female present = F
pair together = P
calling (no song) = C
change in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	Distance when first observed 0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m; 2 = 50 - 100 m; 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T4-10			ROADSIDE DITCH

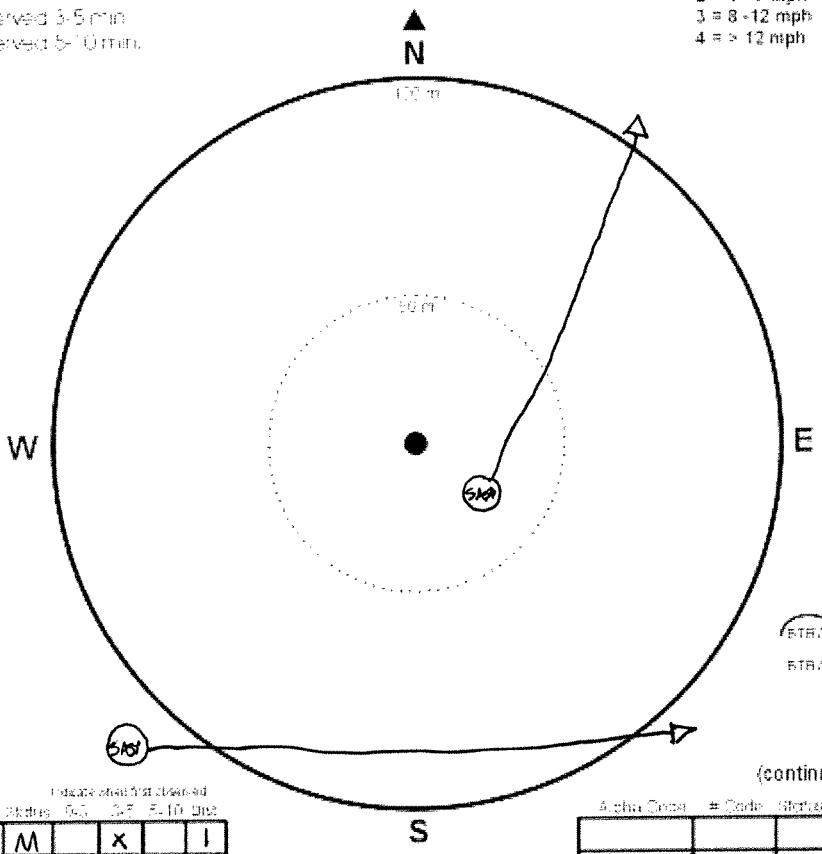
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
9	18	07	0930	JM, MZ	80	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTSW = first observed 0-3 min.
BTSW ✓ = first observed 3-5 min.
BTSW ✗ = first observed 5-10 min.

Notes:



Status
- juvenile = J
- nest = N
- flyover = X
- observed = O (year-round)

Alpha Code	# Code	Status	Distance when first observed 0-3	3-5	5-10	Dist.
SASP		M		X		1
SASP		M			X	3

Dist. = minimum distance from observer: 1 = < 50 m; 2 = 50 - 100 m; 3 = > 100 m

Status
- singing male = S
- male courting = M
- female observed = F
- pair together = P
- calling (10 sec.) = C
- change in position
- simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer: 1 = < 50 m; 2 = 50 - 100 m; 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T6-2			NATIVE GRASSLAND

Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
9	18	07	1430		84°F	1	1

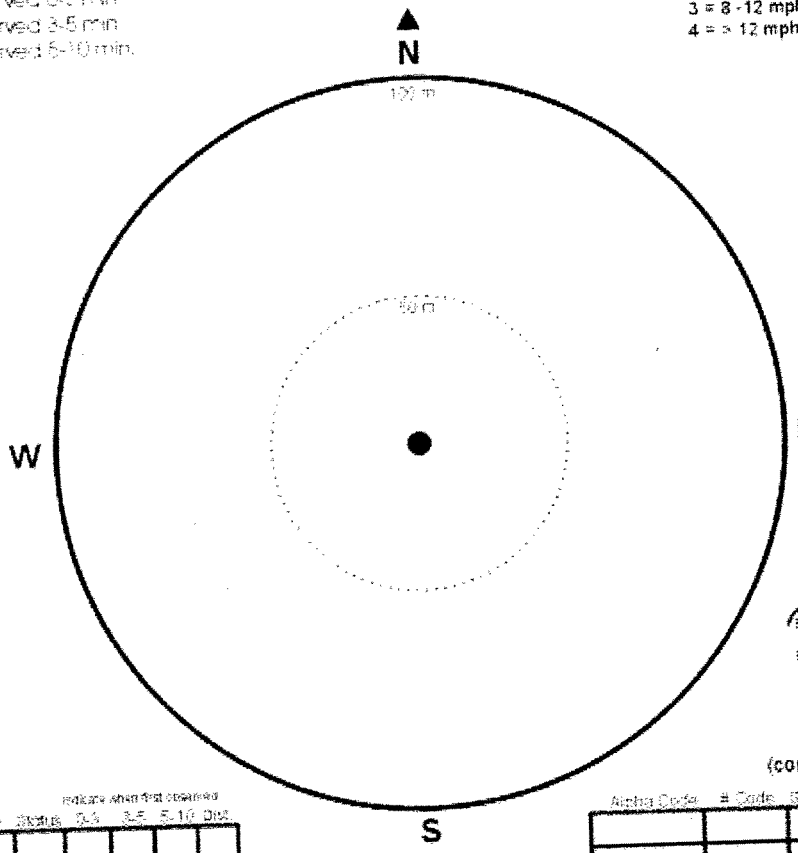
Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min
BTBW ✓ = first observed 3-5 min
BTBW ✗ = first observed 5-10 min

Notes:

NO BIRDS OBSERVED



Status
juvenile = J
nest = N
flyover = X
observed = O

Alpha Code	# Code	Status	Indicate when first observed 0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status
singing male = S
male (song) = M
female (song) = F
pair together = P
calling (??) = C
change in position
simultaneous songs song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T64			NATIVE GRASSLAND

Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
9	18	07	1358	MEJM	87°F	1	0

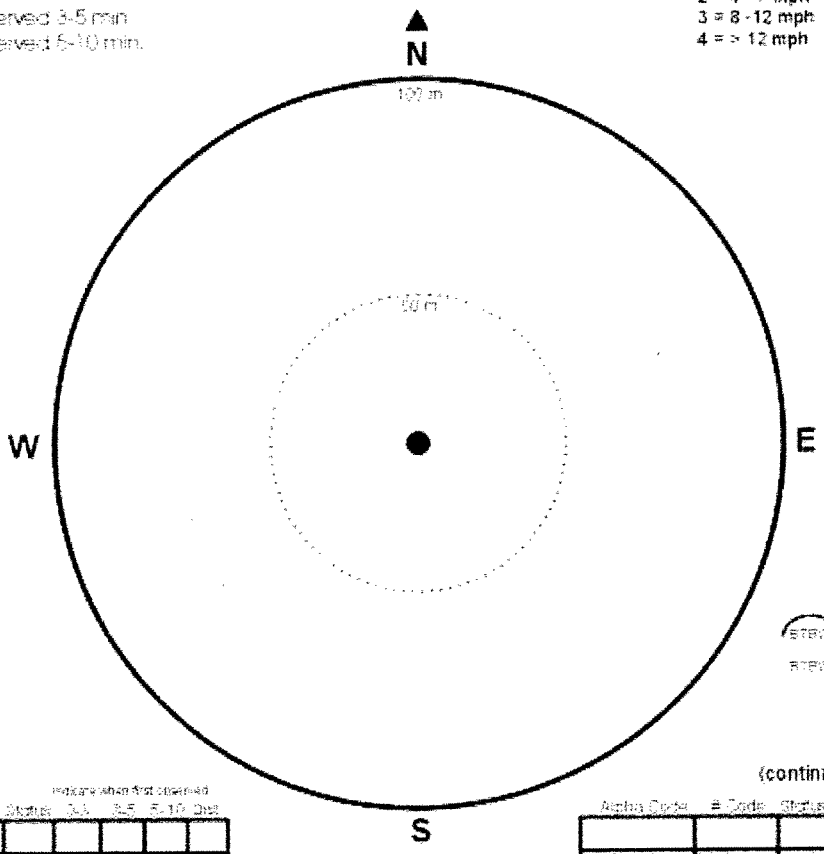
Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min
BTBW ✓ = first observed 3-5 min
BTBW ✗ = first observed 5-10 min.

Notes:

NONE OBSERVED



Status
juvenile = J
nest = N
flyover = X
observed = O

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status
singing male = S
male (silent) = M
female (silent) = F
pair together = P
calling (2nd bird) = C
change in perch
simultaneous song of 2 males

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T6-6			BIG SAGE

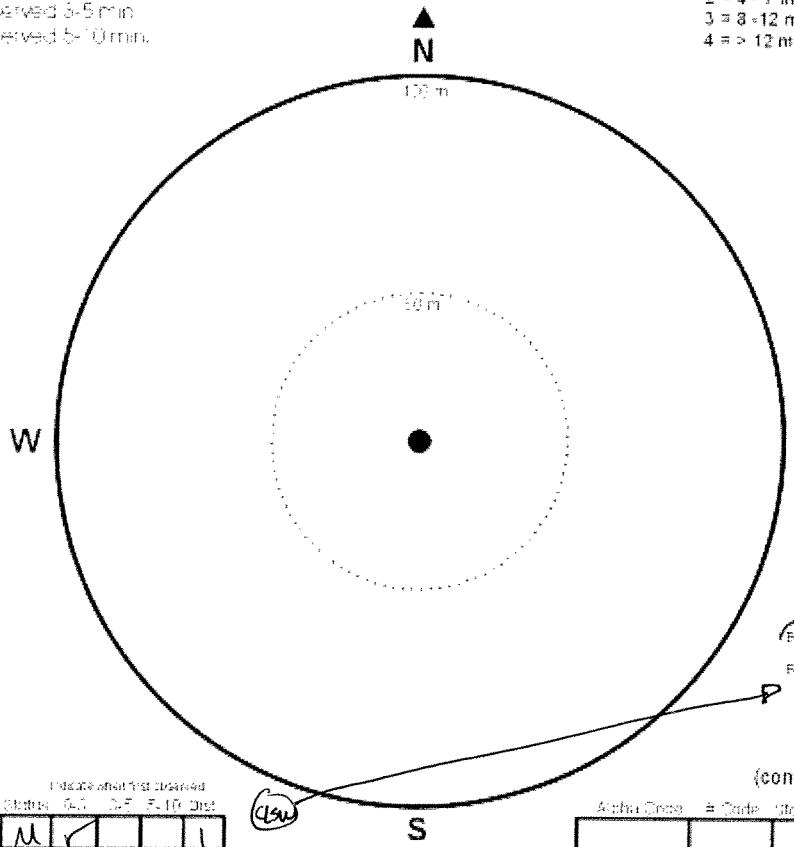
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
9	18	07	1132	MZ, JM	85	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
J = juvenile
N = nest
X = flyover
O = observed

Alpha Code	# Code	Status	Indicate if first observed 0-3	3-5	5-10	Dist.
CLSW		M	✓			1

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status
S = singing male
M = mate (guarding)
F = female (present)
P = pair together
C = calling (flyover)
= change in position
= simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T6-8			Big SAGE

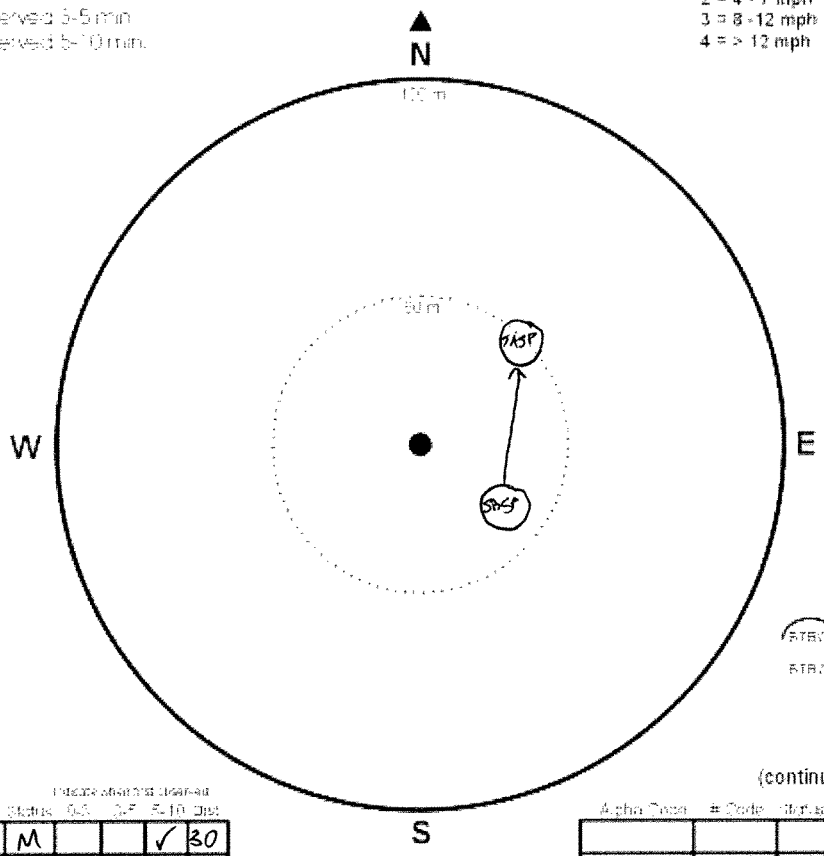
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
9	18	07	1028	JM, MZ	80	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

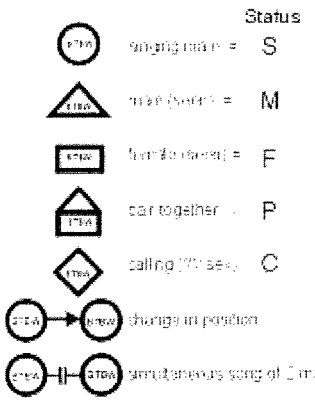
Notes:



Status
juvenile = J
nest = N
BTBW observed = X
BTBW observed = O (gray: unknown)

Alpha Code	# Code	Status	Distance class first observed 0-5	5-25	25-50	Dist
SASP		M			✓	30

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m



(continued)

Alpha Code	# Code	Status	Distance class first observed 0-5	5-25	25-50	Dist

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	PINON RIDGE MILL T7-9			SAGEBRUSH

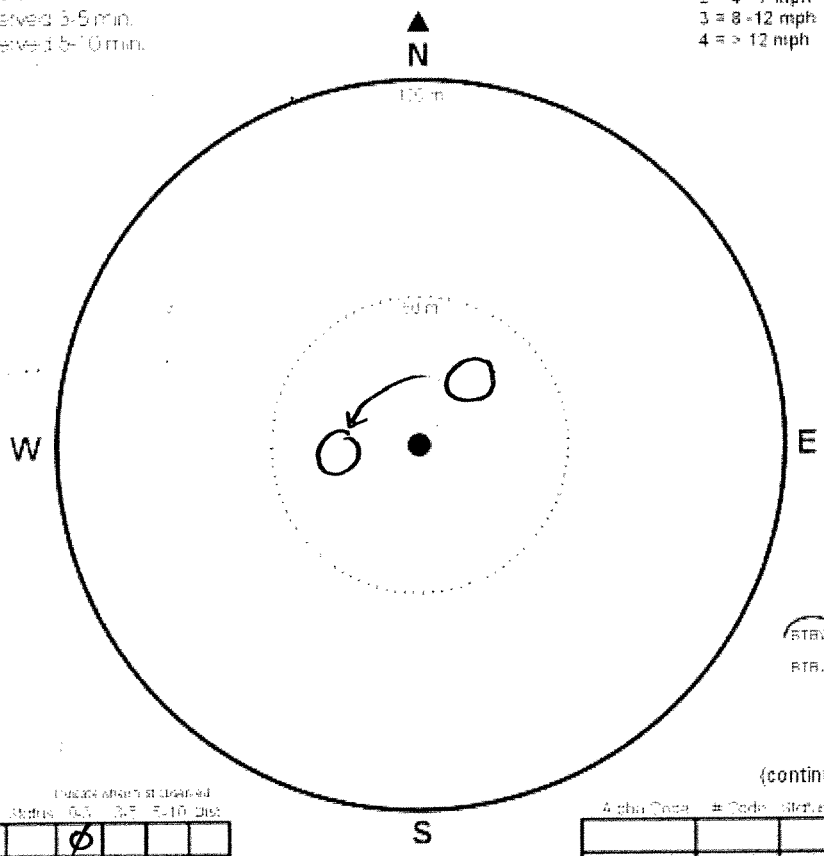
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
08	23	07	0939	JM/SB		O MILD	Ø

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest N
BTBW ... = X
BTBW observed = O
(say/sex unknown)

(Please check if observed)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.
			Ø			
SAGSPA				✓		1

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Status
singing male = S
male observed = M
female observed = F
pair together = P
calling (no see) = C
change in position
circuit breaks song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m 2 = 50 - 100 m 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type

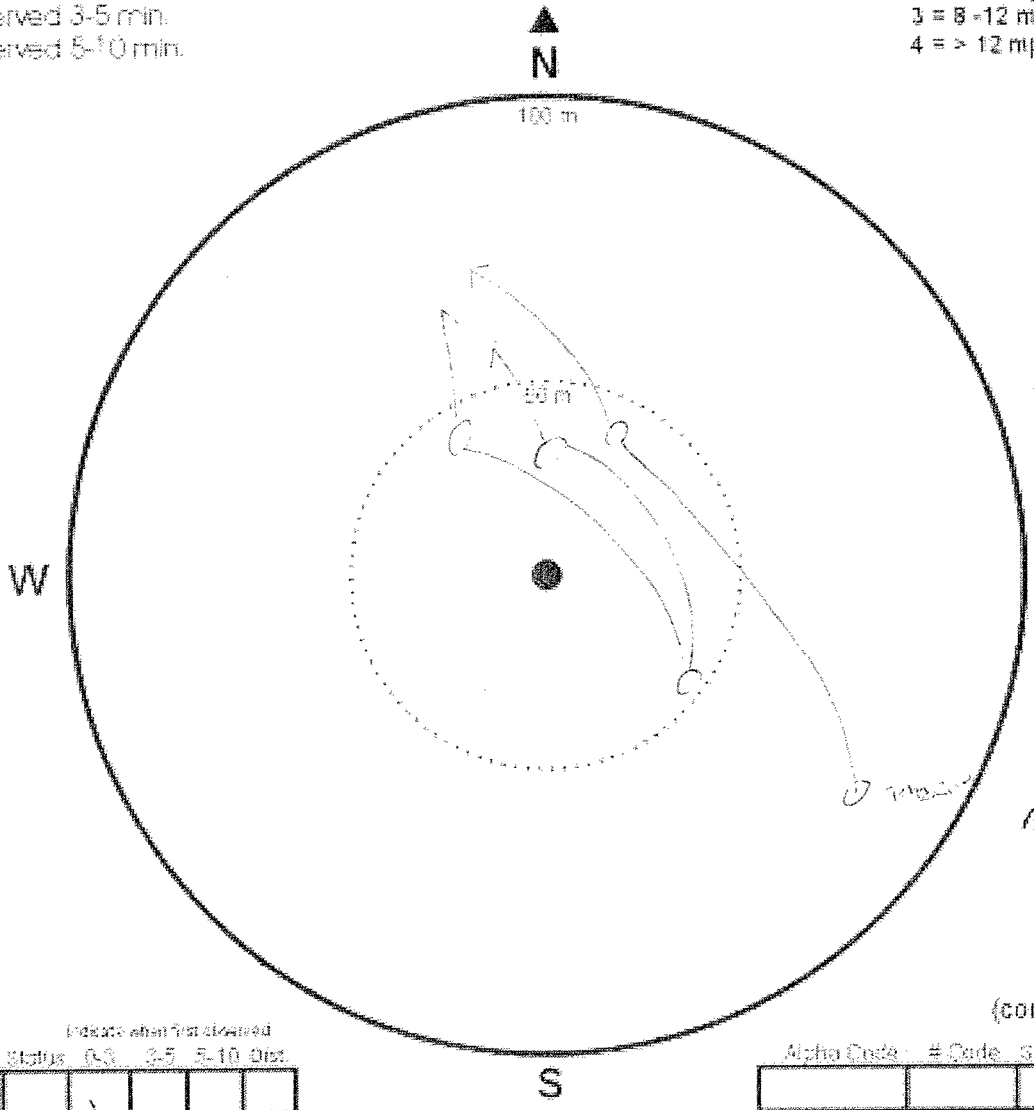
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
Juvenile = J
nest = N
flyover = X
BTBW observed = ○ (sex unknown)

Indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Status
singing male = S
male (song) = M
female (song) = F
pair together = P
calling (? sex) = C
change in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T1-5			

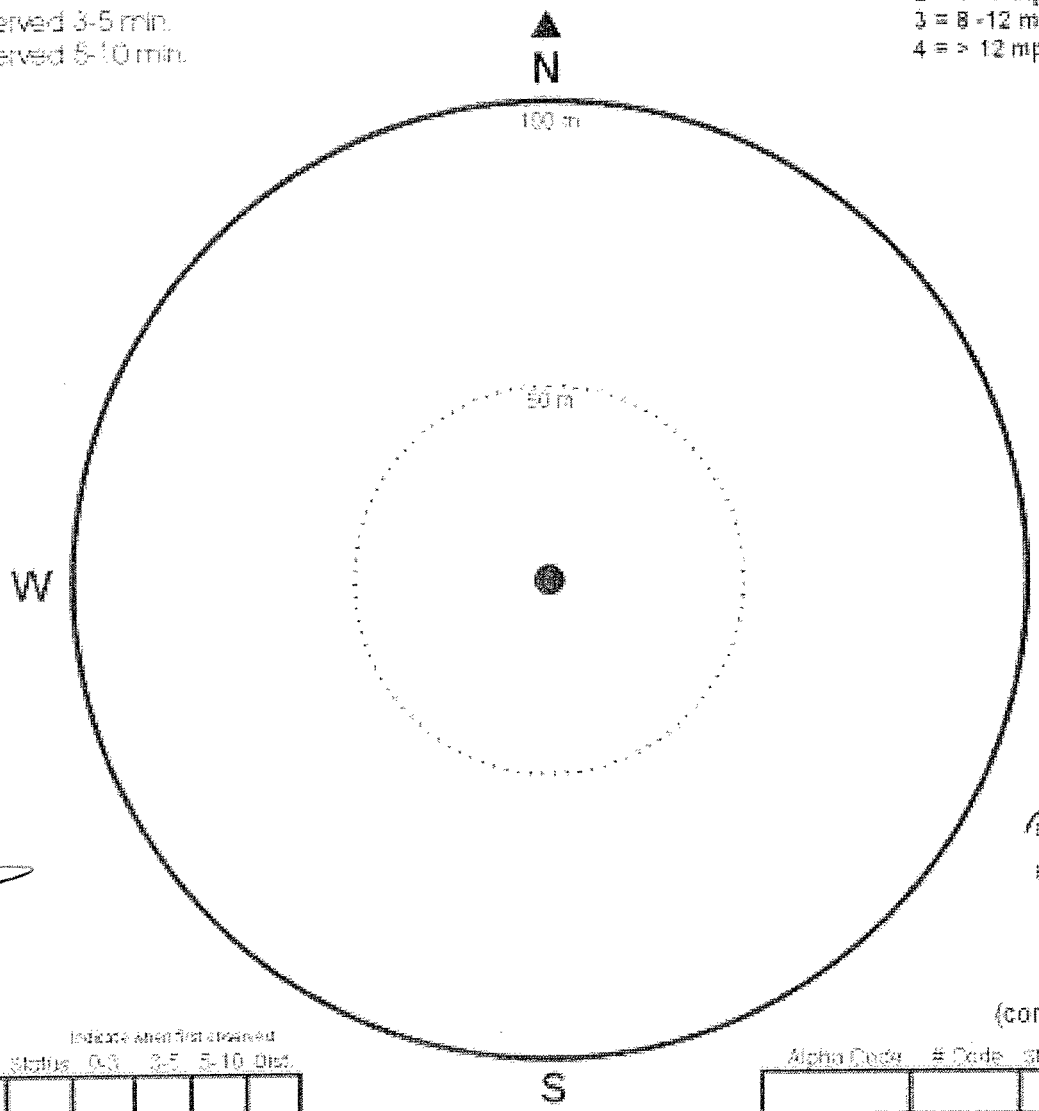
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
1	16	03	1229	JM MZ			

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



NONE

OBSERVED

Status
juvenile = J
nest = N
flyover = X
observed = O (sex unknown)

Indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Status
singing male = S
male (silent) = M
female (silent) = F
pair together = P
calling (♂ or ♀) = C
changes in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T1-7			CLEARCUT

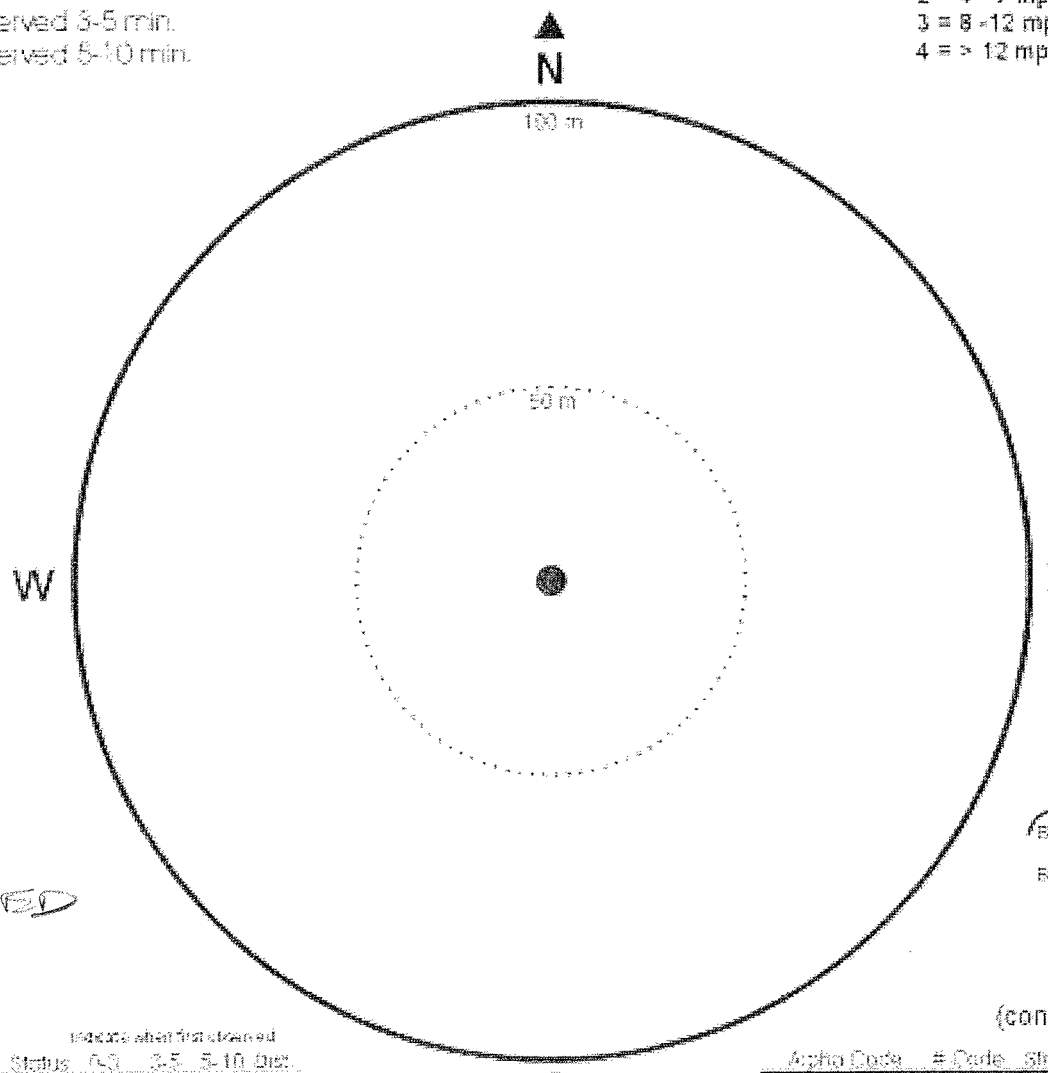
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
1	16	08	1243	JM LB MZ	20	2	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



NO BIRDS OBSERVED

Status
juvenile = J
nest = N
flyover = X
observed = O (sex unknown)

Indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer.

Status
singing male = S
male (silent) = M
female (nest) = F
pair together = P
calling (? sex) = C
changes in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer.

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T1-9			DIST GRASS

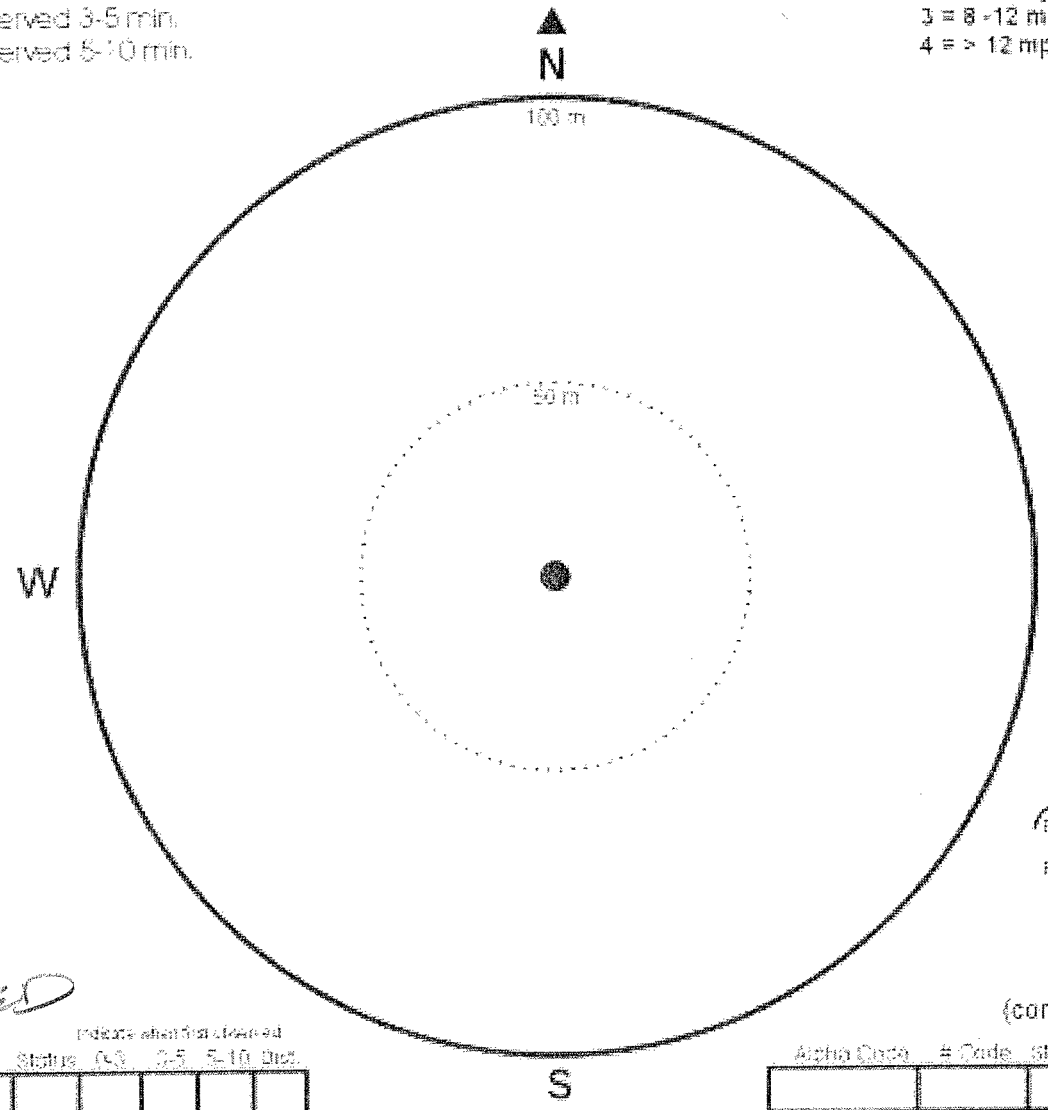
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
1	16	08	1529	JM LB MZ	20	3	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
- juvenile = J
- nest = N
- flyover = X
- observed = O (sex unknown)

NO BIRDS OBSERVED

Alpha Code	# Code	Status	Distance (indicate when first observed: 0-3, 3-5, 5-10)	Dist.

Dist. = minimum distance from observer

Status
- singing male = S
- male (silent) = M
- female (seen) = F
- pair together = P
- calling (2nd see) = C
- change in position
- simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	Distance (indicate when first observed: 0-3, 3-5, 5-10)	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T3-1			PJ

Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
1	16	08	0925	JM, MZ	12	0	0

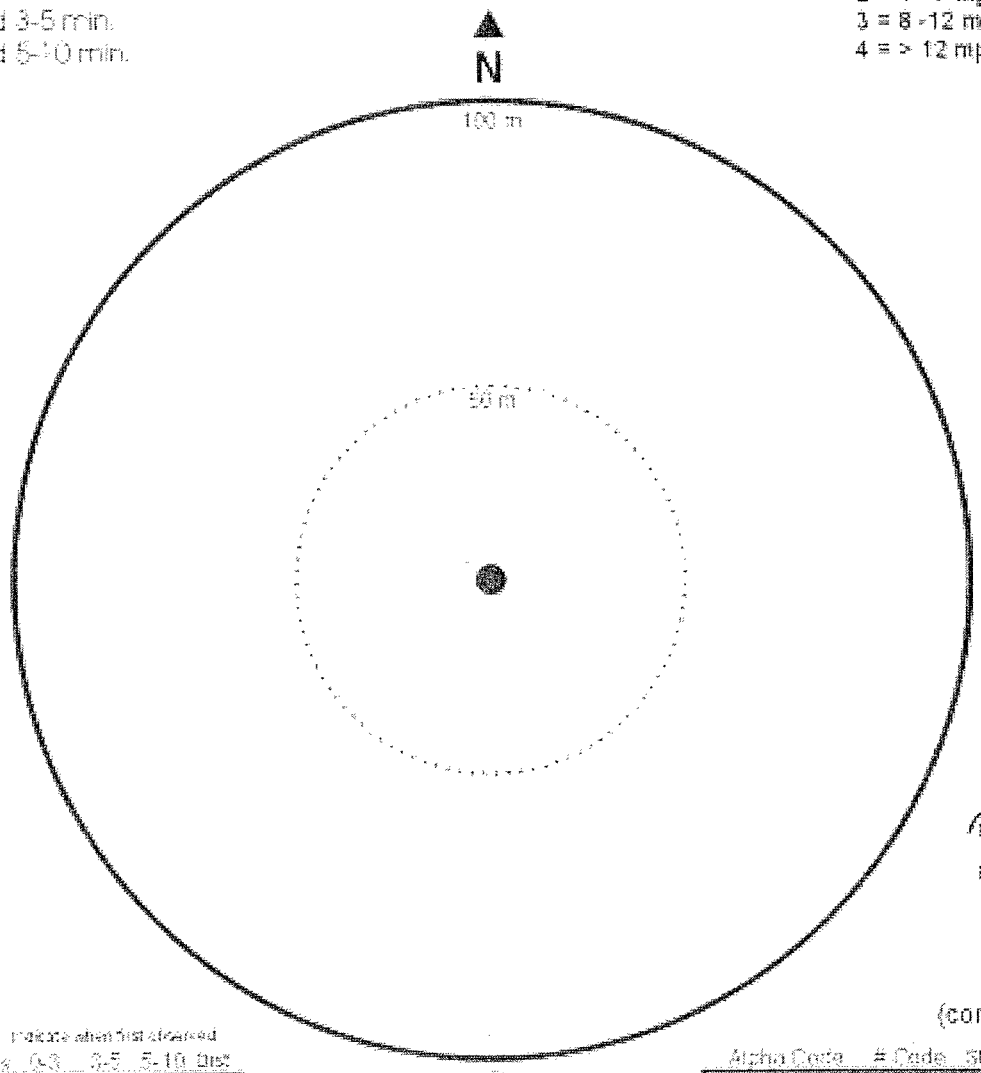
Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✔ = first observed 3-5 min.
BTBW ✘ = first observed 5-10 min.

Notes:

None Observed



Status
juvenile = J
nest = N
flyover = X
BTBW observed = O (sex unknown)

Indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Status
singing male = S
male (seen) = M
female (seen) = F
pair together = P
calling (? sex) = C
change in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State | SiteID | Latitude | Longitude | Habitat Type

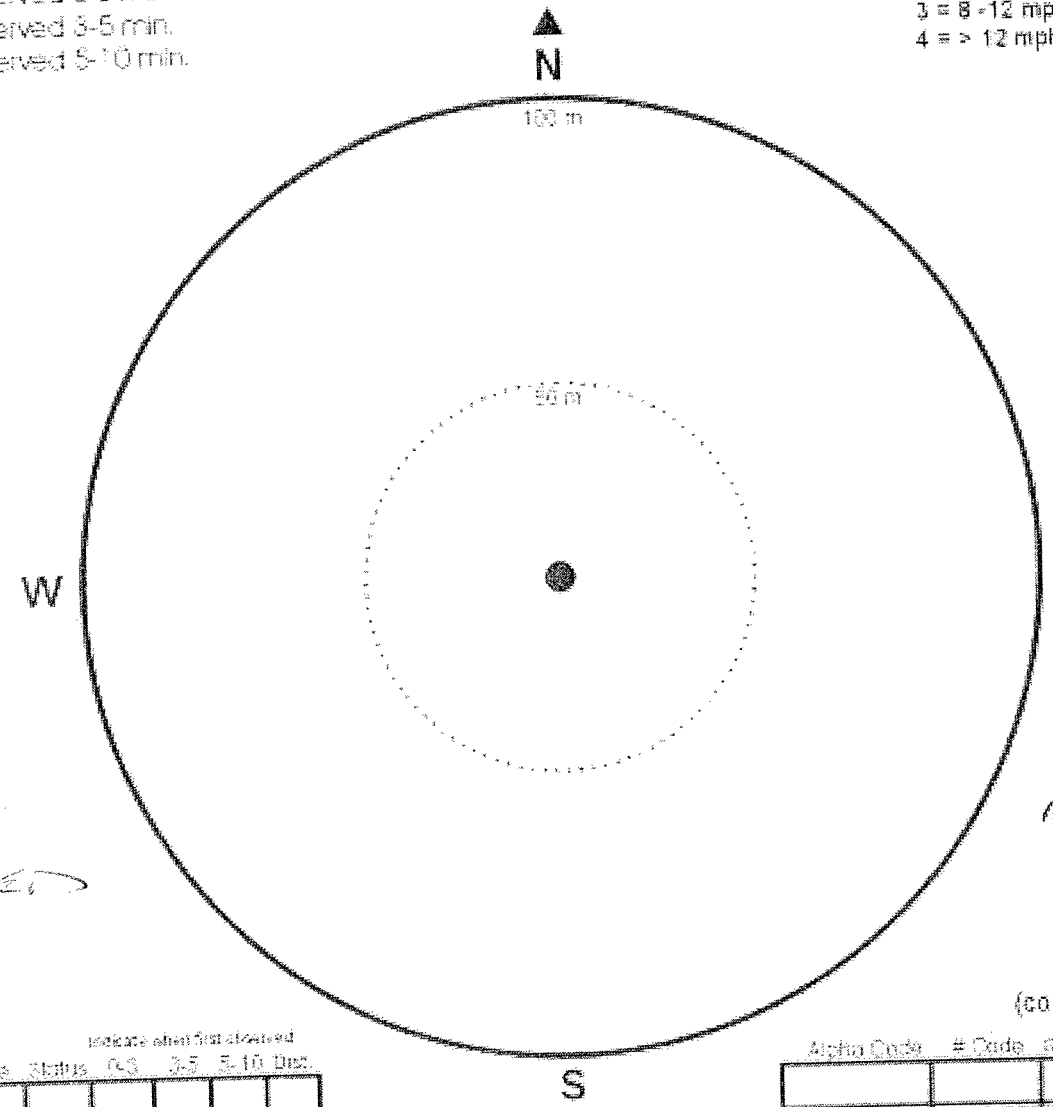
Month | Day | Year | Time | Observer(s) | Temp. | Wind | Sky

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



NONE

OBSERVER

Status
juvenile = J
nest = N
flyover = X
observed = O (sex unknown)

Indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Status
singing male = S
male (song) = M
female (song) = F
pair together = P
calling (? sex) = C
change in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T3-5			DISTURBED SAGE

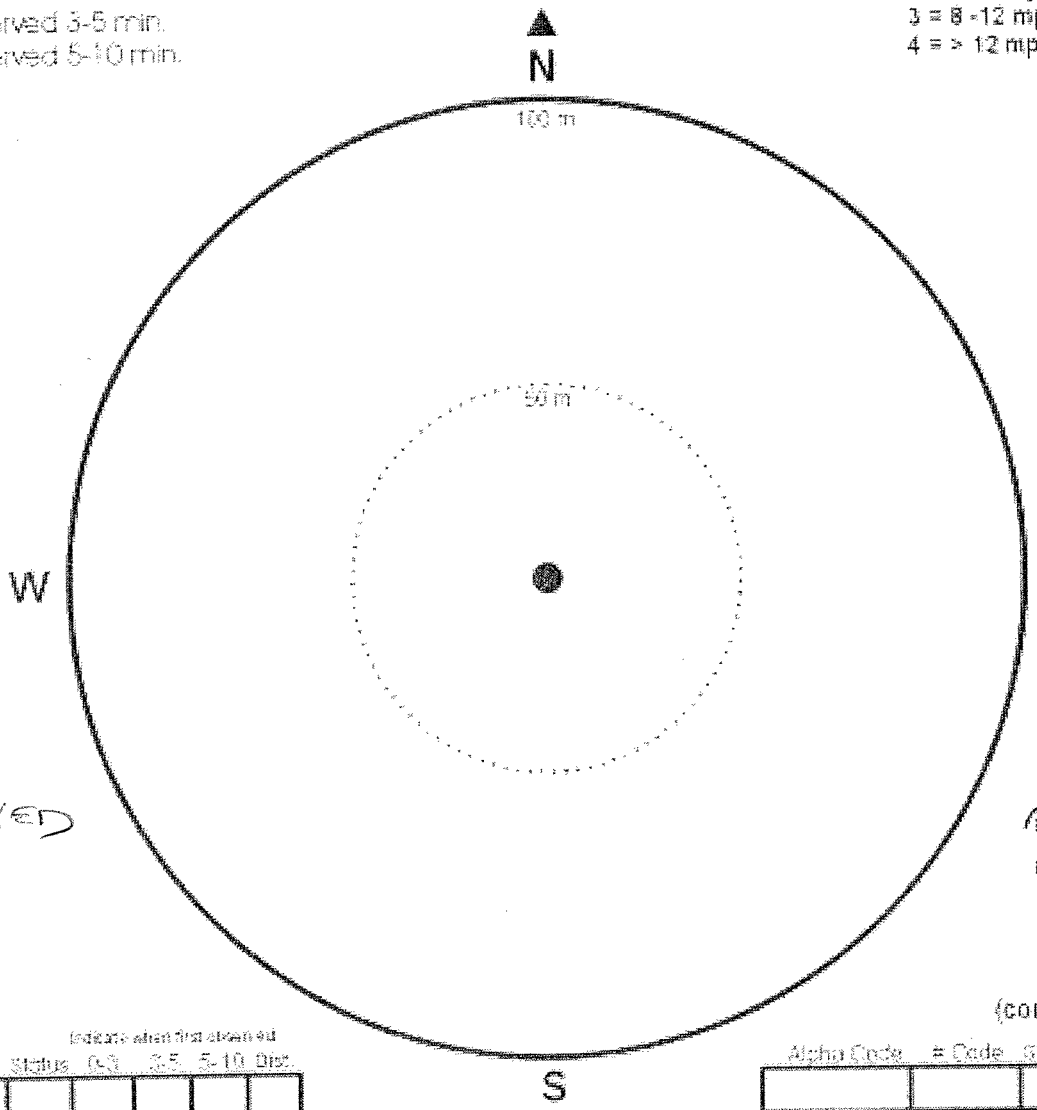
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
1	16	08	1129	JM, MZ	12°F	3	◠

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✔ = first observed 3-5 min.
BTBW ✘ = first observed 5-10 min.

Notes:



NONE OBSERVED

Status
- juvenile = J
- nest = N
- flyover = X
- observed = O (sex unknown)

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

(indicate when first observed)

Dist. = minimum distance from observer

Status
- singing male = S
- male (Song) = M
- female (Song) = F
- pair together = P
- calling (10 sec) = C
- change in position
- simultaneous song of 2 males

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T3-7			Big Sagebrush

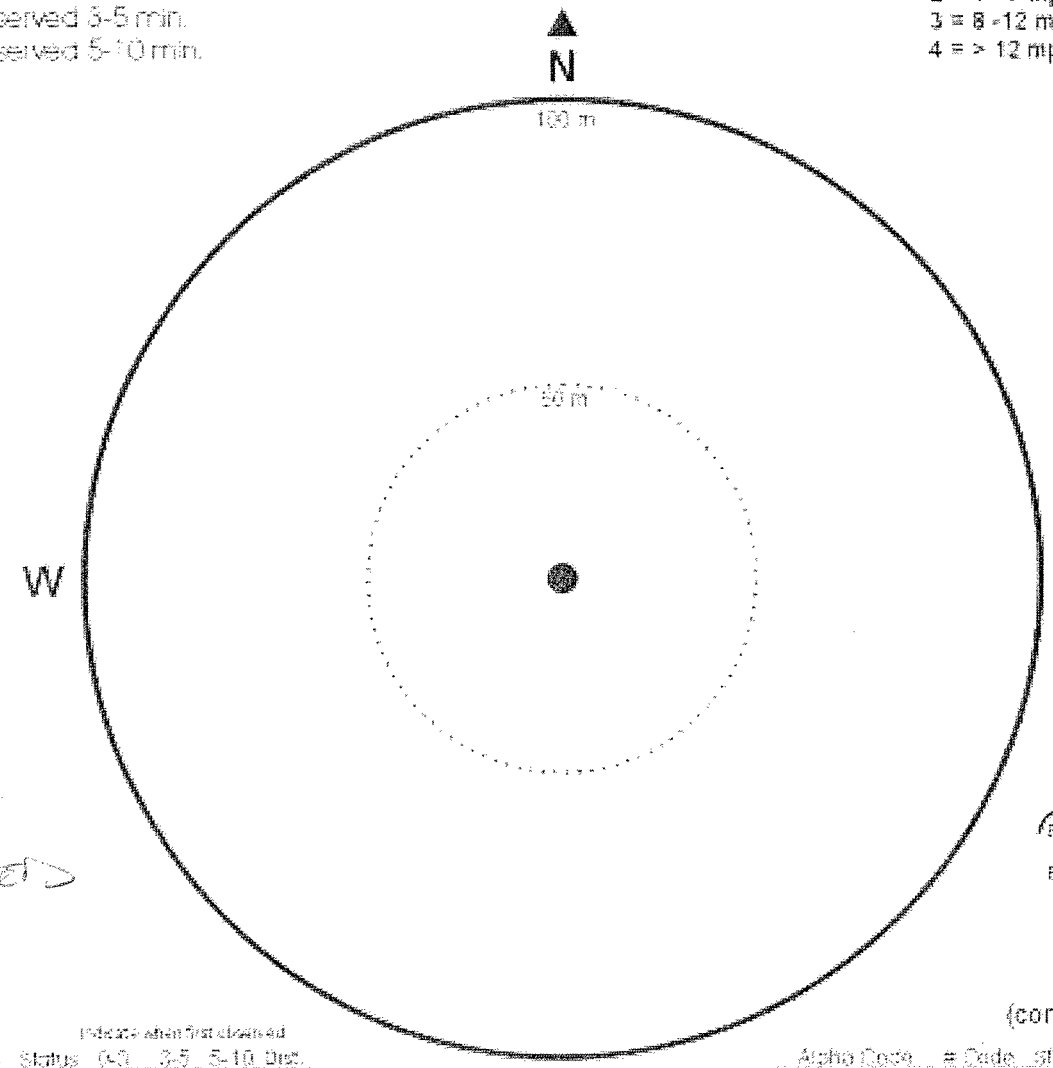
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
1	16	08	1307	JM, MZ	20°F	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



None Observed

Status
juvenile = J
nest = N
flyover = X
BTBW observed = O (sex unknown)

Indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer.

Status
singing male = S
male (silent) = M
female (silent) = F
pair together = P
calling (♂ or ♀) = C
change in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer.

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T3-9			Disturbed Site

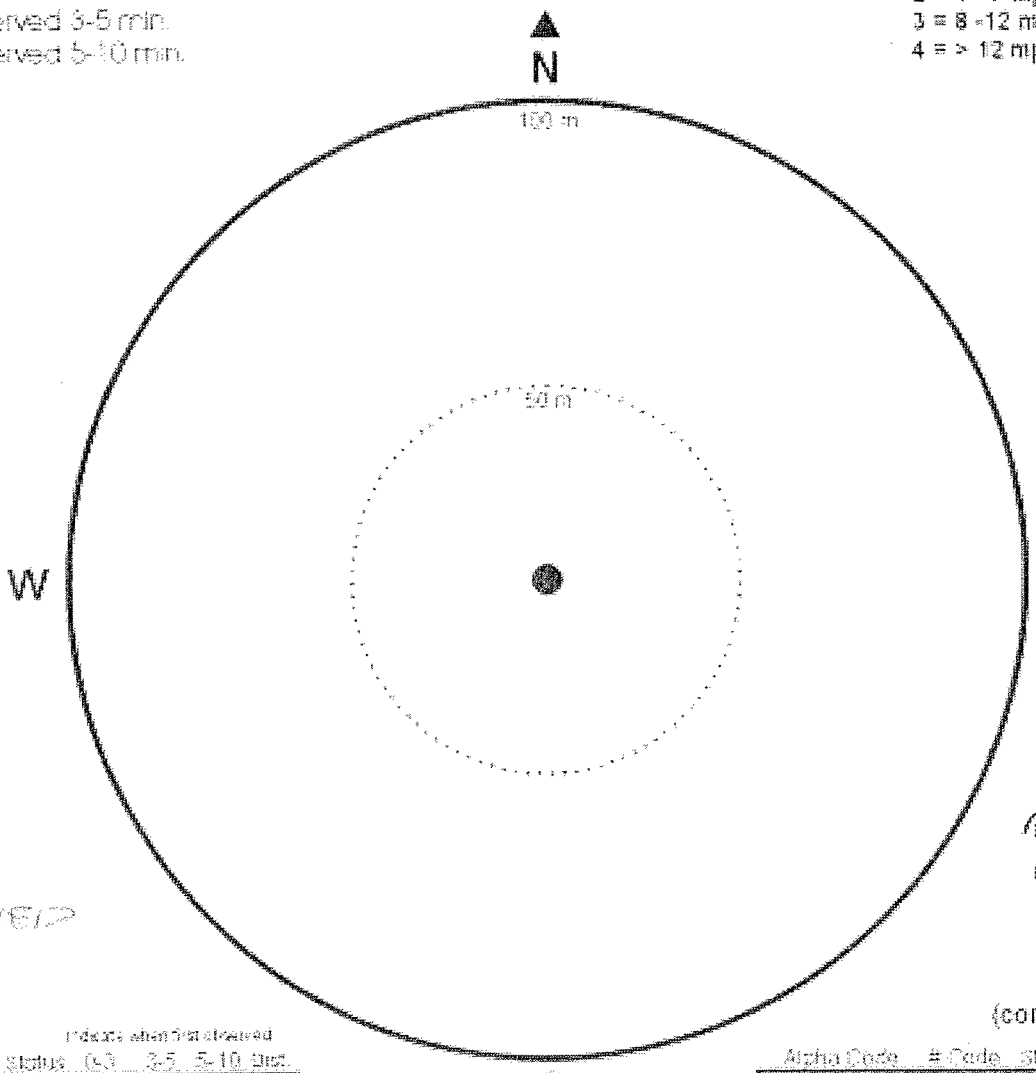
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
1	16	08	1511	JM MZ LB	20°	2	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



NO BIRDS OBSERVED

Status
juvenile = J
nest = N
flyover = X
observed = O (sex unknown)

Indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Status
singing male = S
male (silent) = M
female (silent) = F
pair together = P
calling (♂/♀ sex) = C
changes in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T5-3			

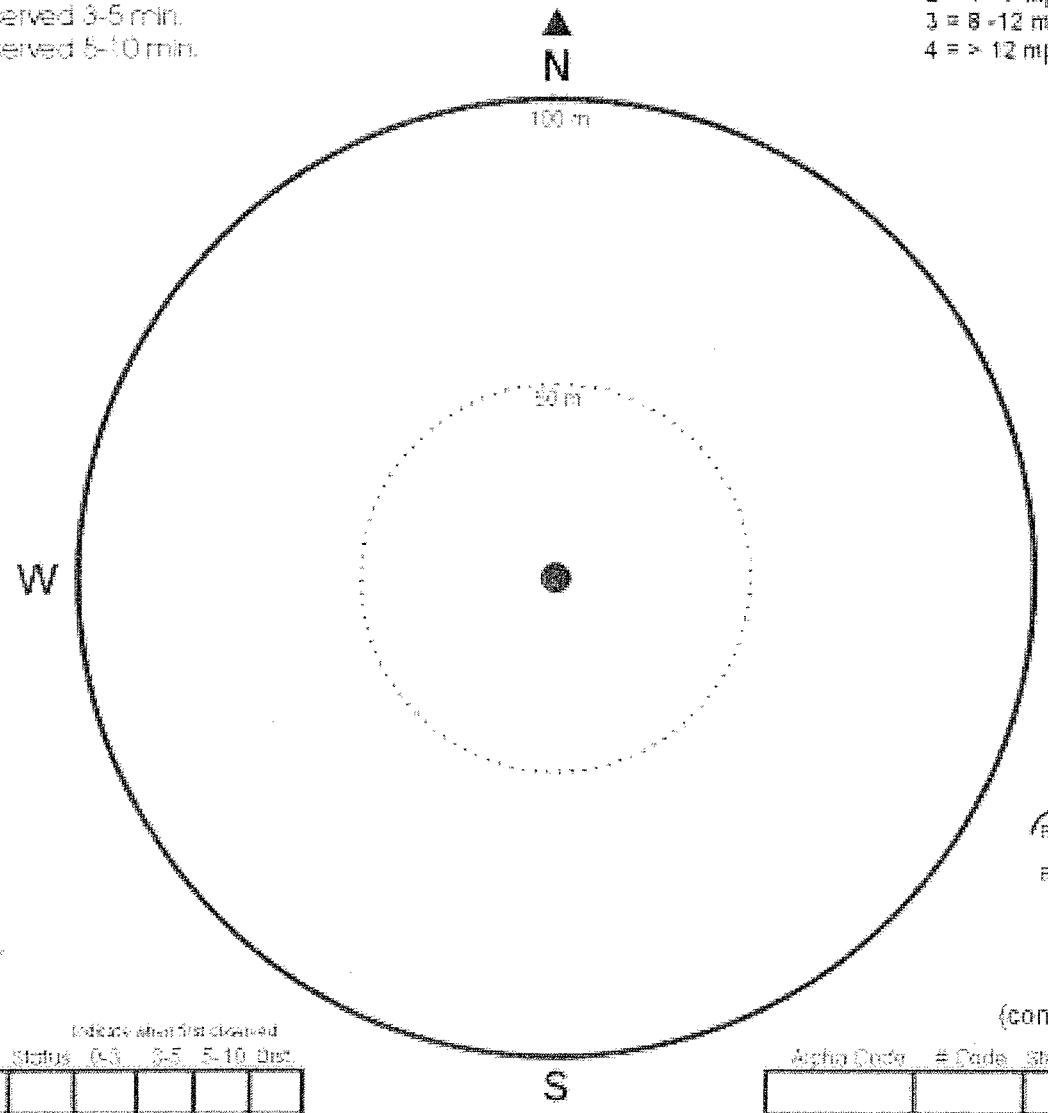
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
1	16	08	1004	JM, MZ	12°F	3	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



NONE OBSERVED

Status
juvenile = J
nest = N
flyover = X
observed = O (sex unknown)

Indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Status
singing male = S
male (silent) = M
female (silent) = F
pair together = P
calling (?? sex) = C
changes in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T5-5			BIG SAGE SHRUBLAND

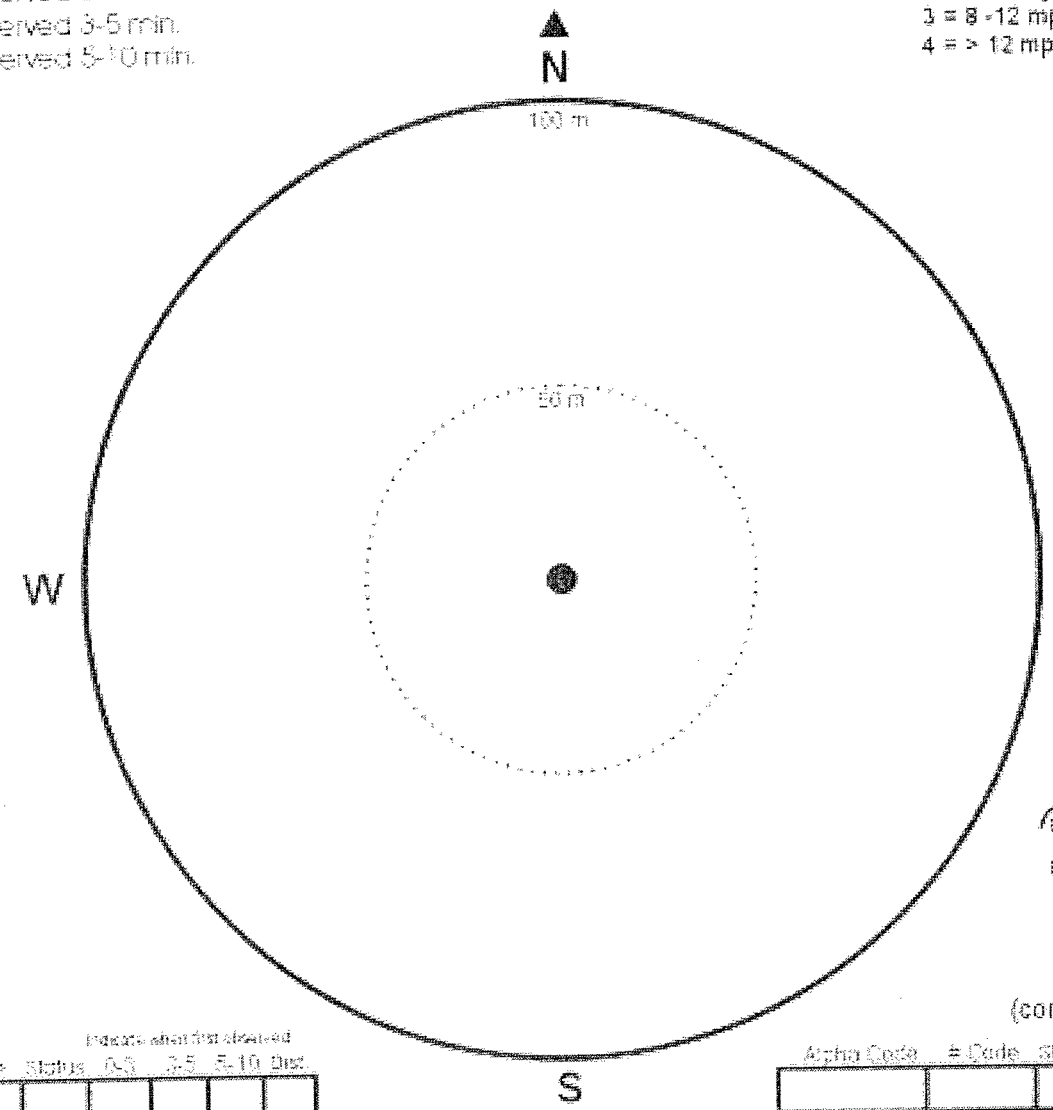
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
1	16	08	1105	JM, MZ	12°F	2	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



None Observed

Status
juvenile = J
nest = N
flyover = X
BTBW observed = O (sex unknown)

(continued)

Alpha Code	# Code	Status	Indicate when first detected 0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Status
singing nearby = S
male (seen) = M
female (seen) = F
pair together = P
calling (? sex) = C
change in position
simultaneous singing of 2 males

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m; 2 = 50 - 100 m; 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T5-7			Big Cage Shrubs

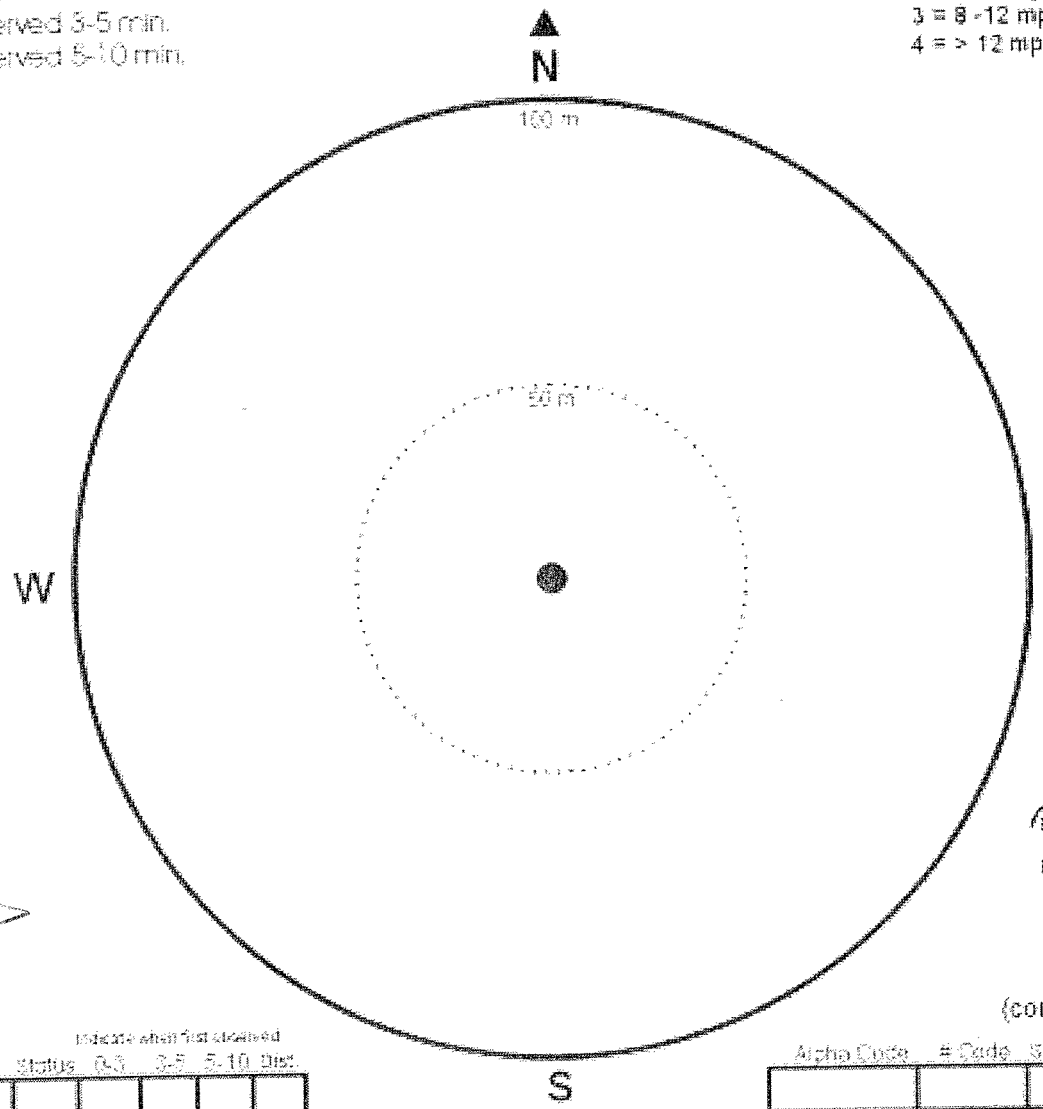
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
1	16	08	1332	JM, MZ	20°F	0	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



NONE OBSERVED

Status
- juvenile = J
- nest = N
- flyover = X
- observed = O (sex unknown)

(continued)

Alpha Code	4 Code	Status	Indicate when first observed 0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Status
- singing male = S
- male (sex?) = M
- female (sex?) = F
- pair together = P
- calling (?° sex) = C
- changes in position
- simultaneous song of 2 males

Alpha Code	4 Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T5-9			BIG SAGE

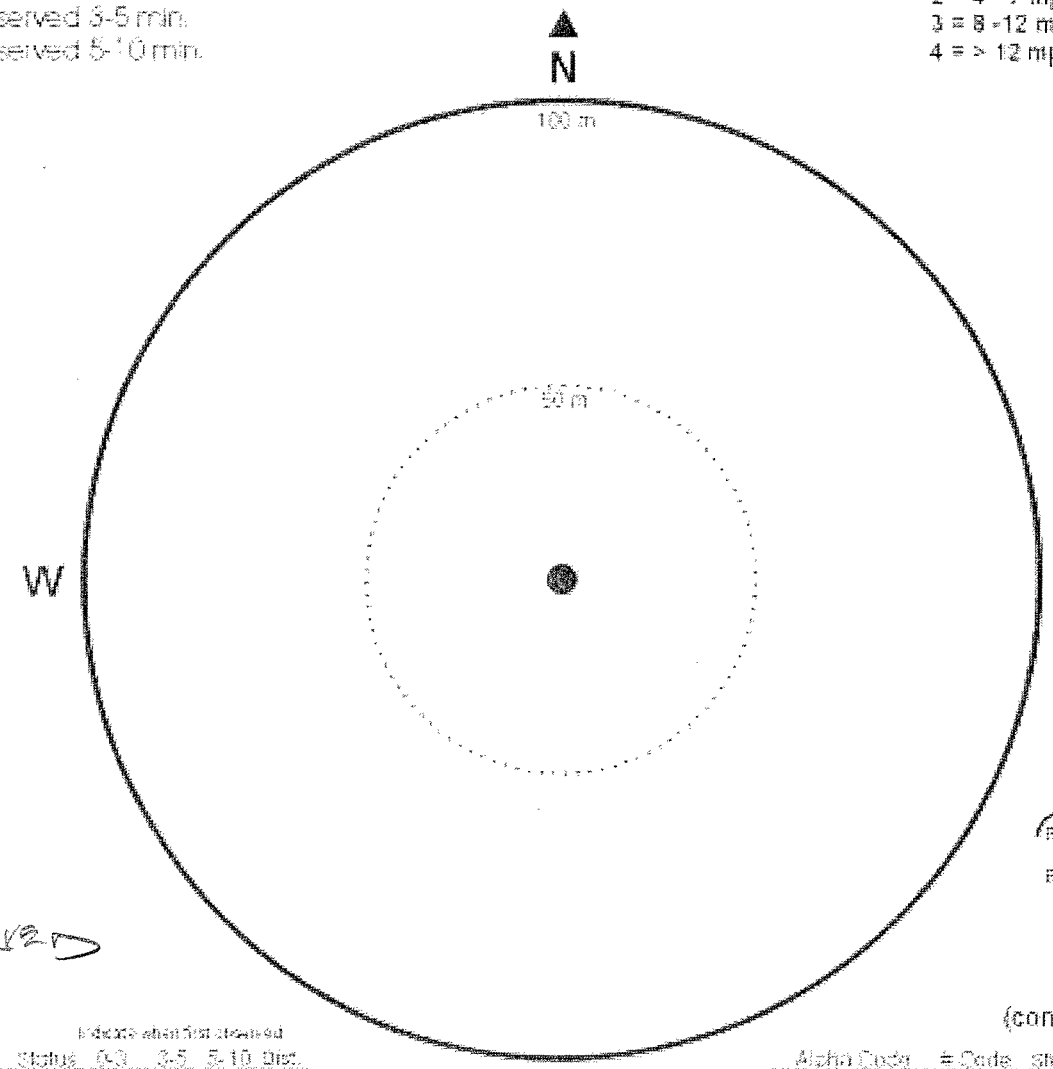
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
1	16	08	1443	JM, MZ	20°F	0	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✔ = first observed 3-5 min.
BTBW ✘ = first observed 5-10 min.

Notes:



NONE OBSERVED

Status
Juvenile = J
Nest = N
BTBW flyover = X
BTBW observed = O (sex unknown)

Indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Status
singing male = S
male (silent) = M
female (seen) = F
pair together = P
calling (?? sex) = C
changes in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T7-1			DST. GRASS

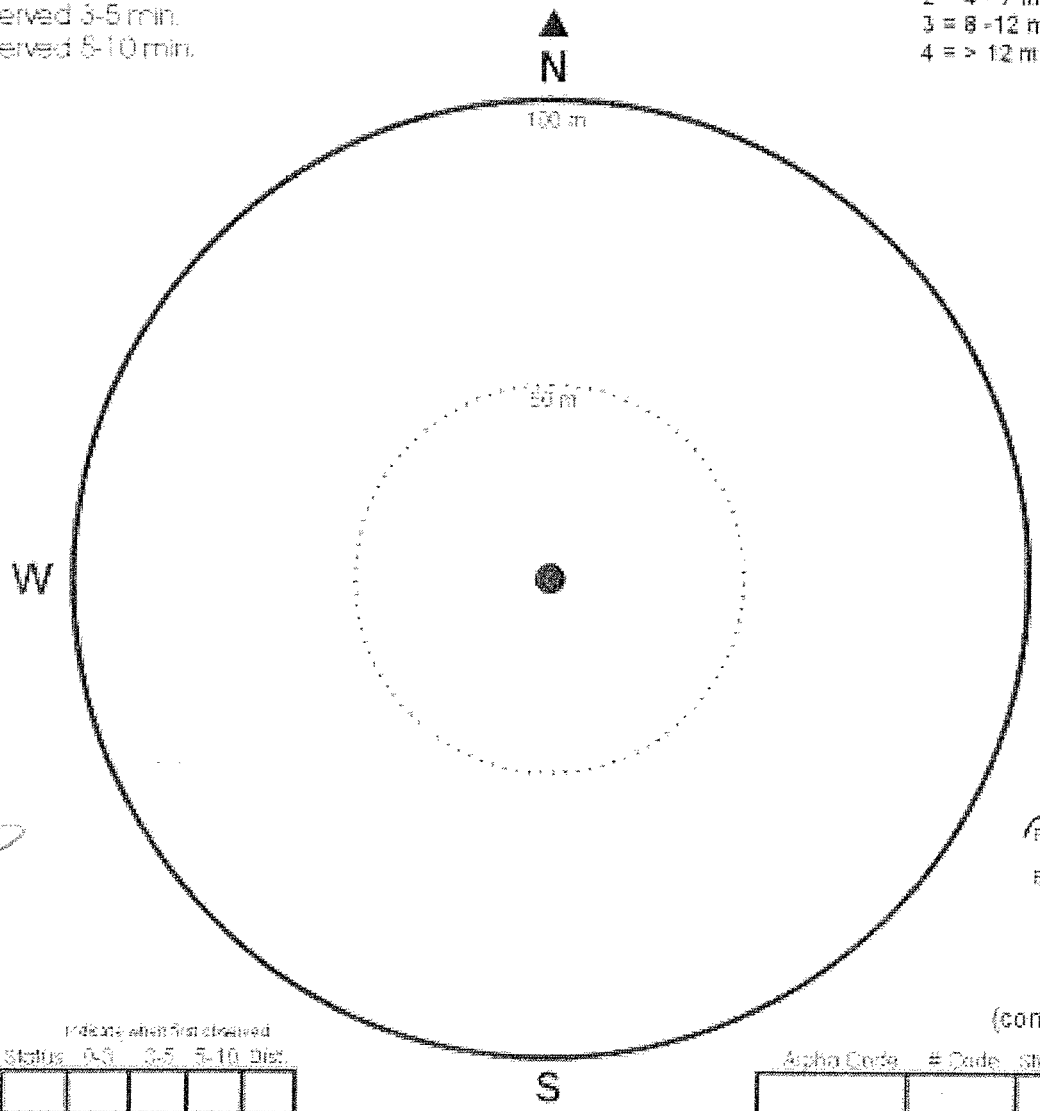
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
7	16	08	1025	MZ, JM	15°	Z	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



NONE OBSERVED

Status
- juvenile = J
- nest = N
- BTBW flyover = X
- BTBW observed = O (sex unknown)

Status
- singing male = S
- male (Song) = M
- female (Song) = F
- pair together = P
- calling (?? sec) = C
- BTBW → BTBW change in position
- BTBW + BTBW simultaneous song of 2 males

Indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T7-5			DISTURBED GRASSL

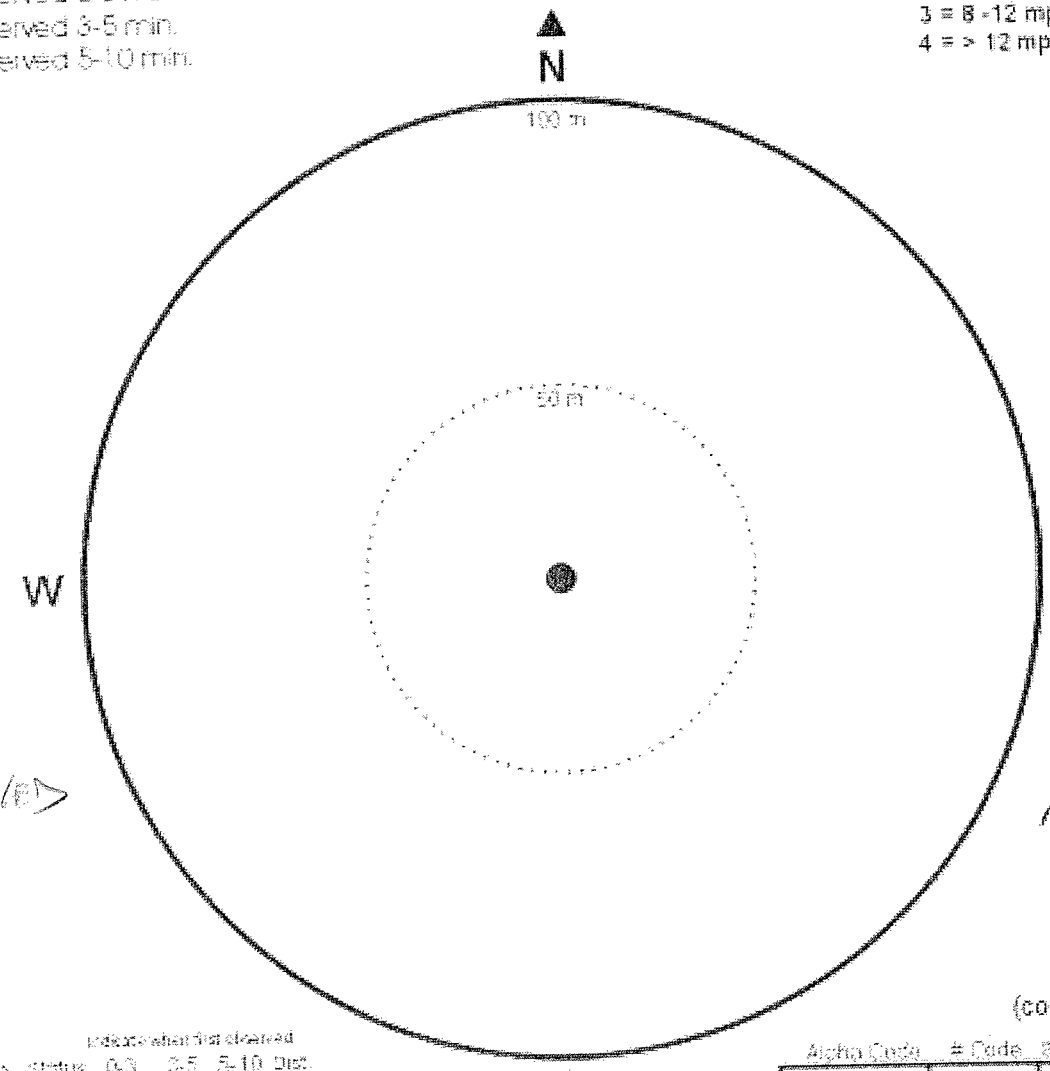
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
1	16	08	1039	JM, MZ	12°F	2	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✔ = first observed 3-5 min.
BTBW ✘ = first observed 5-10 min.

Notes:



NONE OBSERVED

Status
juvenile = J
nest = N
flyover = X
observed = O (sex unknown)

(continued)

Alpha Code	# Code	Status	Indicate when first observed 0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer. 1 = < 50 m; 2 = 50 - 100 m; 3 = > 100 m

Status
singing male = S
male (silent) = M
female (silent) = F
pair together = P
calling (? sex) = C
change in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer. 1 = < 50 m; 2 = 50 - 100 m; 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T7-7			ROADSIDE ADS BIG SAGE

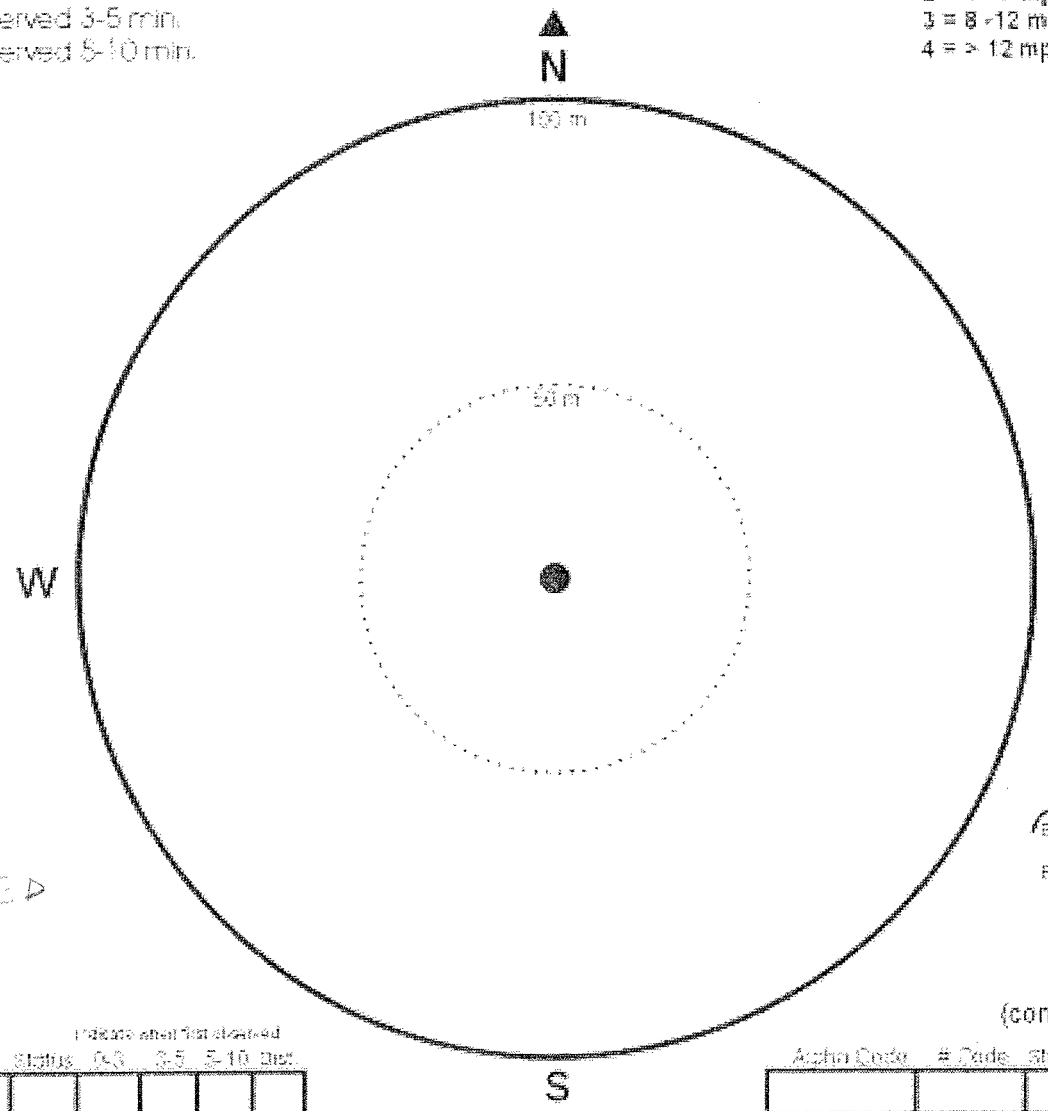
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
1	16	09	1357	JM, MZ	20°F	0	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✔ = first observed 3-5 min.
BTBW ✘ = first observed 5-10 min.

Notes:



NONE OBSERVED

Status
juvenile = J
nest = N
flyover = X
observed = O (sex unknown)

Alpha Code	# Code	Status	Indicate when first observed 0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Status
singing male = S
male (song) = M
female (seen) = F
pair together = P
calling (?'s sex) = C
changes in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T7-9			BIG SAGEBRUSH

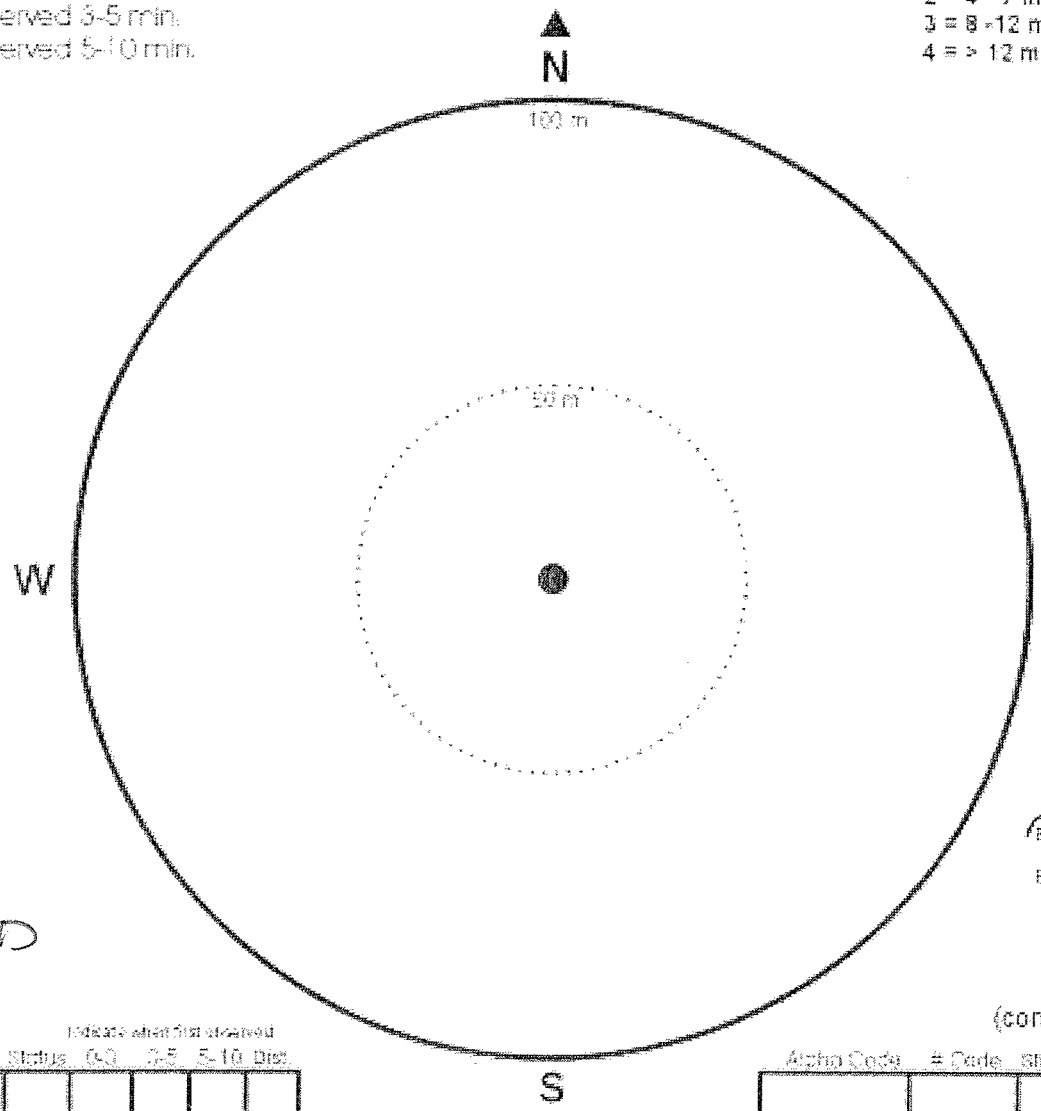
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
1	16	08	1417	JM, MZ	20°F	0	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



NONE OBSERVED

Status
juvenile = J
nest = N
flyover = X
BTBW observed = O (sex unknown)

Status
singing male = S
male (silent) = M
female (seen) = F
pair together = P
calling (not seen) = C
changes in position
simultaneous song of 2 males

Indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T1-3			RS on steep slope

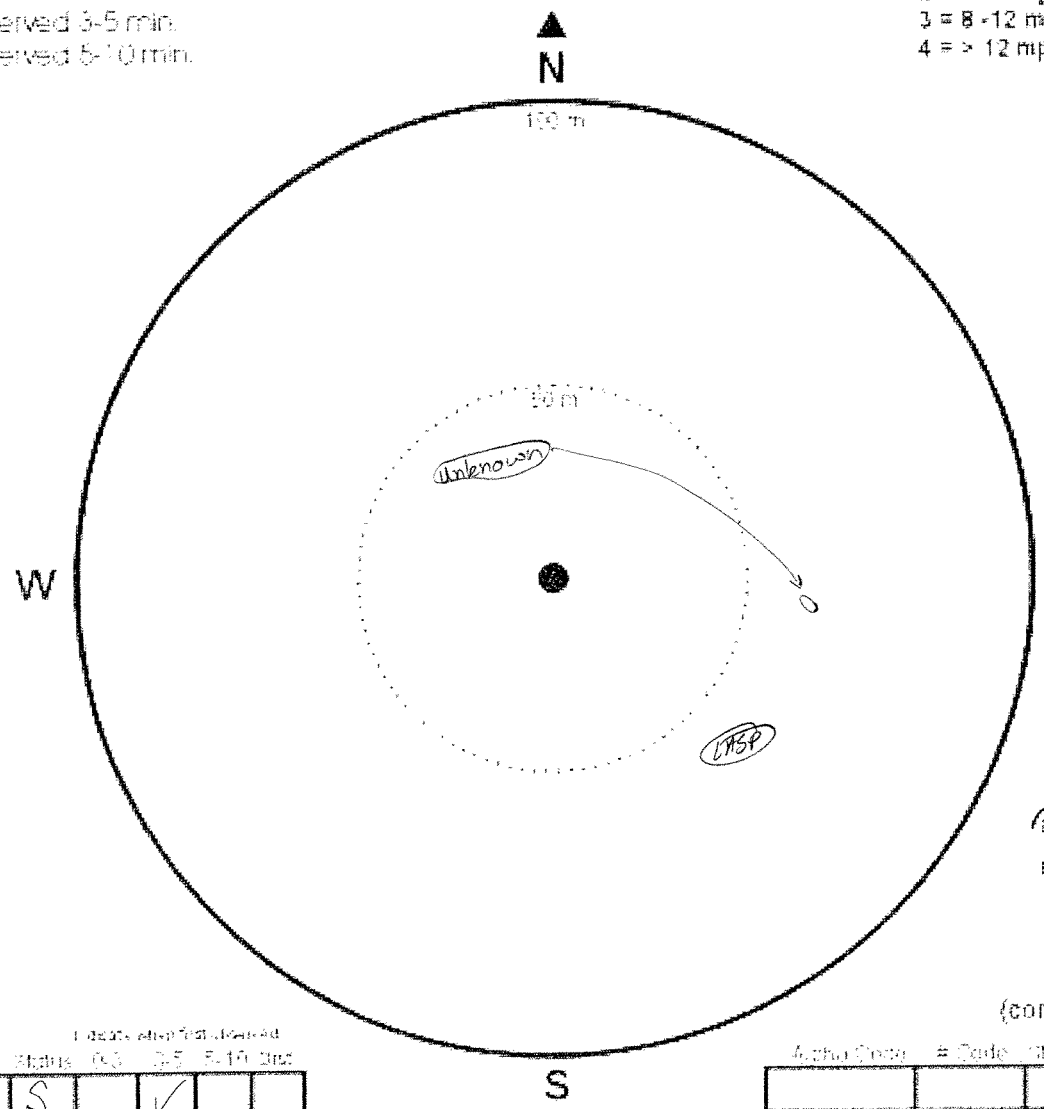
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	19	08	12:10	Meyer / Jones	70s	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
BTBW = X
BTBW observed = ○

Species	# Birds	Status	0-3	3-5	5-10	Dist.
Unknown		S		✓		
LASP		S			X	

Status
singing male = S
mated pair = M
female (nest) = F
pair together = P
calling (no see) = C
changes in position
simultaneous song of 2 males

(continued)

Species	# Birds	Status	0-3	3-5	5-10	Dist.

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T1-5			GRASSLAND

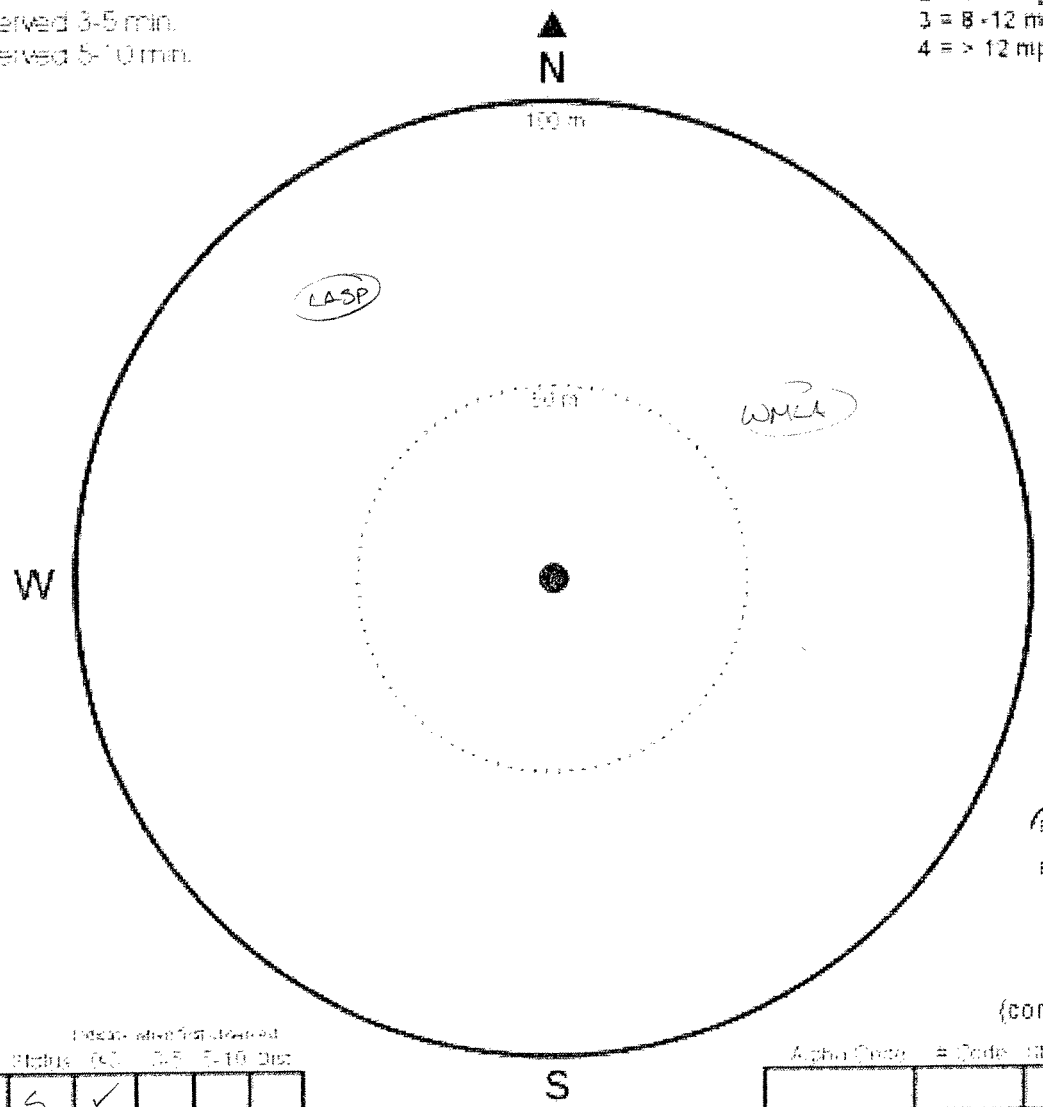
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
05	19	08	3:15	MEYER, JONES	90°F	2	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
J = juvenile
N = nest
X = banded
O = observed (band unknown)

Alpha Code	# Birds	Status	Distance (m) first observed: 0-3	3-5	5-10	10+
LASP		S	✓			
WMLA		S	✓			

Status
S = singing male
M = male displaying
F = female/juvenile
P = pair together
C = calling (?) sex
= changes in position
= vocal dominance song of 2 males

(continued)

Alpha Code	# Birds	Status	Distance (m) first observed: 0-3	3-5	5-10	10+

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T-7			Grassland

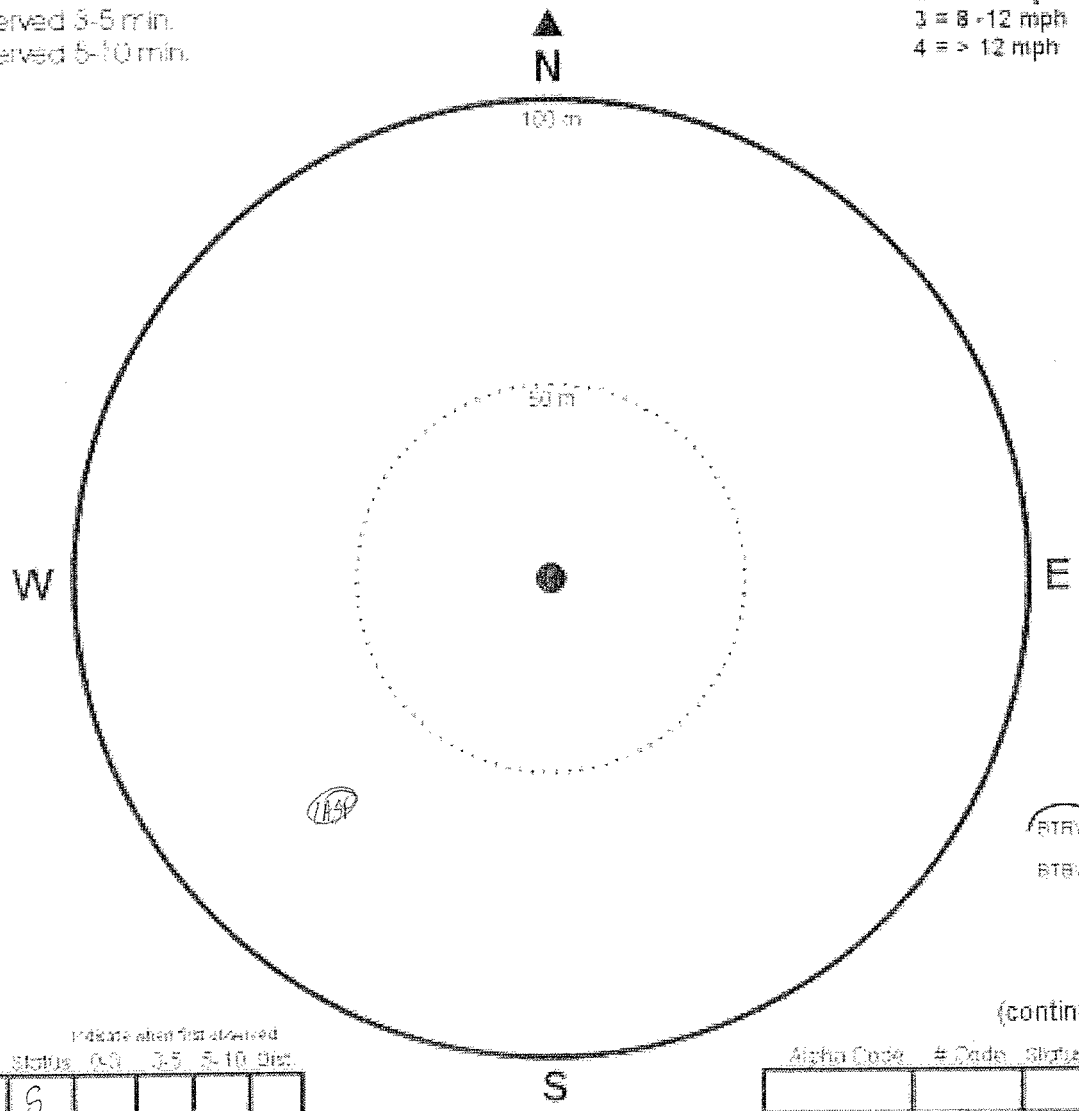
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	19	80	6:05	J. Myers / R. Jones	80s	0	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
flyover = X
observed = O (sex unknown)

Please check first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.
LASP		S				

Dist. = minimum distance from observer

Status
singing male = S
male (silent) = M
female (silent) = F
pair together = P
calling (? sex) = C
change in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T1-9			Grassland

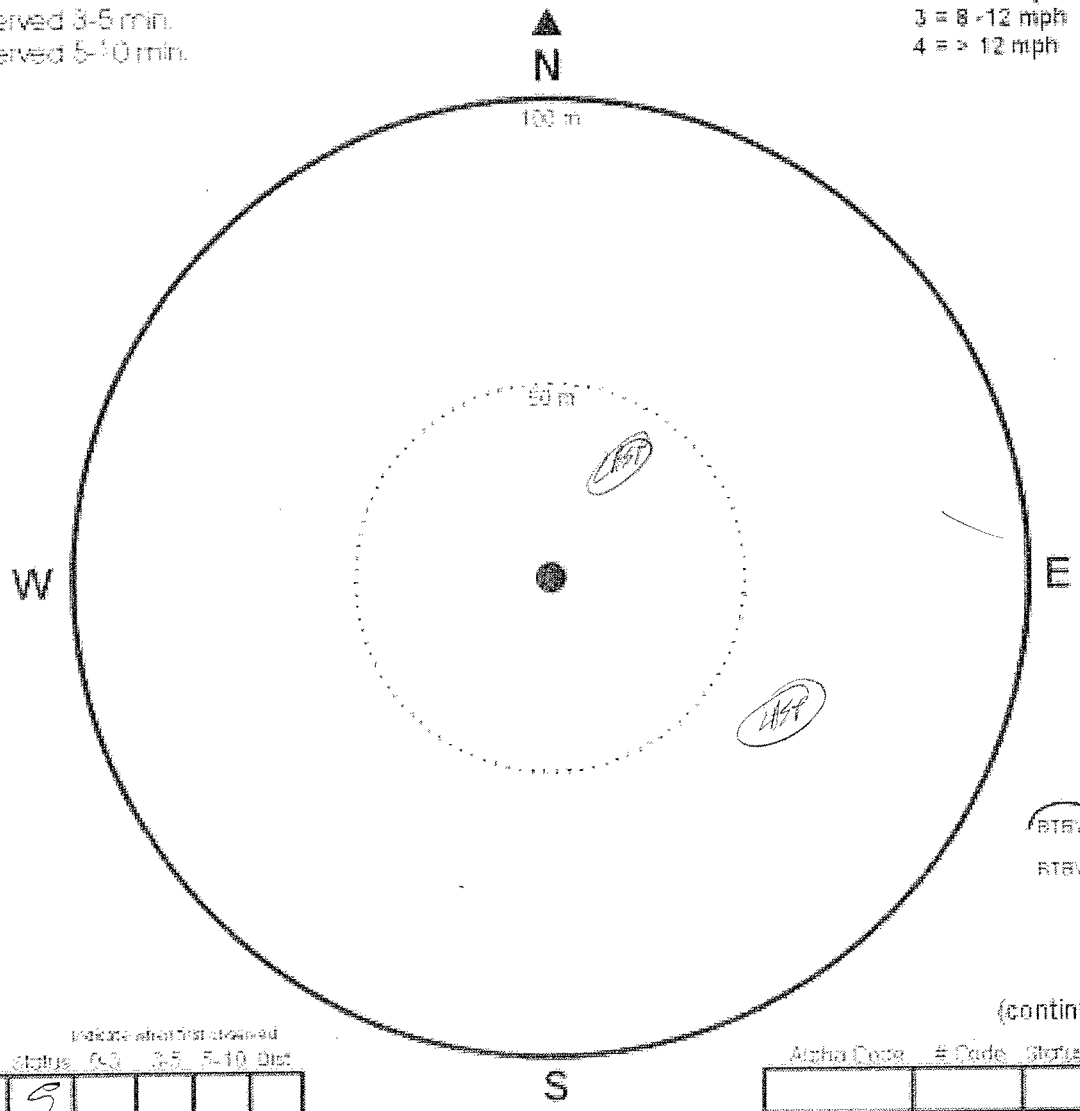
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	20	08	11:20	R. Jones	78°F	1	0

0 = none
1 = 1 - 3 mph
2 = 4 - 7 mph
3 = 8 -12 mph
4 = > 12 mph

0 = < 10% clouds
1 = partly cloudy
2 = mostly cloudy
3 = overcast
4 = raining

BTBW = first observed 0-3 min.
BTBW ✔ = first observed 3-5 min.
BTBW ✘ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
flyover = X
observed = O (sex unknown)

indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.
LASP		S				
LASP		S		✓		

Dist. = minimum distance from observer

Status
singing male = S
male (silent) = M
female (silent) = F
pair together = P
calling (?? sex) = C
change in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T2-2			Sagebrush Grassland

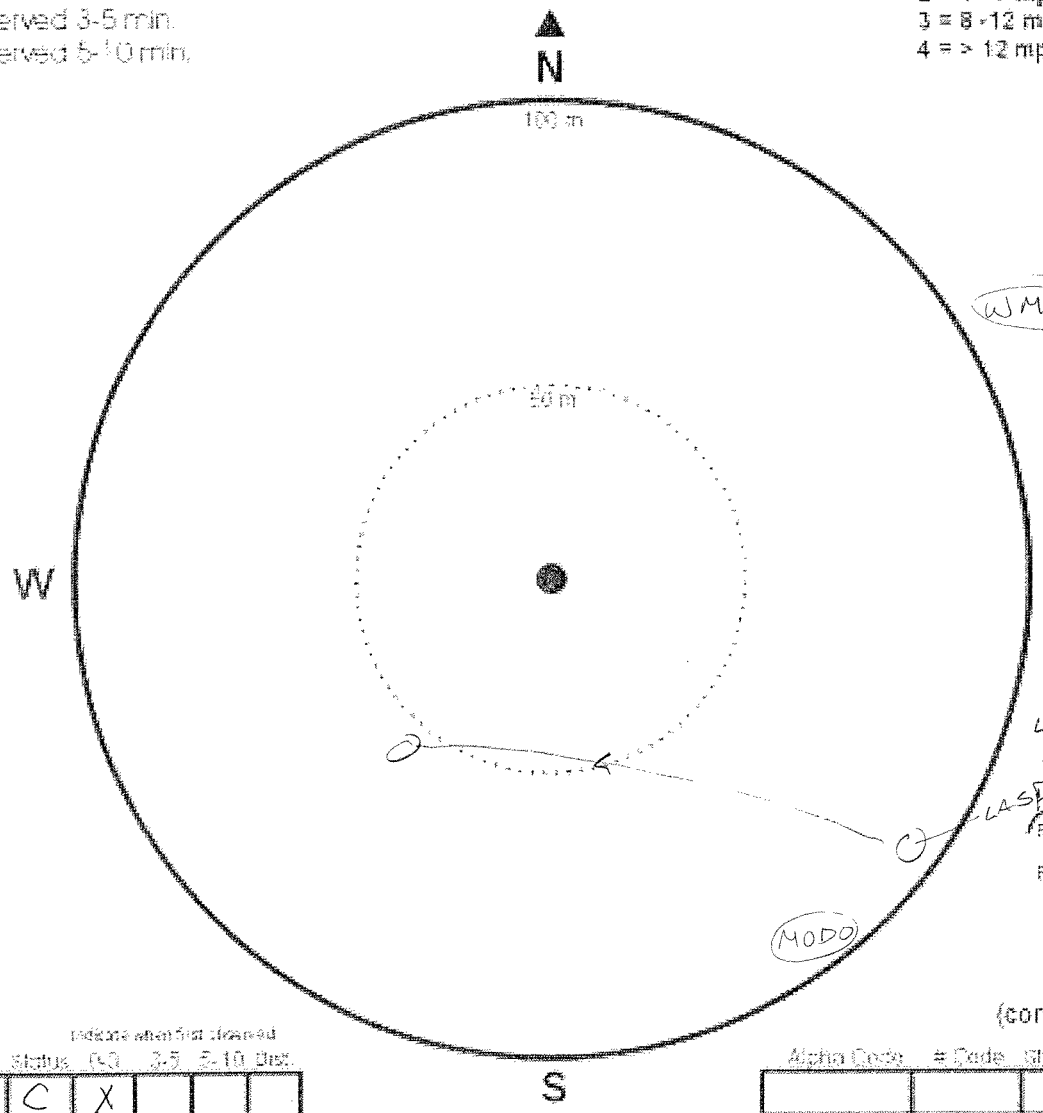
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
05	19	08	0837	RJ JM	70°F	0	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
- LASP/Sprague's Pipit = J
- nest = N
- flyover = X
- observed = O (sex unknown)

Alpha Code	# Code	Status	indicate when first observed 0-3	3-5	5-10	Dist.
MODO		C	X			
WMLA		S	✓			
LASP		M			×	

Dist. = minimum distance from observer

Status
- singing male = S
- male (seen) = M
- female (seen) = F
- pair together = P
- calling (?!? sex) = C
- change in position
- simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T2-4			Grassland

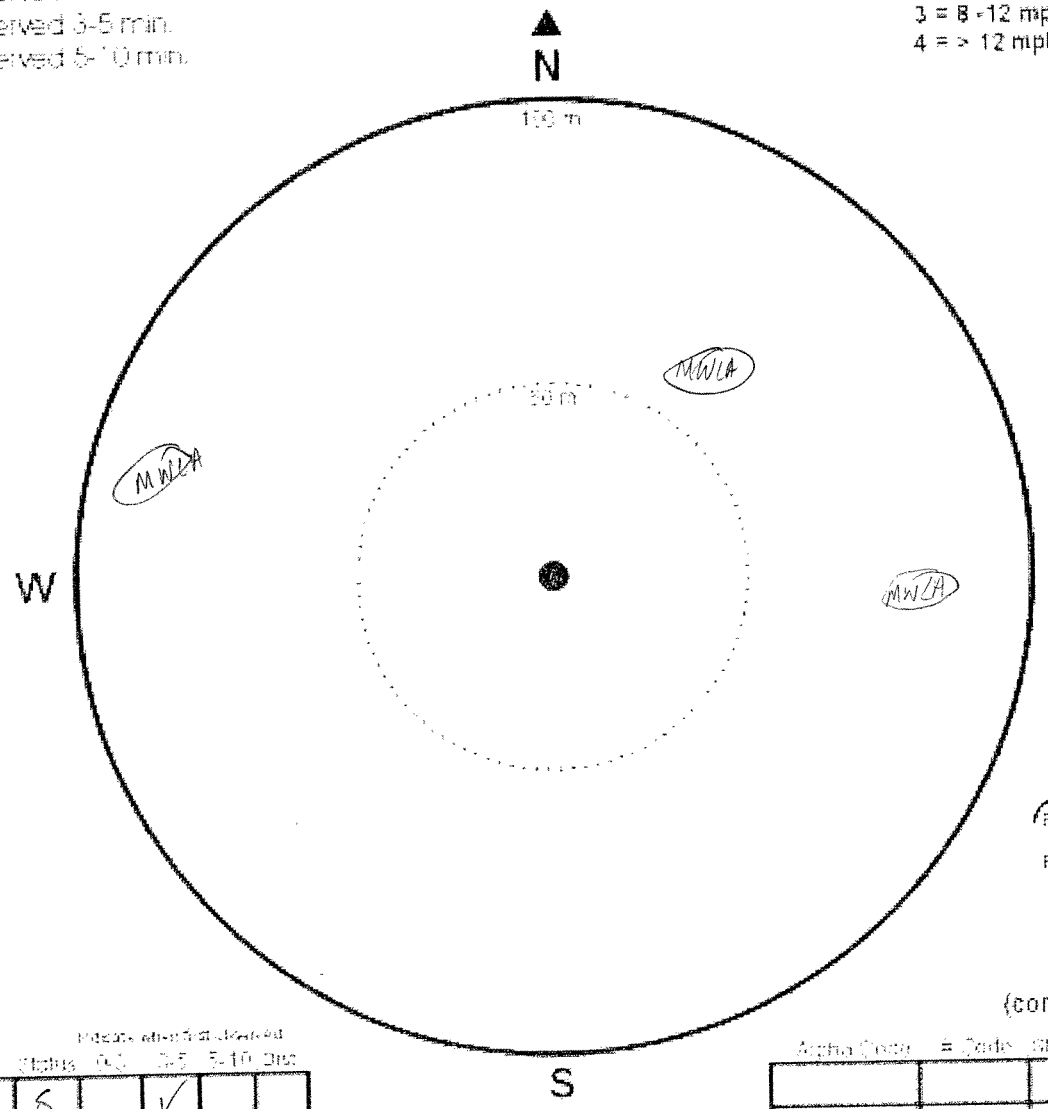
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
05	19	08	12:58	Meyer / Jones	90s	2	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
flyover = X
observed = O
(seen, unknown)

Alpha Code	= Code	Status	0-3	3-5	5-10	Dist
MWLA		S		✓		
MWLA		S		✓		
MWLA					X	

Status
singing male = S
singing male = M
female/juvenile = F
pair together = P
calling (flight) = C
changes in position
simultaneous song of 2 males

(continued)

Alpha Code	= Code	Status	0-3	3-5	5-10	Dist

Dist = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T2-6			

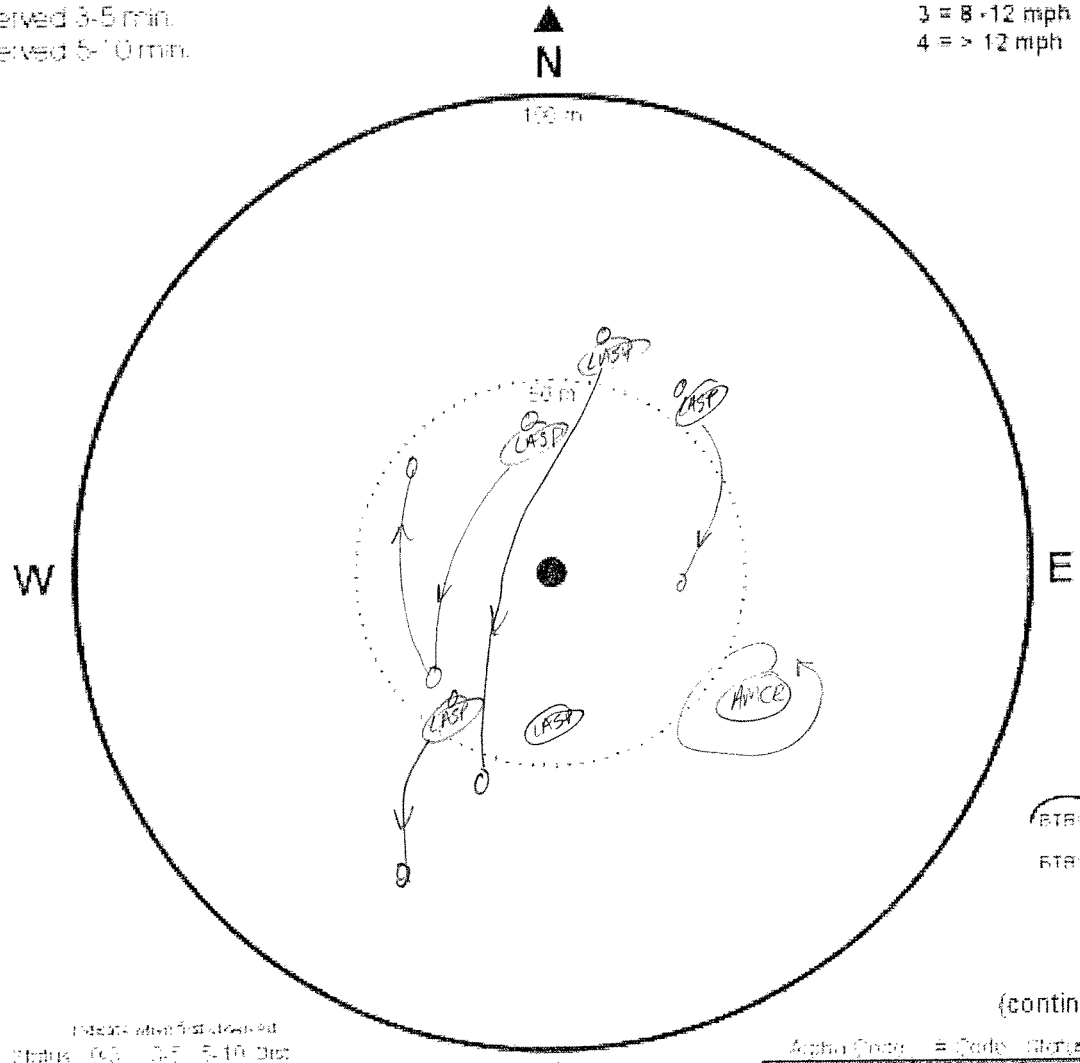
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	19	08	3:42	Meyer / Jones	68°	2	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
BTBW = X
BTBW observed = O
(year unknown)

Alpha Code	= Code	Status	Distance when first observed 0-3	3-5	5-10	Dist
LASP		S				
LASP		S				
LASP		S				
AMCR				✓		

Dist = maximum distance from observer

Status
singing male = S
mate guarding = M
female present = F
pair together = P
calling (no song) = C
change in location
vocal interaction (song of 2 males)

(continued)

Alpha Code	= Code	Status	Distance when first observed 0-3	3-5	5-10	Dist

Dist = maximum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T2-8			Sagebrush

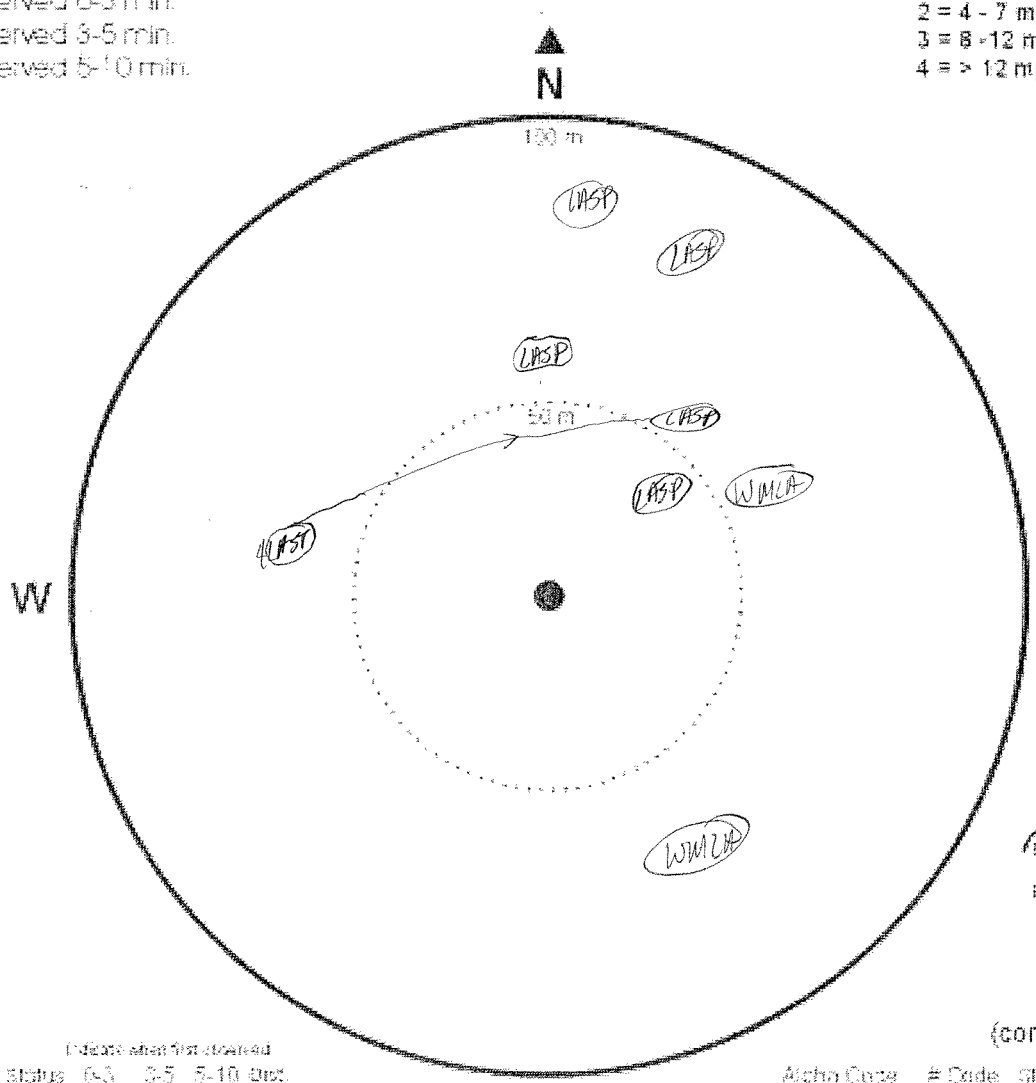
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	20	08	8:03	J. Meyer / R. Jones	170s	0	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✔ = first observed 3-5 min.
BTBW ✘ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
flyover = X
BTBW observed = ○ (sex unknown)

Indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.
WMLA		S				
WMLA		S				
LASP		S				
LASP		S				
LASP		S			X	
LASP		S			X	
LASP		S			X	
LASP		S			X	
LASP		S			X	
LASP		S			X	

Dist. = minimum distance from observer

Status
singing male = S
male (Solo) = M
female (Duet) = F
pair together = P
calling (1st sec) = C
change in position
simultaneous sing of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T3-1			RT steep slope

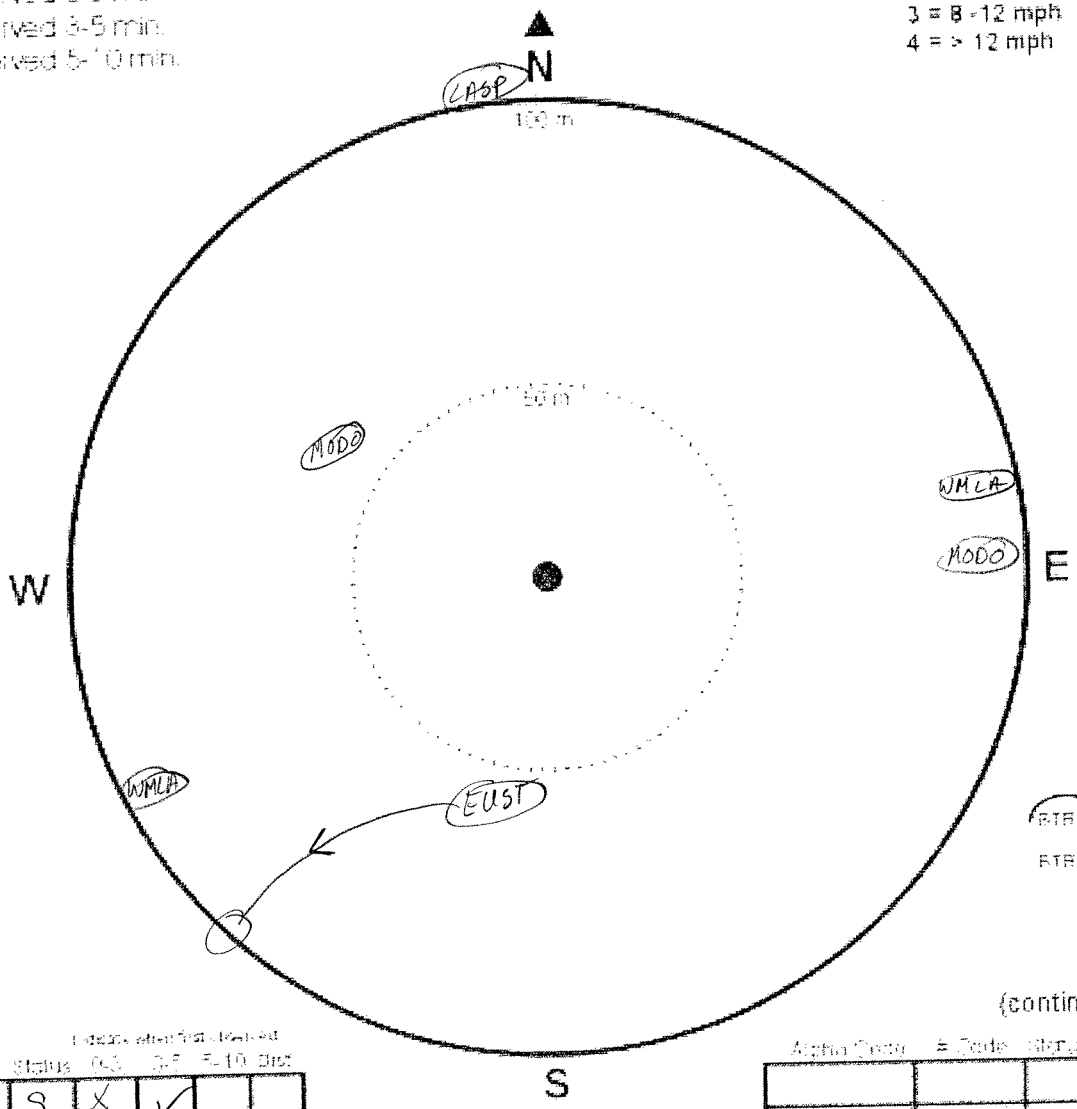
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	19	08	9:20	J. MEYER, R. JONES	70s	0	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
possible = J
nest = N
flyover = X
observed = O

Alpha Code	= Code	Status	0-3	3-5	5-10	Dist
LASP		S	X	✓		
MODO		C	X	✓		
WMLA		M	X	✓		
MODO		C			X	
WMLA		C			X	
EUST		C			X	

Dist = minimum distance from observer

Status
singing (this st...) = S
male (some...) = M
female (some...) = F
pair together = P
calling (20 sec) = C
changes in position
simultaneous song of 2 males

(continued)

Alpha Code	= Code	Status	0-3	3-5	5-10	Dist

Dist = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T3-3			Grassland

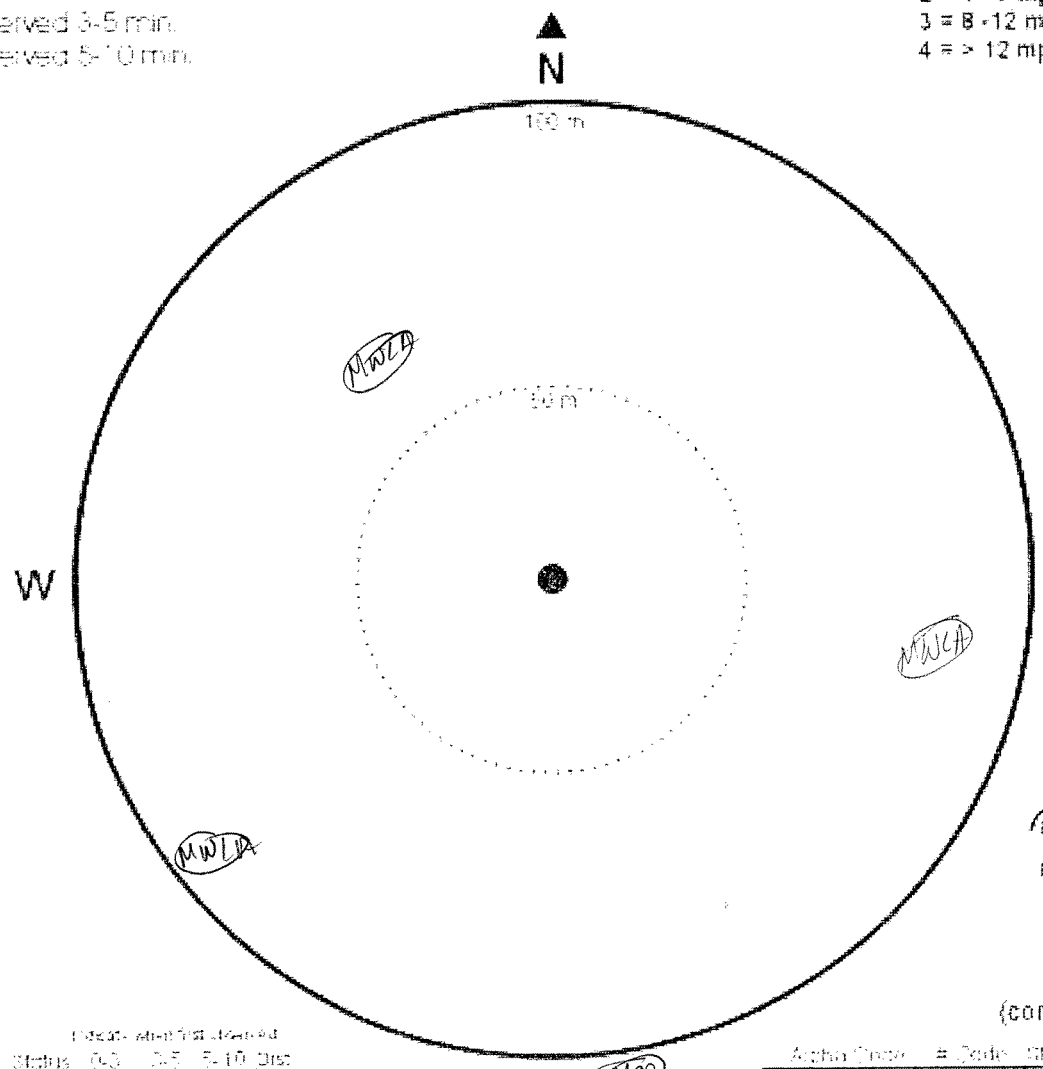
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
05	19	08	11:43	J. MEYER/BJUNES	80s	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
BTBW = X
BTBW = observed = O
(seen or heard)

Alpha Code	= Code	Status	0-3	3-5	5-10	Dist
MWLA		S				
MWLA		S				
MWLA		S				
LASP		S				
AMCR				✓		

Indicate when first observed

Status
singing male = S
mate guarding = M
female (present) = F
pair together = P
calling (2nd sex) = C
changes in position
simultaneous to song of 2 males

(continued)

Alpha Code	= Code	Status	0-3	3-5	5-10	Dist

Dist = nearest radial distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T3-5			Sagebrush

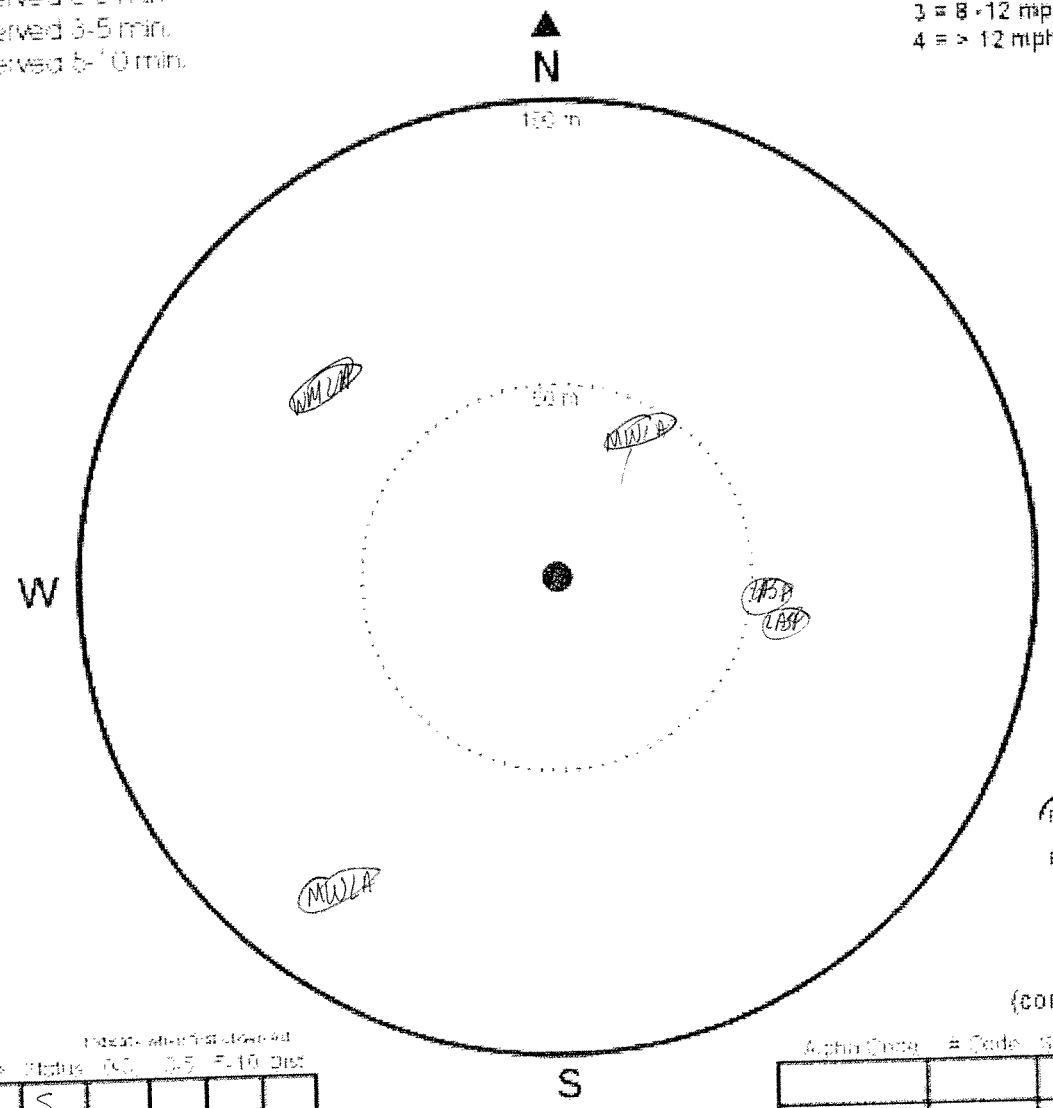
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	19	08	2:51	Meyer / Jones	↓ 90s	3	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
BTBW = X
BTBW observed = O
(year unknown)

Alpha Code	4-Code	Status	0-3	3-5	5-10	Dist.
WMLA		S				
WMLA		S		✓		
WMLA		S			X	
LASP		S			X	
LASP		S			X	

Distance = minimum distance from observer

Status
singing male = S
male carrying = M
female present = F
pair together = P
calling (no bird) = C
change in position
simultaneous song of 2 males

(continued)

Alpha Code	4-Code	Status	0-3	3-5	5-10	Dist.

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T3-7			Sagebrush

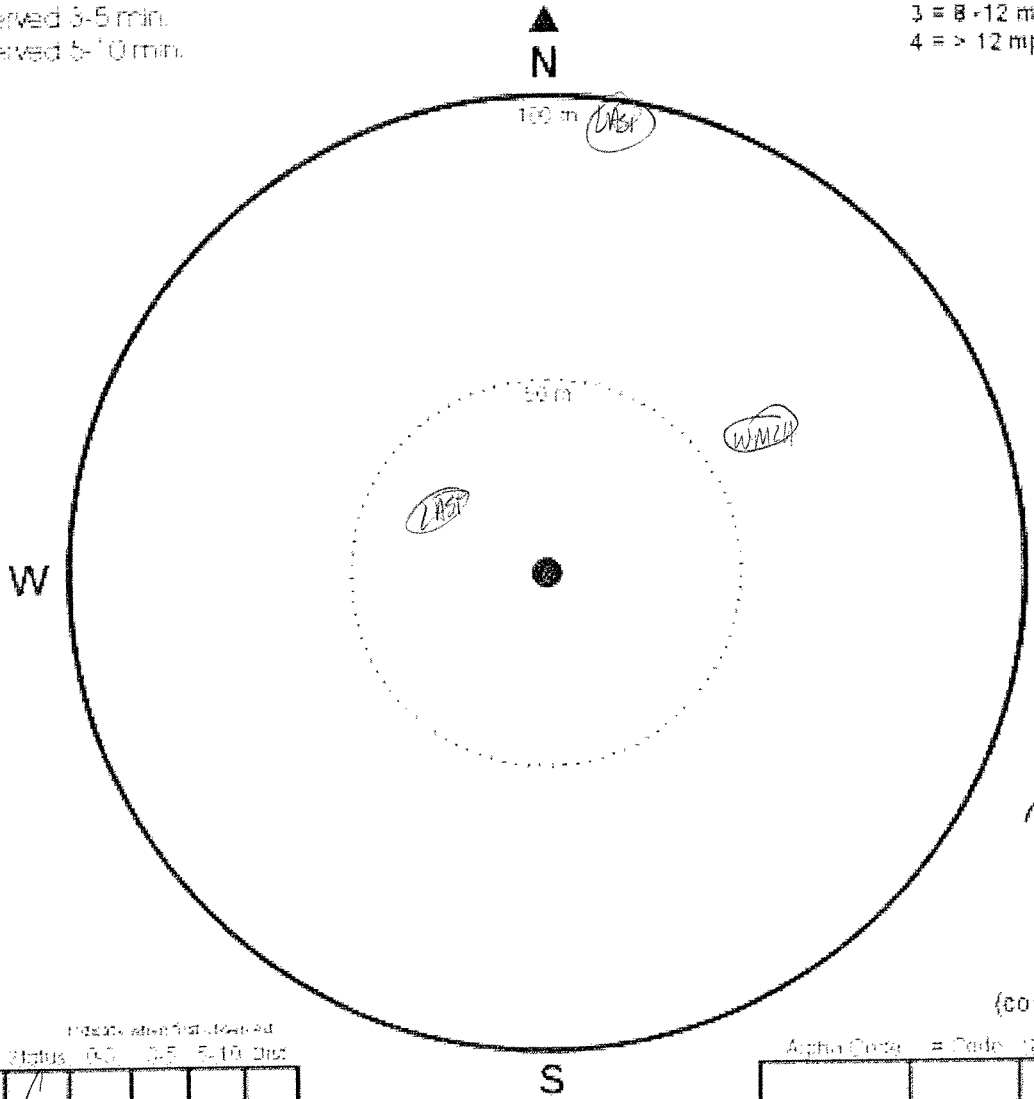
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	19	08	5:41	J. Meyer / R. Jones	↓ 80s	0	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
J = juvenile
N = nest
X = flyover
O = observed (year unknown)

Alpha Code	= Code	Status	0-3	3-5	5-10	Dist
LASP		C				
LASP		C				
WMLA		C			X	

Status
S = singing male
M = male (song)
F = female present
P = pair together
C = calling (other)
= change in position
= same bird vs. song of 2 males

(continued)

Alpha Code	= Code	Status	0-3	3-5	5-10	Dist

Dist = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T3-9			Sagebrush

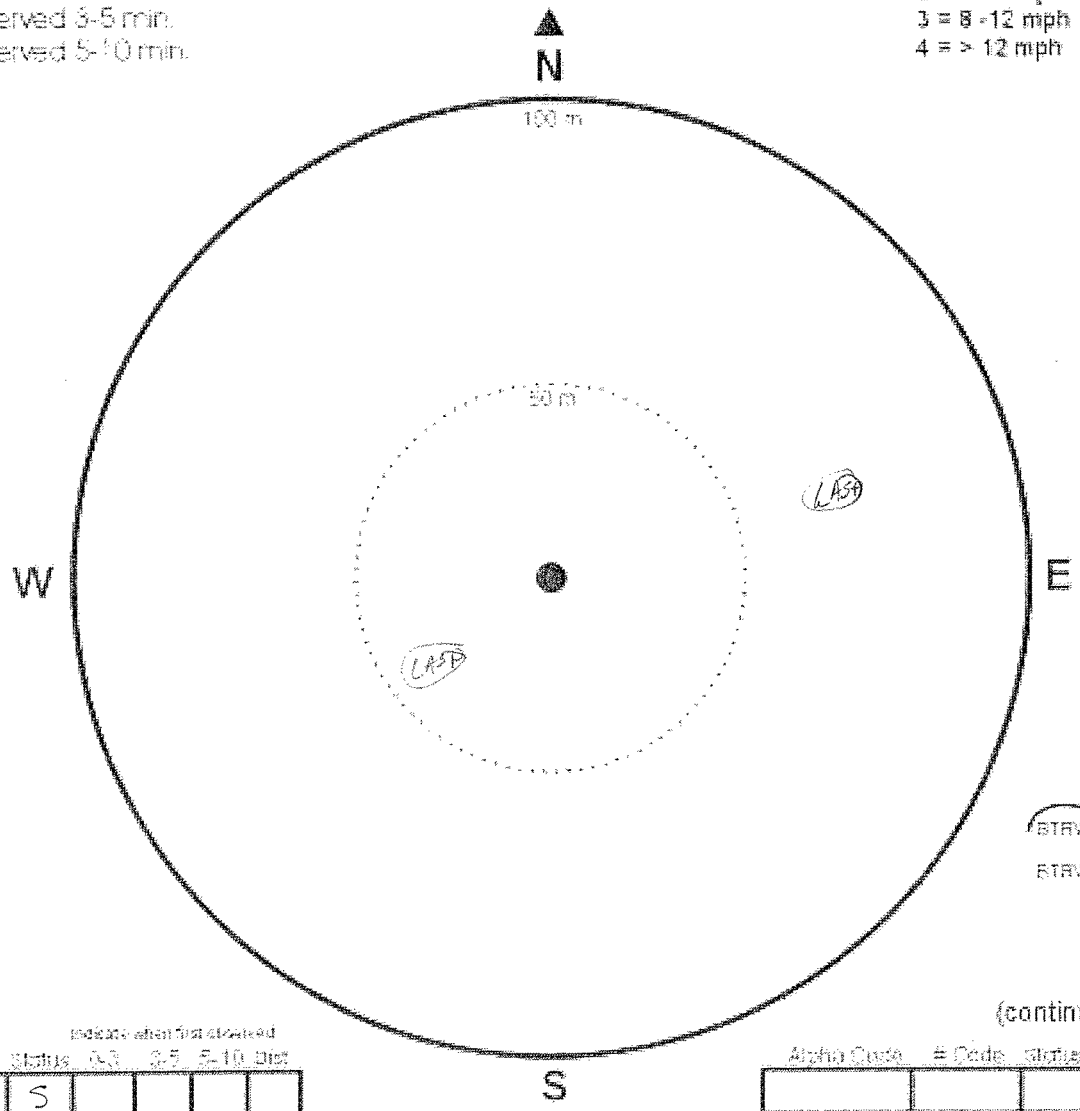
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	20	08	10:58	J. Meyer / R Jones	180	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
flyover = X
observed = O (sex unknown)

indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.
LASP		S				
LASP		S				

Dist. = minimum distance from observer

Status
singing male = S
mate (Sure?) = M
female (sure) = F
pair together = P
calling (?'s sex) = C
change in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T4-2			

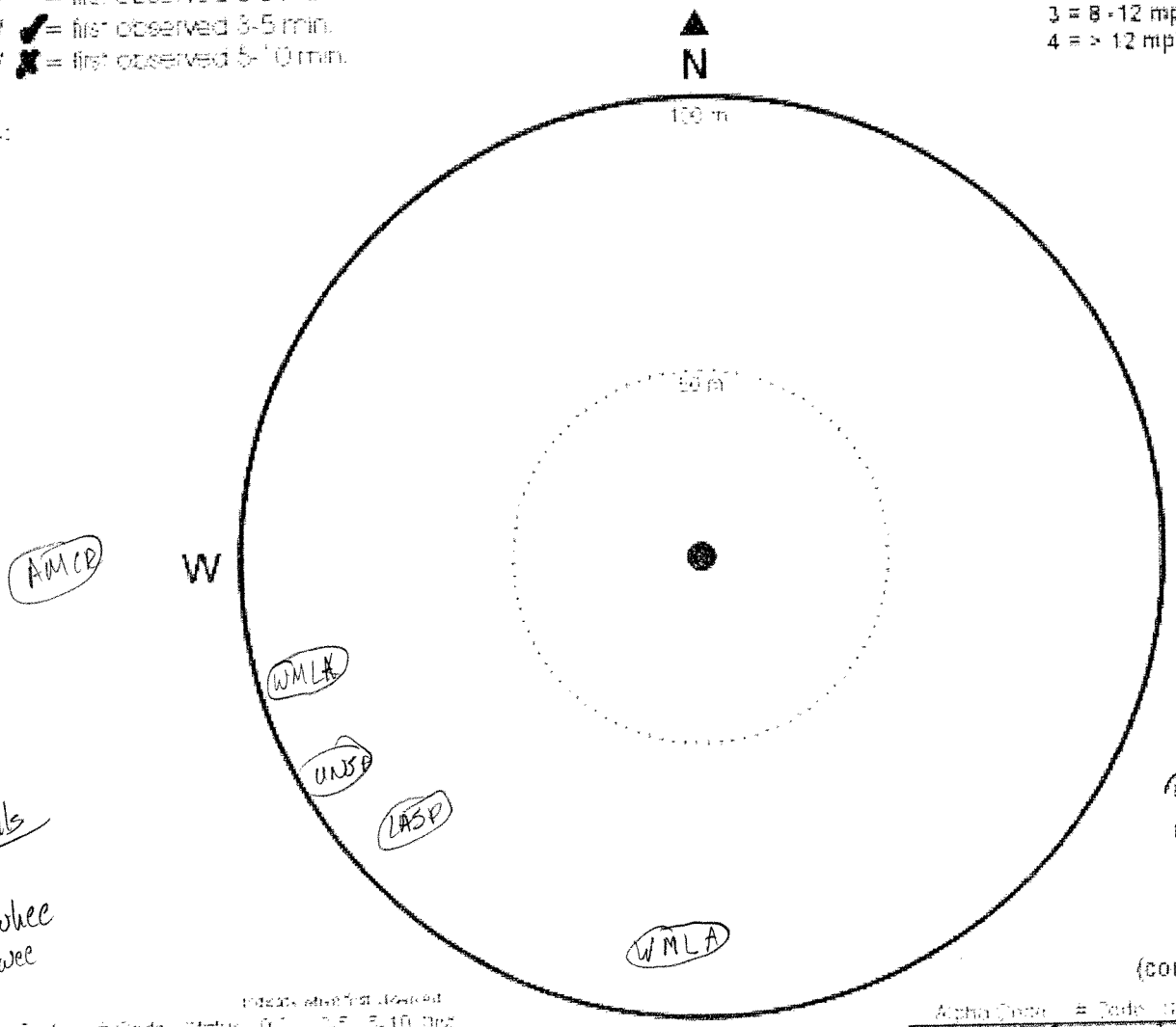
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	19	08	10:03	J. MEYER, R. JONES	75	0	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Calls

Tewhee
Kowee

Status
juvenile = J
nest = N
flyover = X
observed = O

Alpha Code	= Code	Status	0-3	3-5	5-10	Dist
Unknown SP		C				
AMCR		C				
WMLA		C				
LASP		C				
WMLA		C		✓		

Dist = minimum distance from observer

Status
singing male = S
mated pair = M
female present = F
pair together = P
calling (no see) = C
change in position
simultaneous songs of 2 males

(continued)

Alpha Code	= Code	Status	0-3	3-5	5-10	Dist

Dist = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T4-4			Grassland

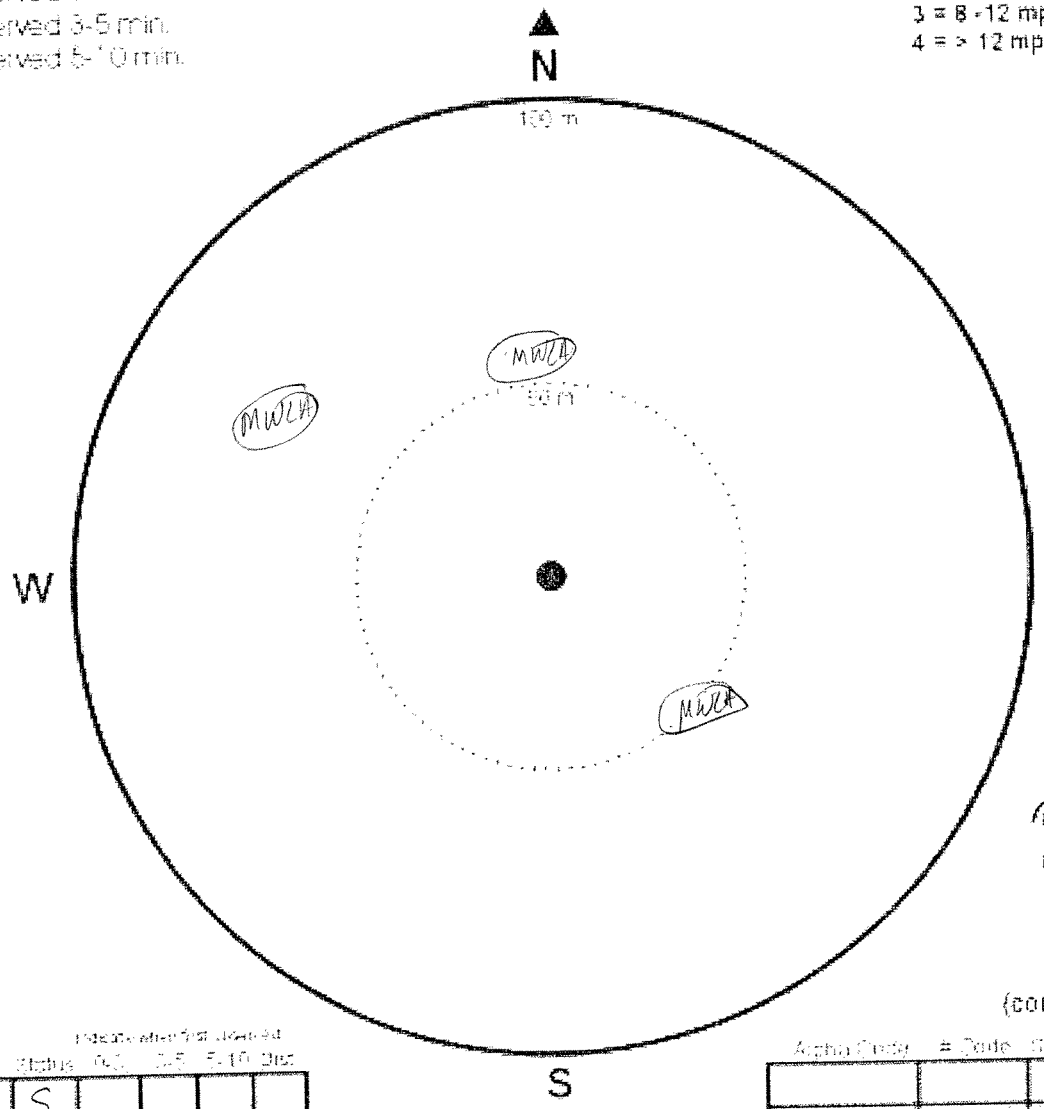
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	19	08	1:19	Meyer / Jones	90	2	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
flyover = X
BTBW observed = ○ (sex unknown)

Alpha Code	# Code	Status	Dist. 0-3	3-5	5-10	Dist.
MWLA		S				
MWLA		S				
MWLA		S				

Status
singing male = S
male courting = M
female present = F
pair together = P
calling (?) sex = C
changes in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	Dist. 0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T4-6			

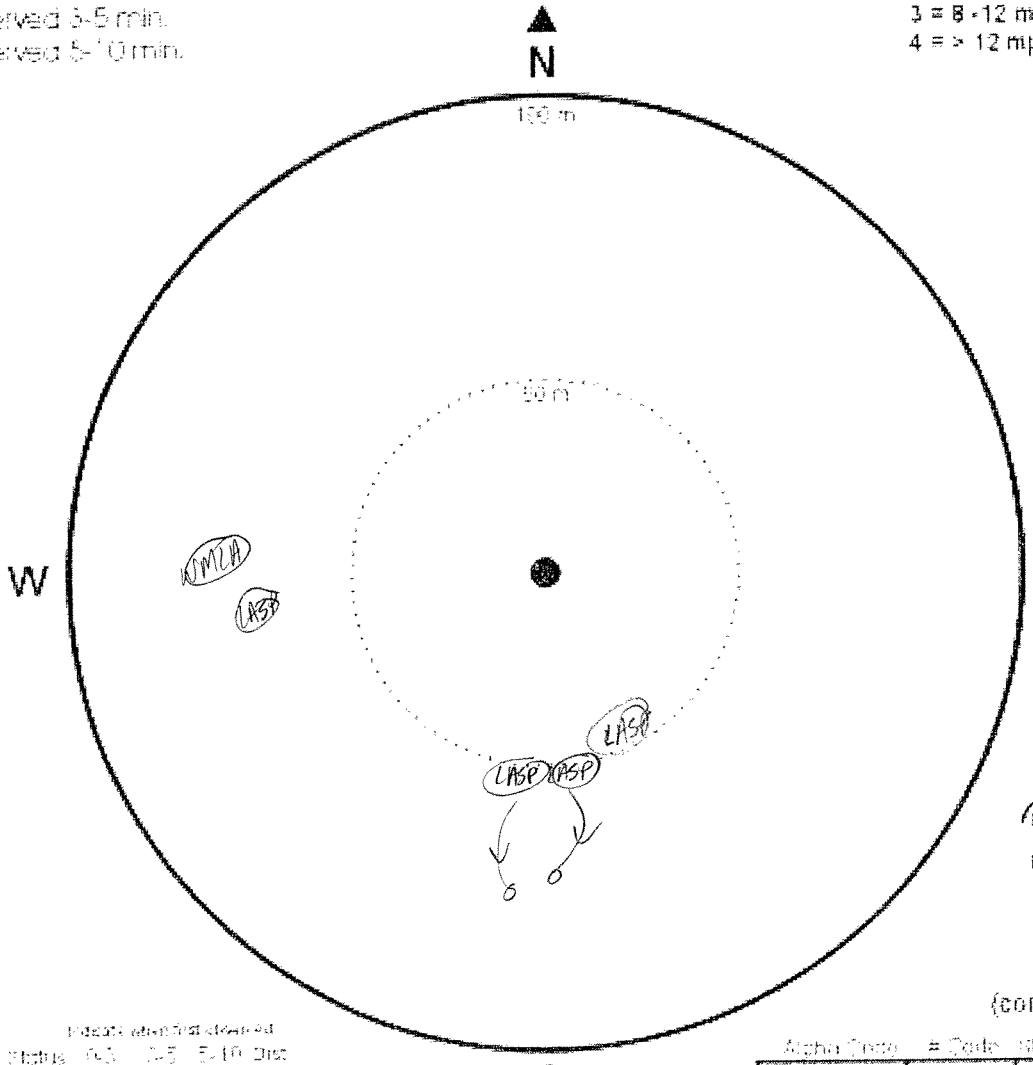
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	19	08	4:07	Meyer / Jones	80s	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
J
N
X
O

Alpha Code	= Code	Status	Dist 0-3	3-5	5-10	Dist
WMLA		S				
LASP		S				
LASP		S		✓		
LASP		S			X	
LASP		S			X	

Status
S
M
F
P
C

(continued)

Alpha Code	= Code	Status	Dist 0-3	3-5	5-10	Dist

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T4-8			Sagebrush

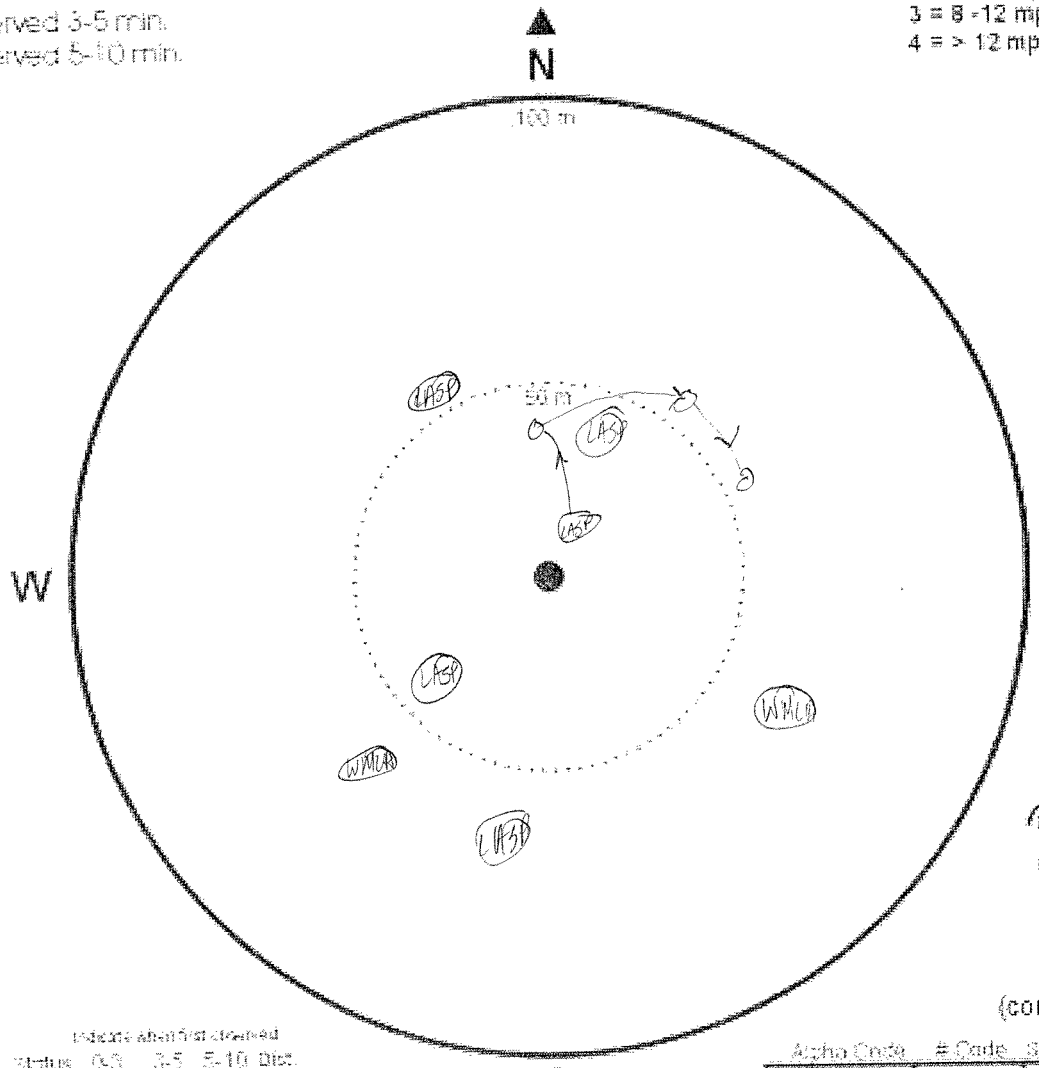
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	20	08	8:28	J. Meyer / R. Jones	1805	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
flyover = X
BTBW observed = ○ (sex unknown)

Indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.
LASP		S				
LASP		S				
WMLA		S				
WMLA		S				
LASP		S				
LASP		S		✓		
LASP		S			X	

Dist. = minimum distance from observer

Status
singing male = S
male (song?) = M
female (song) = F
pair together = P
calling (1st sec) = C
change in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T4-10			Roadside (HWY)

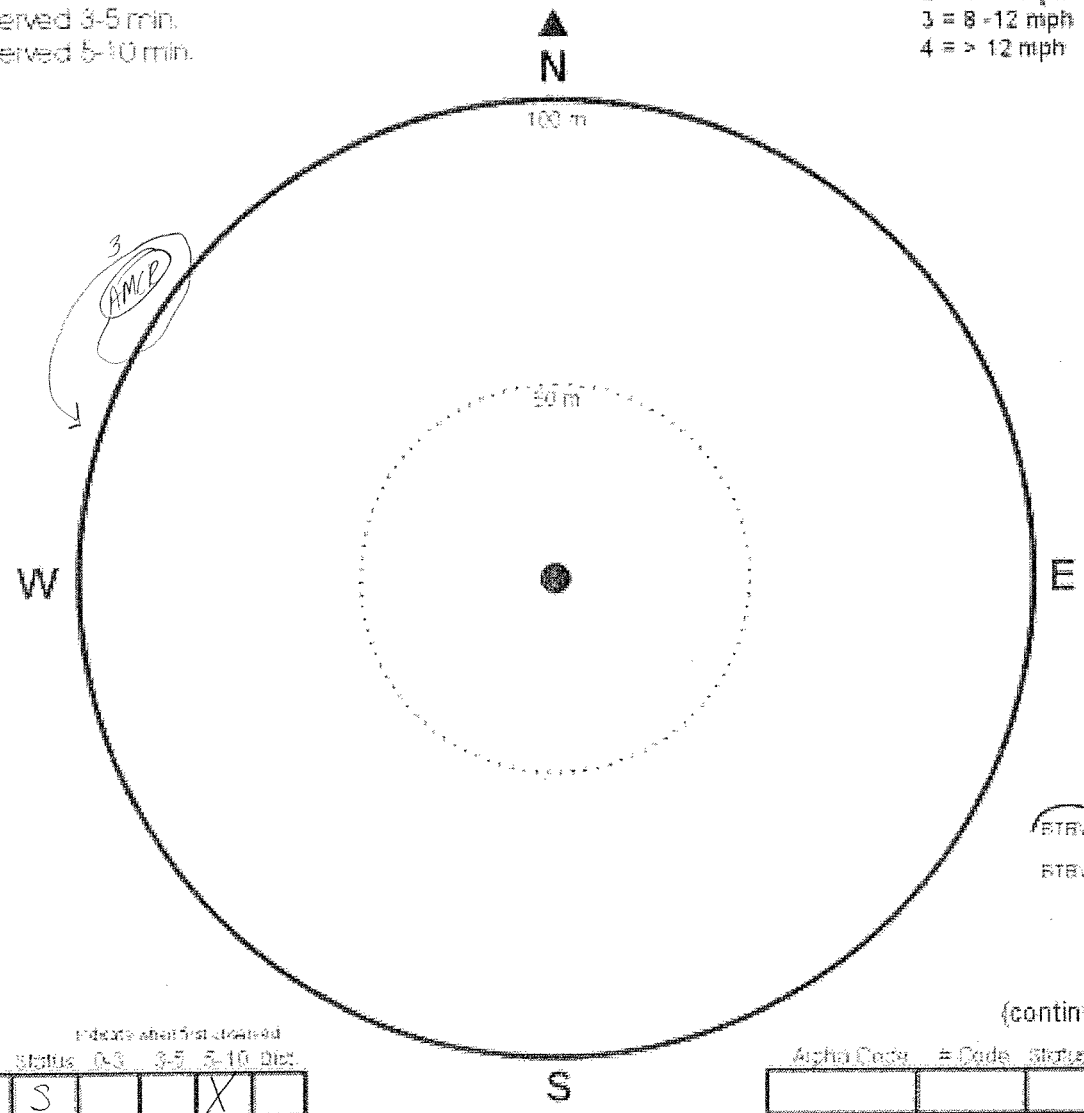
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	20	08	10:06	J. Meyer / R. Jones	mid 80s	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✔ = first observed 3-5 min.
BTBW ✘ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
flyover = X
observed = O (sex unknown)

Indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.
AMCR		S			X	
AMCR		S			X	
AMCR		S			X	

Dist. = minimum distance from observer

Status
singing male = S
male (song) = M
female (song) = F
pair together = P
calling (1st sex) = C
changes in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	TS-3			Disturbed Grassland

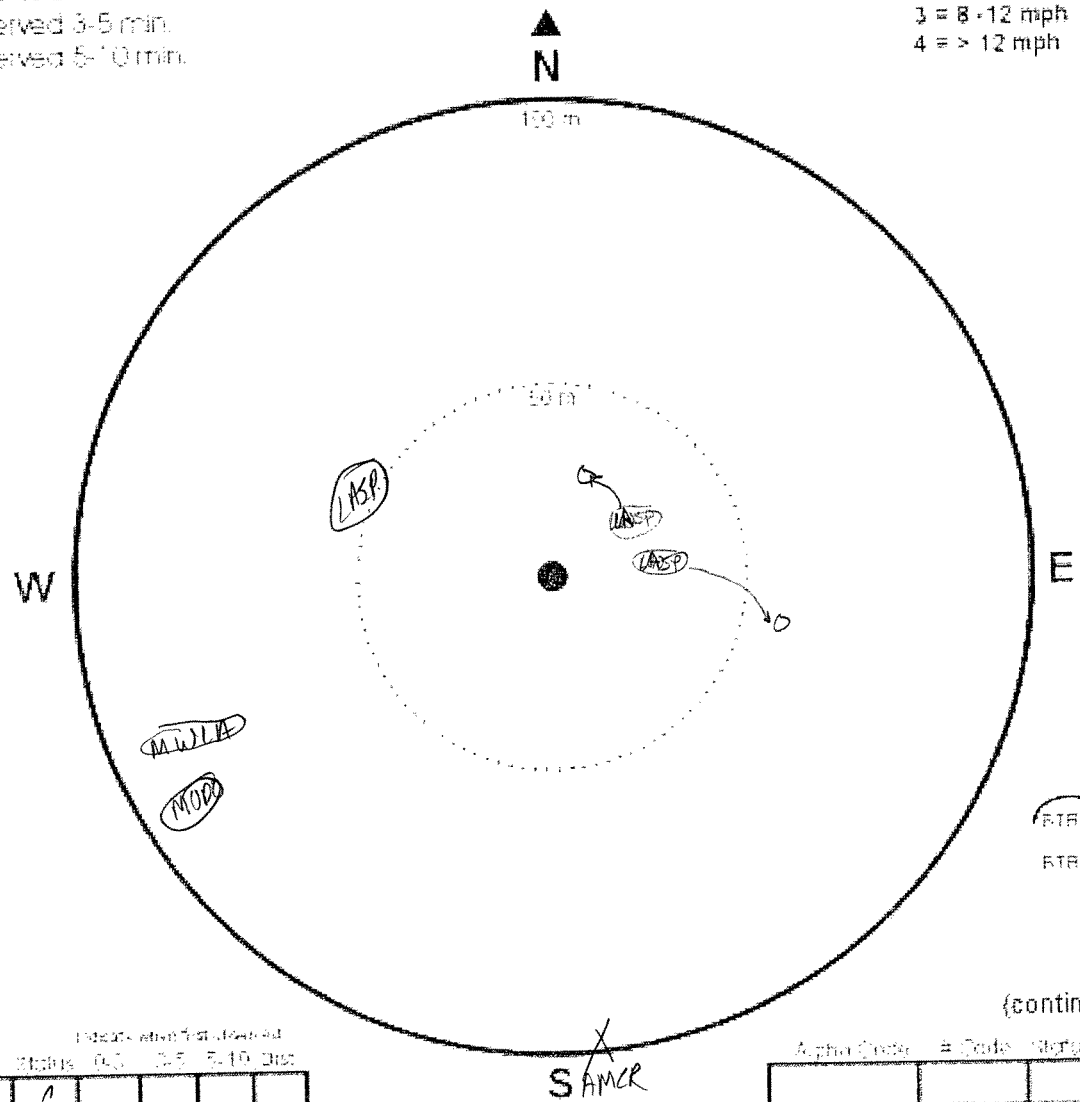
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	19	08	11:18	Meyer/Jones	1805	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
flyover = X
observed = O

Alpha Code	# Code	Status	Dist 0-3	Dist 3-5	Dist 5-10	Dist Ltd
AMCR		C				
MWIA		S				
LASP		S		✓		
LASP		C			X	
LASP		C			X	
MODO		S			X	

Dist = minimum distance from observer

Status
singing male = S
mixed group = M
female (group) = F
pair together = P
calling (group) = C
changes in position
simultaneous singing of 2 males

(continued)

Alpha Code	# Code	Status	Dist 0-3	Dist 3-5	Dist 5-10	Dist Ltd

Dist = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	I5-5			Sagebrush

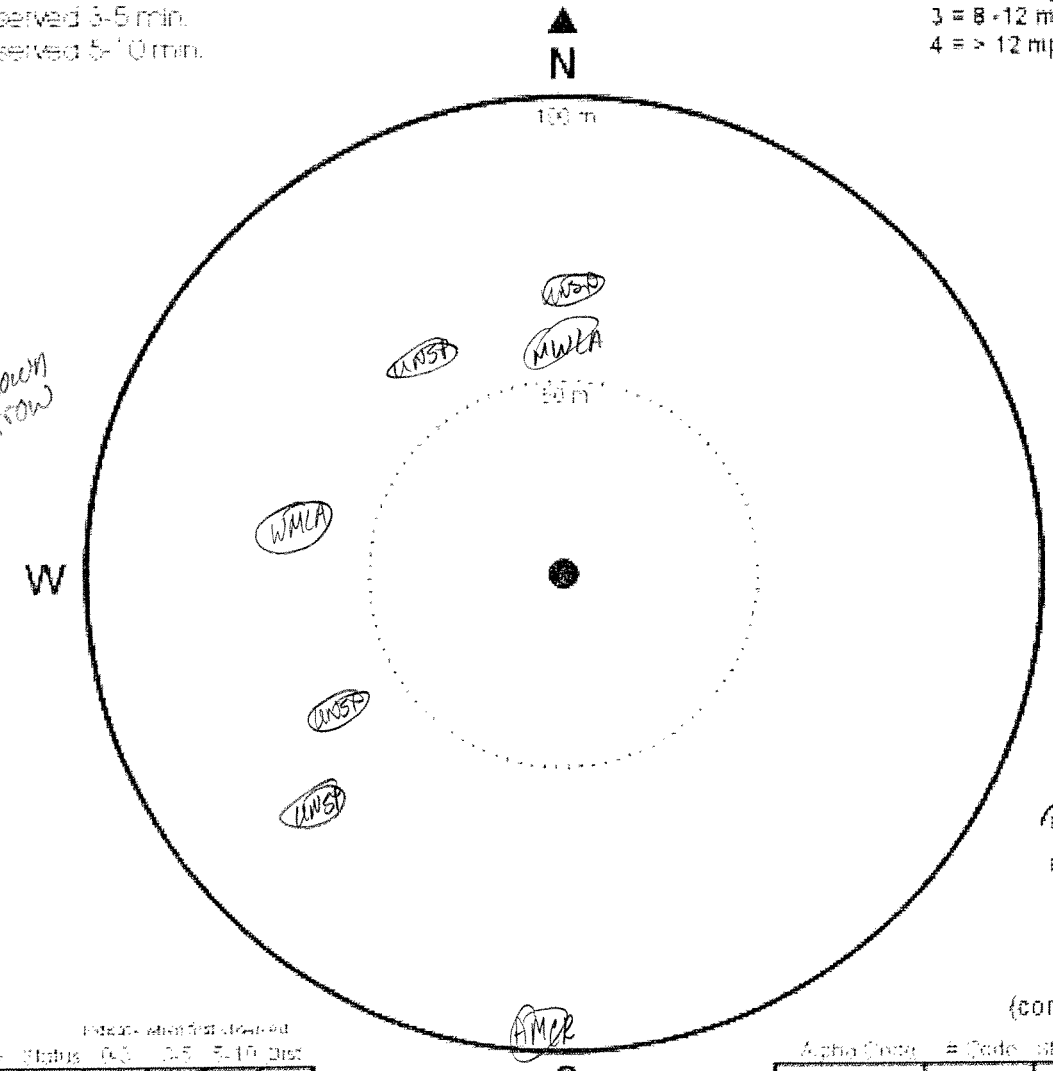
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	19	08	2:26	Meyer/Jones	↓90	3	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
J = juvenile
N = nest
X = BTBW present
O = observed (sex unknown)

Alpha Code	# Code	Status	Distance where first observed: 0-3	3-5	5-10	Dist.
WMLA		S				
AMCR		S				
WMLA		S				
LASP		S				
LASP		S				
LA SP		S		✓		
LASP		S		✓		

Status
S = singing male
M = "mating" song
F = female present
P = pair together
C = calling (no sex)
= changes in position
= simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = meters to distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	TE-7			Sagebrush

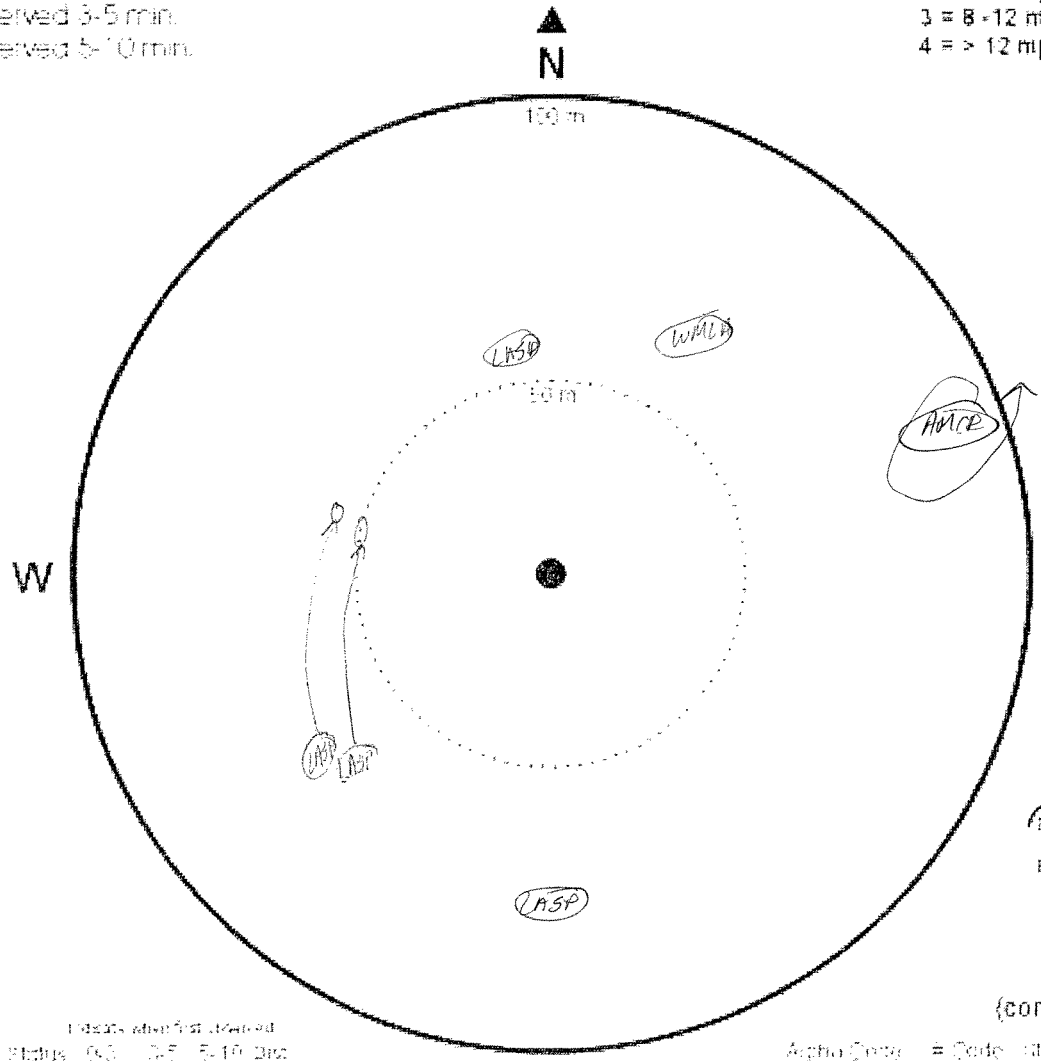
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	19	80	5:20	J. Meyer / Jones	1805	0	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✔ = first observed 3-5 min.
BTBW ✘ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
flyover = X
BTBW observed = O (sex unknown)

Alpha Code	= Code	Status	Dist: 0-3	3-5	5-10	Beyond 10 m
LASP		S				
LASP		S				
WMLA		S				
AMCR		S				
LASP		S				
LASP		S				

Dist = minimum distance from observer

Status
singing male = S
singing female = M
female (nest) = F
pair together = P
calling (flyover) = C
change in position
simultaneous song of 2 males

(continued)

Alpha Code	= Code	Status	Dist: 0-3	3-5	5-10	Beyond 10 m

Dist = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	TS-9			Sagebrush

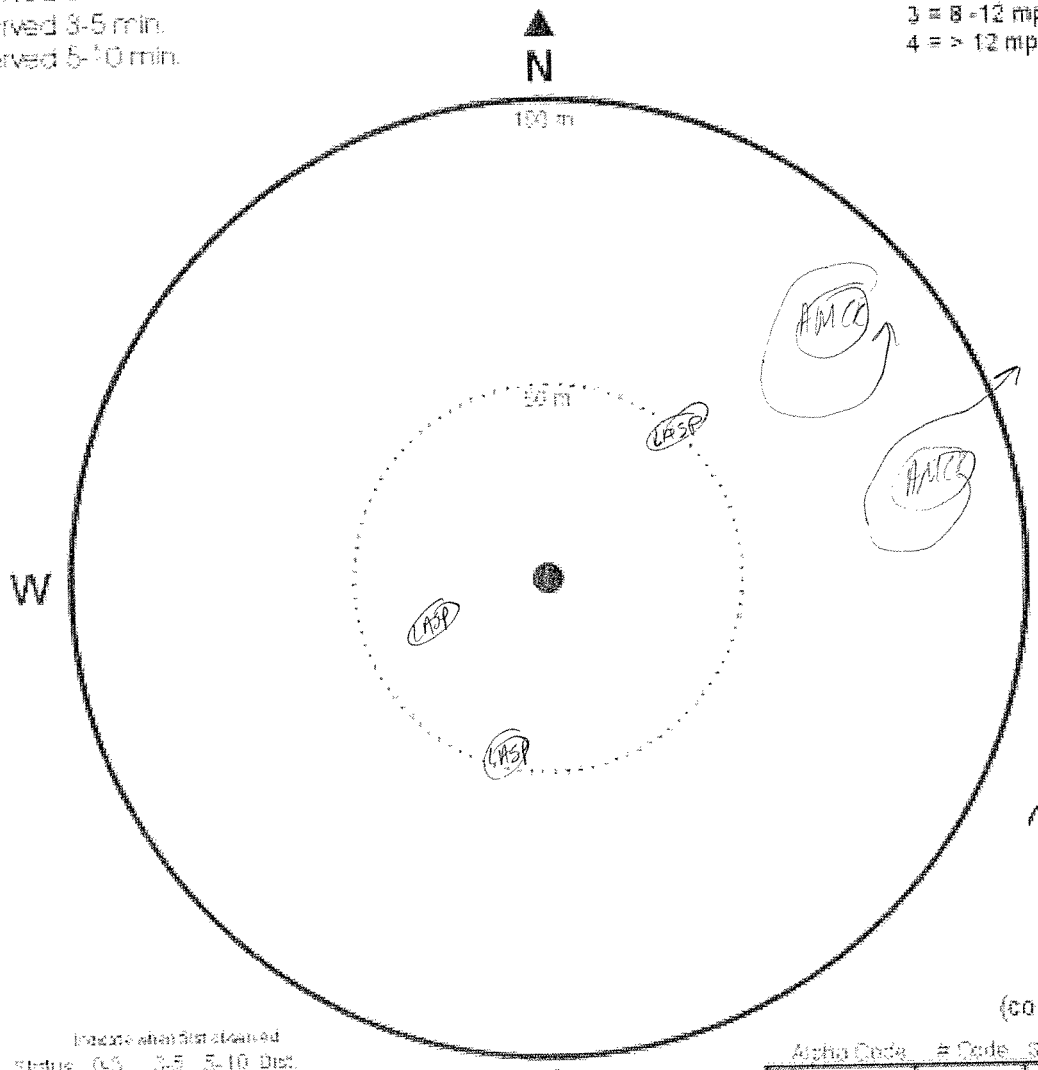
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	20	08	10:25	J. Meyer / R. Jones	180s	0	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
flyover = X
observed = O (sex unknown)

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.
LASP		S				
LASP		S		✓		
LASP		S			X	
AMCR		S			X	
AMCR		S			X	

Dist. = minimum distance from observer

Status
singing male = S
male (song?) = M
female (song?) = F
pair together = P
calling (? sex) = C
change in position
simultaneous song of 2 males

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T6-2			GRASSLAND

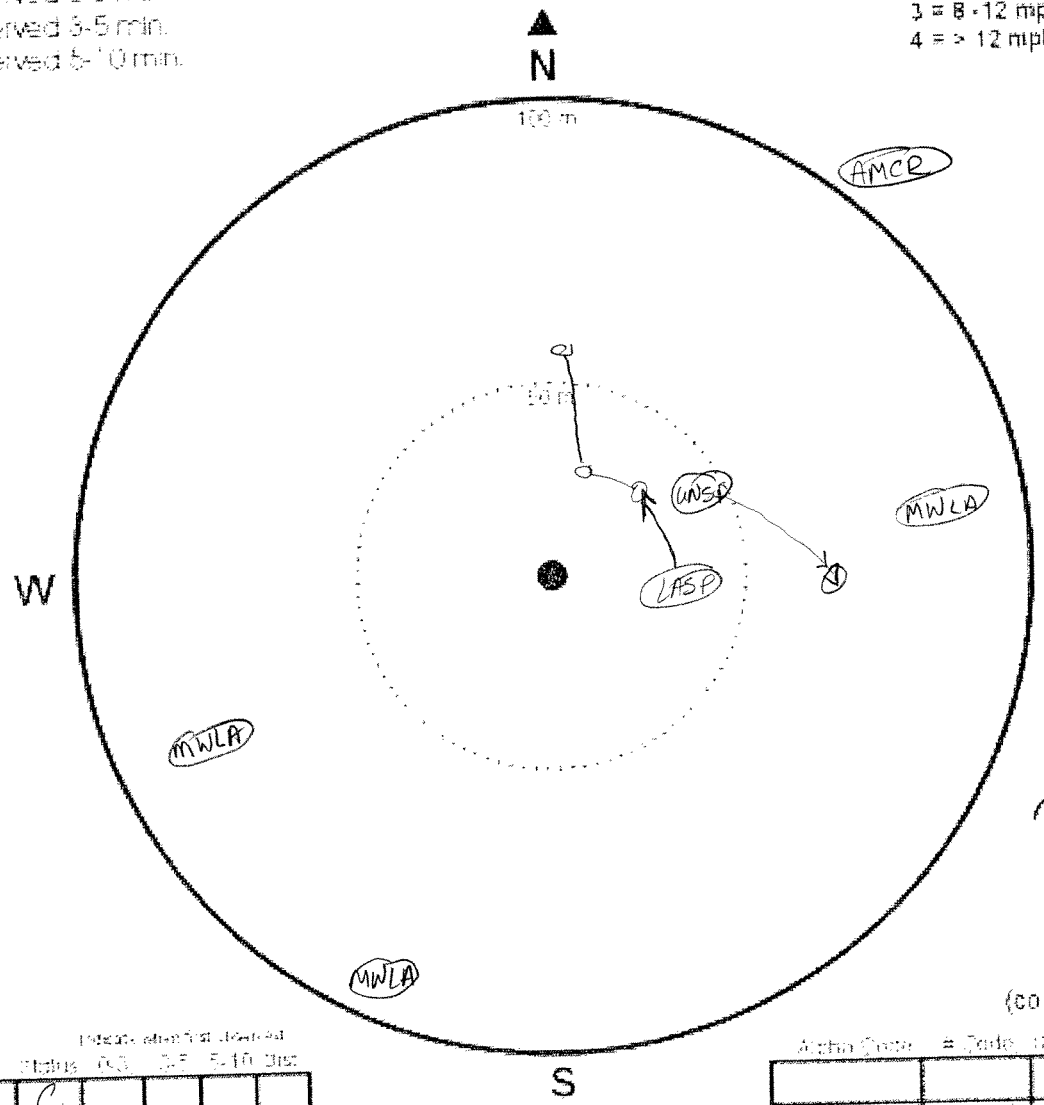
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	19	08	10:29	MEYER / JONES	↑ 70's	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
BTBW = X
BTBW observed = O (gender unknown)

Alpha Code	# Birds	Status	0-3	3-5	5-10	Dist
AMCR		C				
MWLA		C				
LASP		C				
MWLA		C	✓			
MWLA		C	✓			
UNSP		C		X		

Status
singing male = S
mated pair = M
female (nest) = F
pair together = P
calling (no see) = C
changes in position
simultaneous singing of 2 males

(continued)

Alpha Code	# Birds	Status	0-3	3-5	5-10	Dist

Dist = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T6-4			Grassland

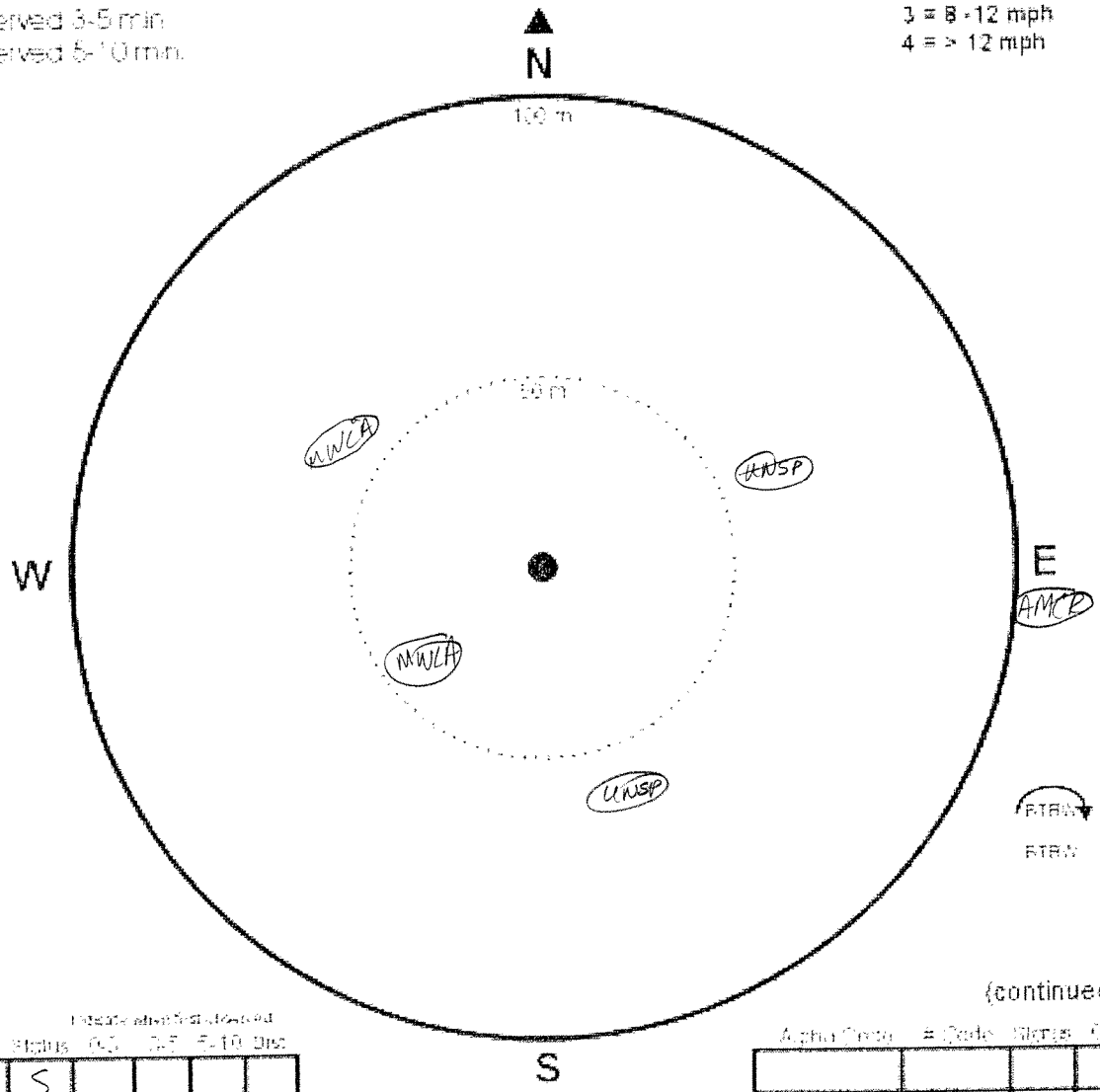
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	19	80	1:41	Meyer/Jones	90's	2	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min
BTBW ✓ = first observed 3-5 min
BTBW ✗ = first observed 5-10 min

Notes:



Status
Juvenile = J
Nest = N
Flyover = X
Observed = O (sex unknown)

Alpha Code	= Code	Status	0-3	3-5	5-10	Dist
MWLA		S				
AMCR		S				
MWSP		S				
MWSP		S		✓		
MWLA					X	

Dist = minimum distance from observer

Status
singing (flitting) = S
"mating" (display) = M
"territorial" (chasing) = F
pair together = P
calling (chipping) = C
changes in position
same bird seen/heard going & coming

(continued)

Alpha Code	= Code	Status	0-3	3-5	5-10	Dist

Dist = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T6-6			Sagebrush

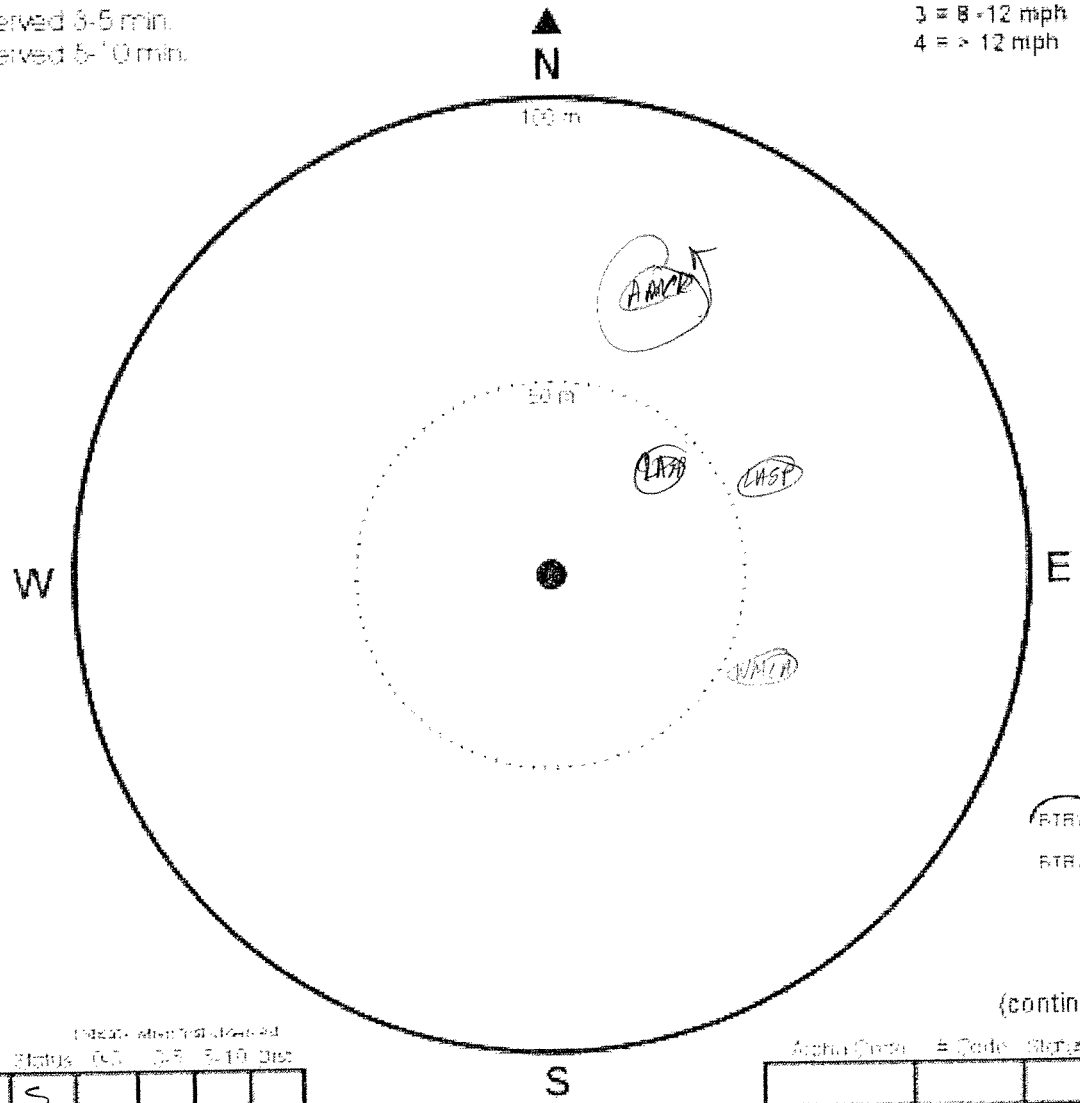
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	19	08	4:33	Meyer / Jones	1 80s	0	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
BTBW = X
BTBW = observed = O (see diagram)

Alpha Code	= Code	Status	Dist. Mod. First Observed 0-3	3-5	5-10	Beyond
AMCR		S				
LASP		S				
LASP		S		✓		
WMLA		S			X	

Status
singing male = S
singing pair = M
female present = F
pair together = P
calling (no see) = C
changes in position
with banners going at 2 minutes

(continued)

Alpha Code	= Code	Status	0-3	3-5	5-10	Beyond

Dist. = meters in distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T6-8			Sagebrush

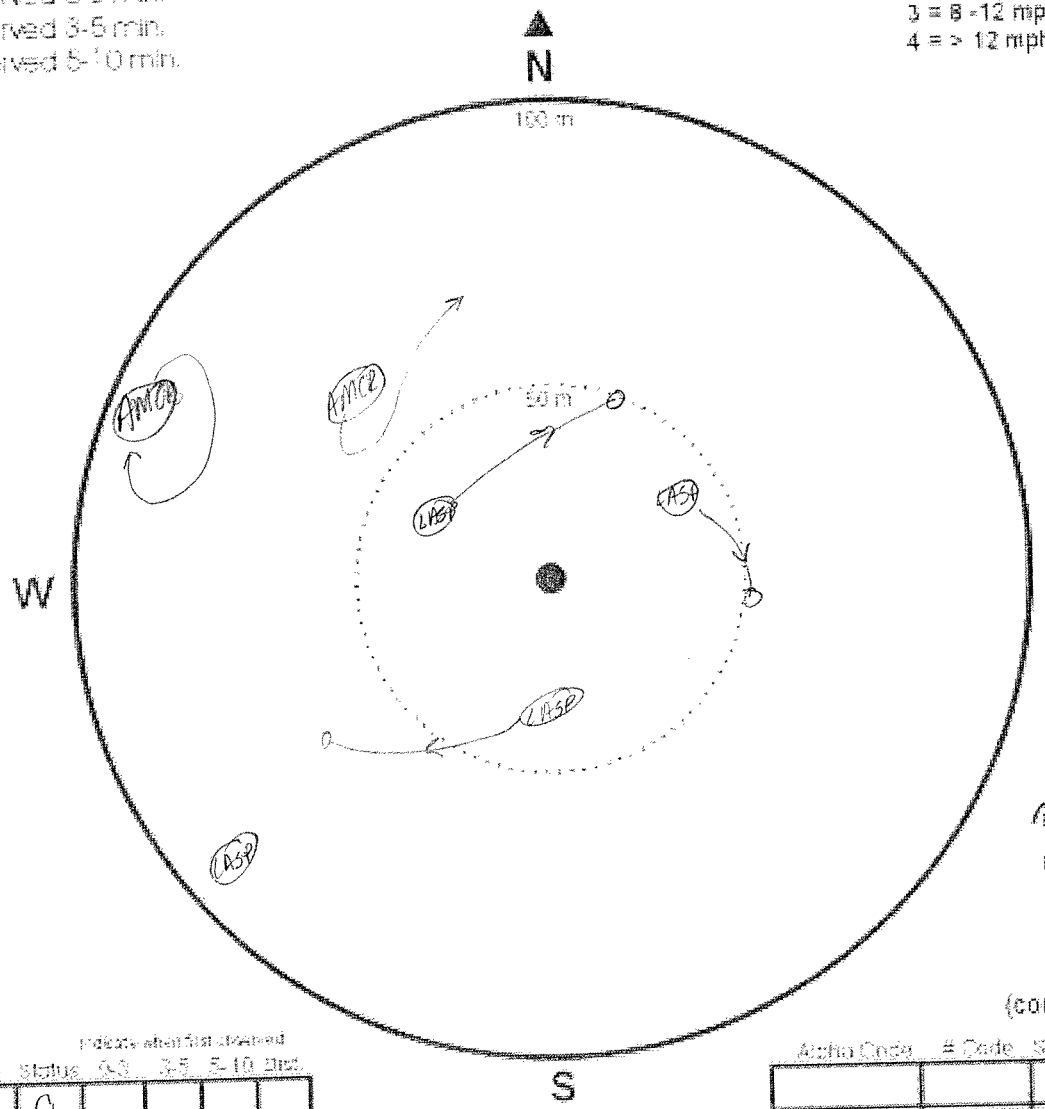
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	20	08	8:53	J. Mayer/R. Jones	V. 80s	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
flyover = X
BTBW observed = O (sex unknown)

Indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.
AMCR		O				
LASP		S				
LASP		S				
LASP		S				
LASP		S				

Dist. = minimum distance from observer

Status
singing male = S
male (silent) = M
female (silent) = F
pair together = P
calling (♂ or ♀) = C
changes in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m; 2 = 50 - 100 m; 3 = > 100 m

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T7-3			Disturbed Grassland

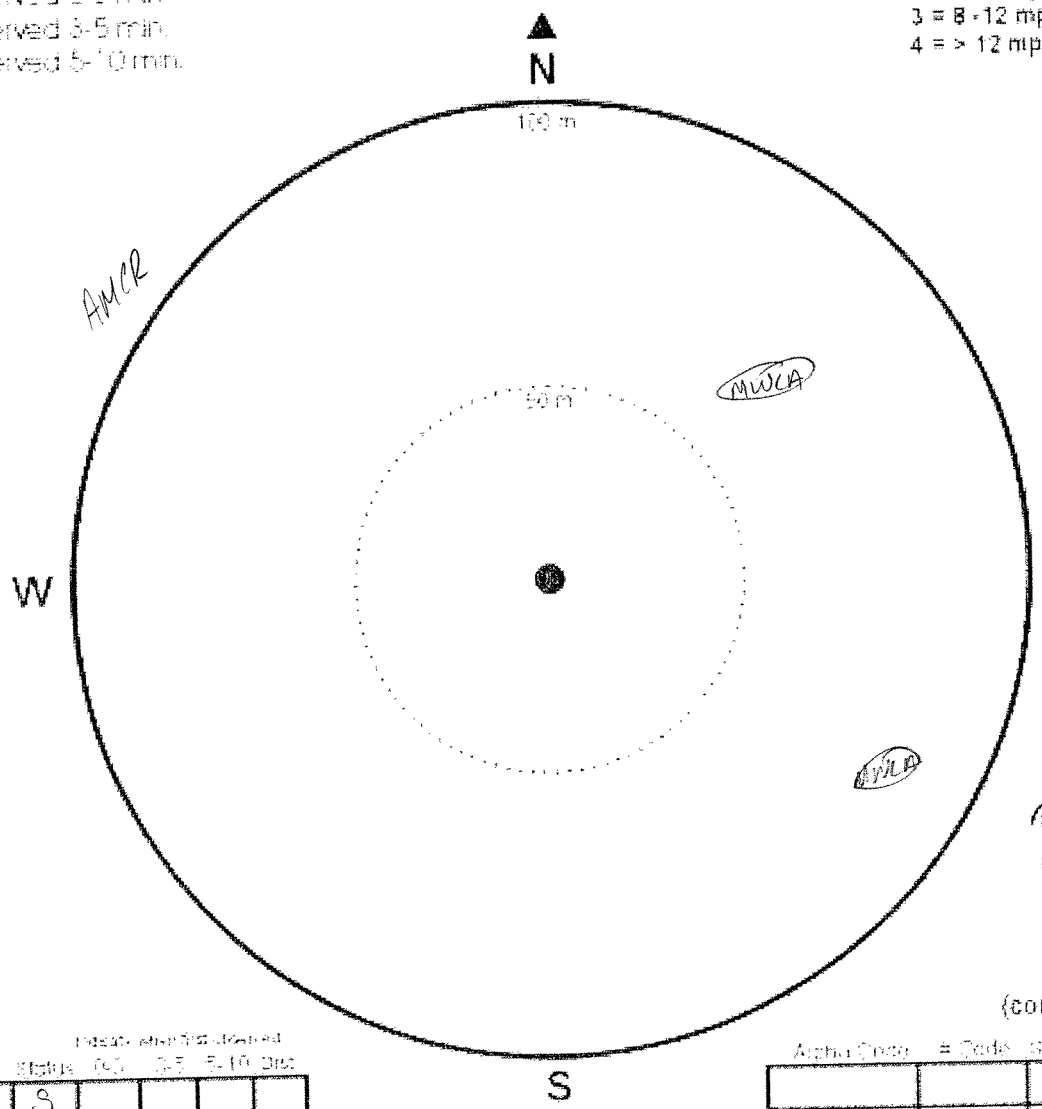
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	19	08	10:55	Meyer / Jones	↓80s	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% clouds; 1 = partly cloudy; 2 = mostly cloudy; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✔ = first observed 3-5 min.
BTBW ✘ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
BTBW = X
BTBW observed = O (see unmapped)

Alpha Code	# Birds	Status	Dist. 0-3	Dist. 3-5	Dist. 5-10	Dist. >10
MWLA		S				
MWLA		S				
AMCR		S				X

Dist. = maximum distance from observer

Status
singing male = S
mate guarding = M
female present = F
pair together = P
calling (2° sex) = C
changes in position
simultaneous singing of 2 males

(continued)

Alpha Code	# Birds	Status	Dist. 0-3	Dist. 3-5	Dist. 5-10	Dist. >10

Dist. = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T7-5			Road

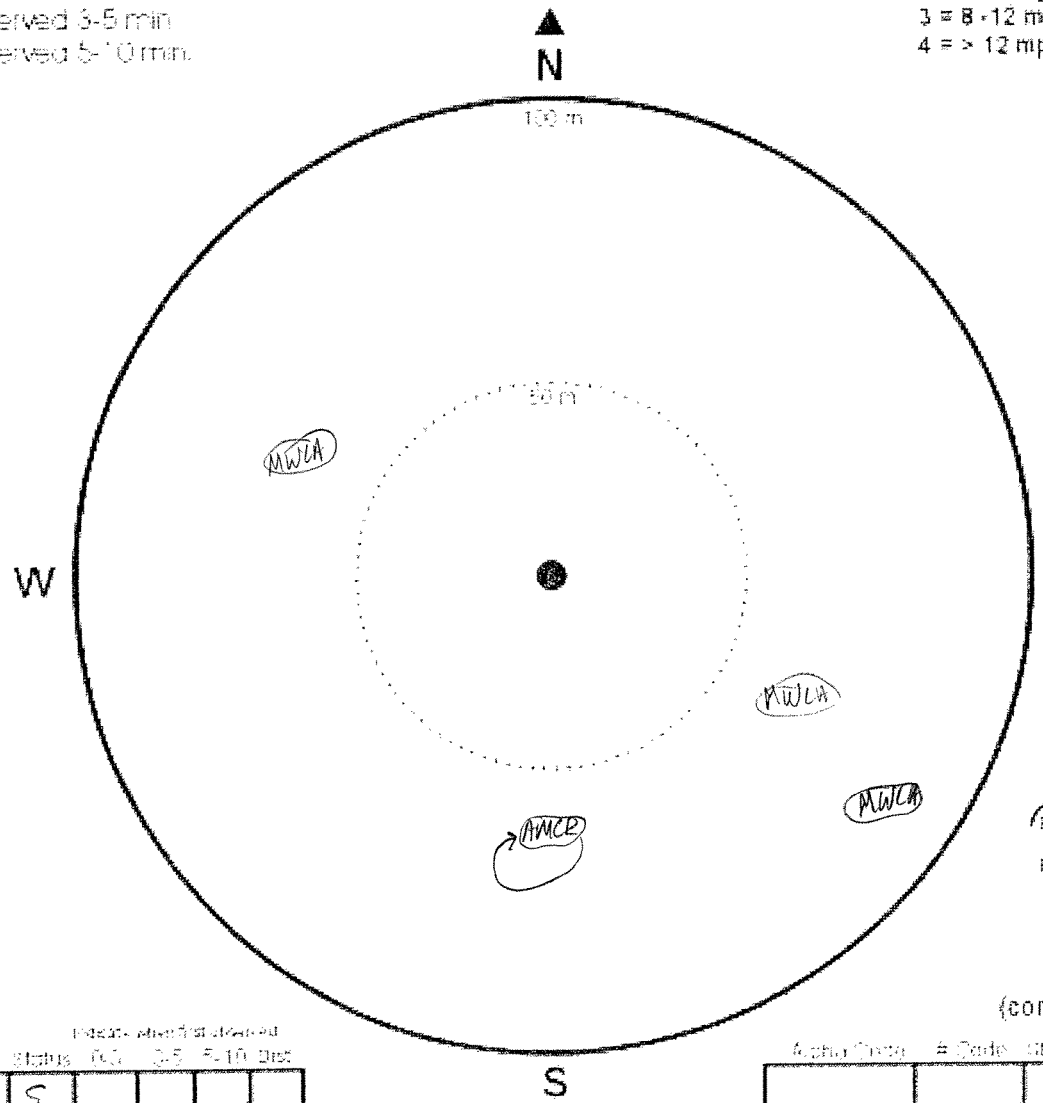
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	19	08	2:02	Meyer/Jones	~90s	1	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 - 12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min
BTBW ✓ = first observed 3-5 min
BTBW ✗ = first observed 5-10 min

Notes:



Status
juvenile = J
nest = N
BTBW = X
BTBW observed = O (sex unknown)

Alpha Code	# Code	Status	Dist: 0-3	3-5	5-10	Dist
MWLA		S				
MWLA		S				
MWLA		S		✓		
AMCR		C			X	

Dist = maximum distance from observer

Status
singing (flight) = S
singing (perch) = M
singing (female present) = F
pair together = P
calling (only sex) = C
change in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	Dist: 0-3	3-5	5-10	Dist

Dist = maximum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	I7-7			Roadside

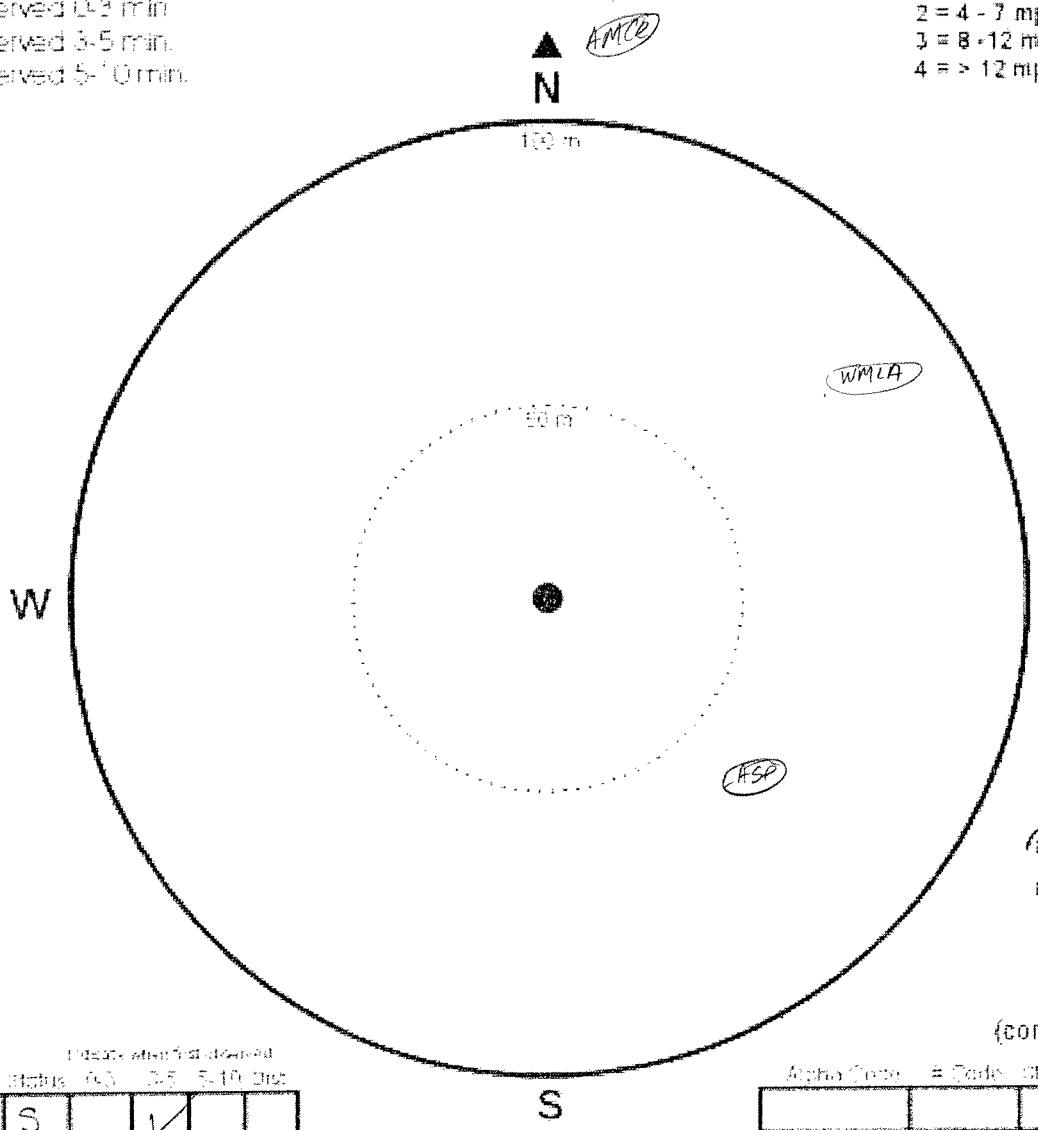
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	19	20	4:58	Meyer / Jones	↓80s	1	0

0 = none
1 = 1 - 3 mph
2 = 4 - 7 mph
3 = 8 -12 mph
4 = > 12 mph

0 = < 10% cloud
1 = partly cloudy
2 = mostly cloud
3 = overcast
4 = raining

BTBW = first observed 0-3 min
BTBW ✓ = first observed 3-5 min.
BTBW ✗ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
flyover = X
observed = O
(see comments)

Alpha Code	4-Code	Status	0-3	3-5	5-10	Dist
WMLA		S		✓		
AMCR		S		✓		200m
LASP					X	

Dist = minimum distance from observer

Status
singing male = S
singing female = M
female/juvenile = F
pair together = P
calling (2° sex) = C
changes its position
simultaneous singing of 2 males

(continued)

Alpha Code	4-Code	Status	0-3	3-5	5-10	Dist

Dist = minimum distance from observer

Bird Point Census Form

State	SiteID	Latitude	Longitude	Habitat Type
CO	T7-9			Sagebrush

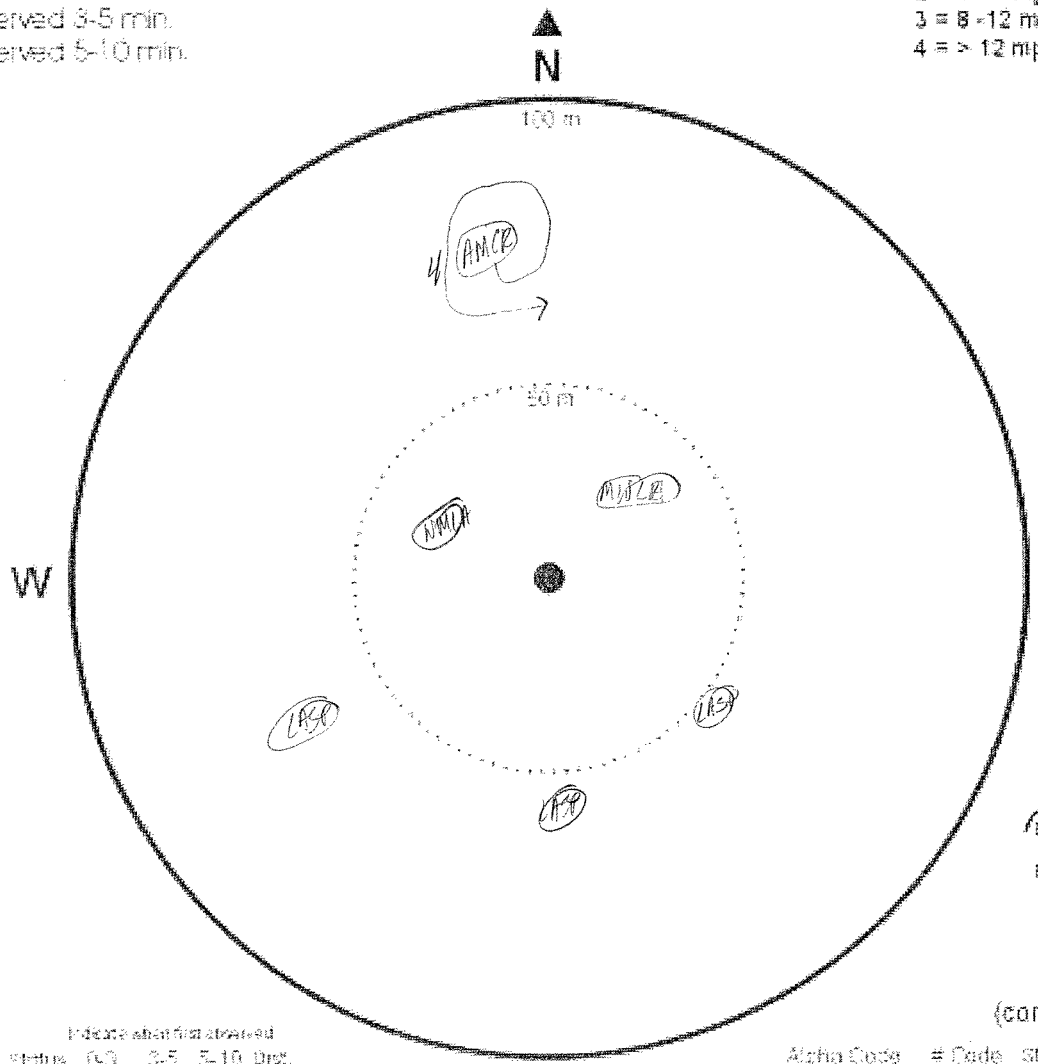
Month	Day	Year	Time	Observer(s)	Temp.	Wind	Sky
5	20	08	9:27	J. Mayer / B. Jones	M 80s	0	0

Wind: 0 = none; 1 = 1 - 3 mph; 2 = 4 - 7 mph; 3 = 8 -12 mph; 4 = > 12 mph

Sky: 0 = < 10% cloud; 1 = partly cloudy; 2 = mostly cloud; 3 = overcast; 4 = raining

BTBW = first observed 0-3 min.
BTBW ✔ = first observed 3-5 min.
BTBW ✘ = first observed 5-10 min.

Notes:



Status
juvenile = J
nest = N
flyover = X
observed = O (sex unknown)

Indicate when first observed

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.
AMCR		S				
AMCR		S				
AMCR		S				
AMCR		S				
WMLA		S				
LASP		S		✓		
LASP		S		✓		
LASP		S			X	
WMLA		S			X	

Dist. = minimum distance from observer
1 = < 50 m; 2 = 50 - 100 m; 3 = > 100 m

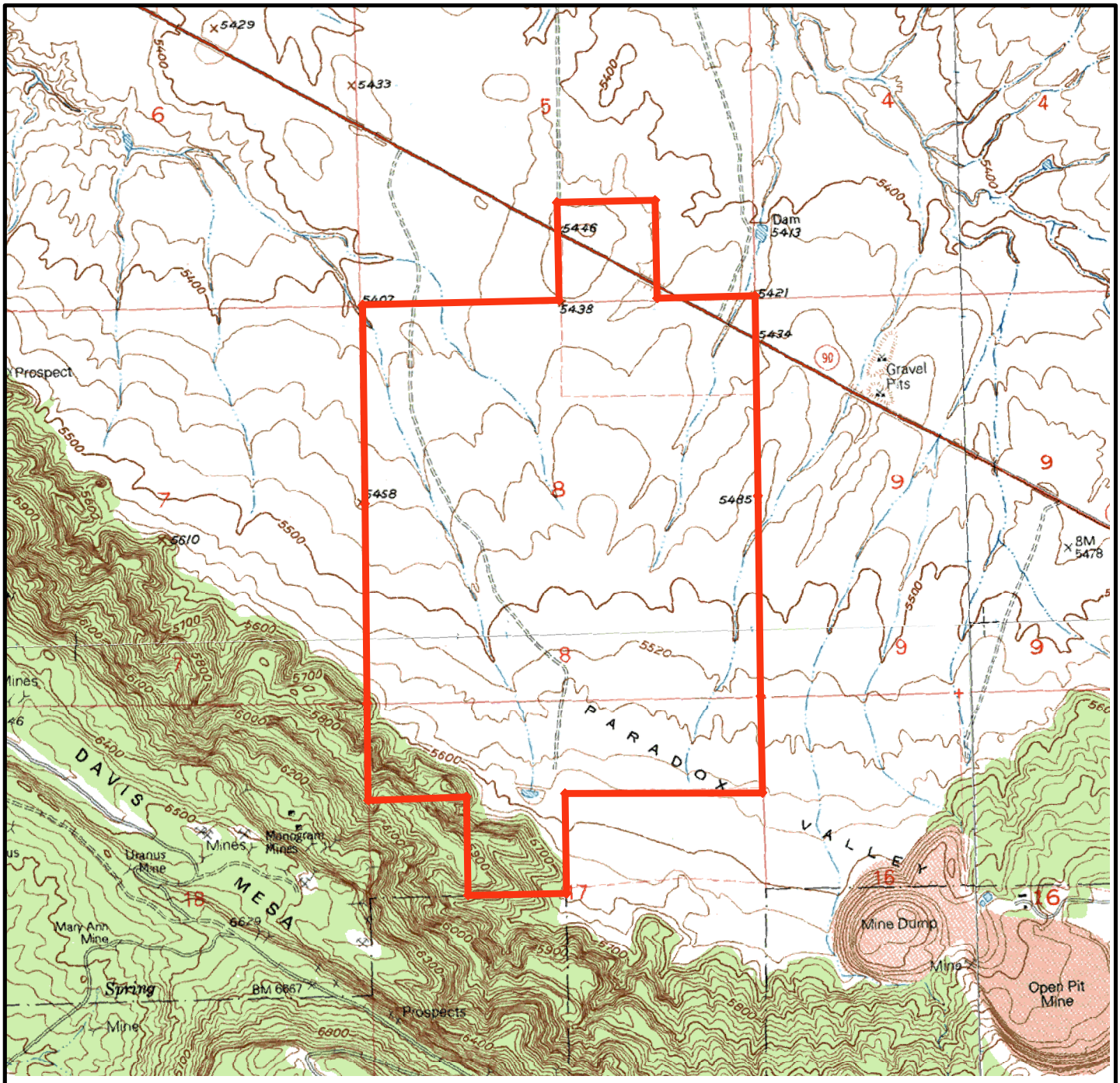
Status
singing male = S
singing (sex?) = M
female (sex?) = F
pair together = P
calling (sex?) = C
change in position
simultaneous song of 2 males

(continued)

Alpha Code	# Code	Status	0-3	3-5	5-10	Dist.

Dist. = minimum distance from observer
1 = < 50 m; 2 = 50 - 100 m; 3 = > 100 m

FIGURES



Legend

Project Boundary

N

1 inch equals 2,000 feet

2,000 1,000 0 2,000 4,000

Feet



The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.

DNC No. 83088.5.J-ALB08RP001

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.	83088
DRAWN:	8/14/08
DRAWN BY:	JJ Meyer
CHECKED BY:	C Jarvis
FILE NAME:	SiteVeg_Figure1_02-04-09

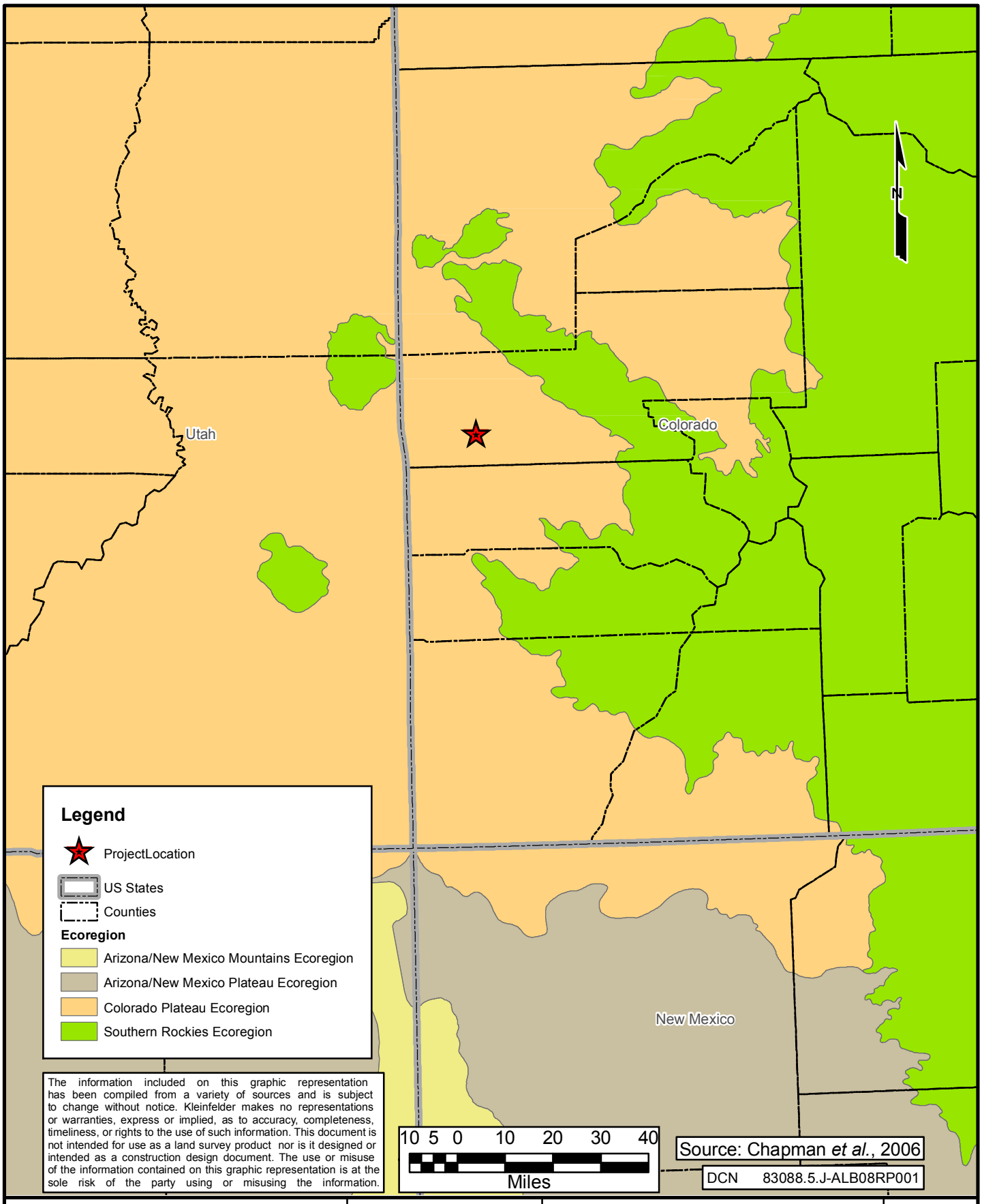
Site Location

ENERGY FUELS RESOURCES
PIÑON RIDGE MILL SITE
MONTROSE COUNTY, COLORADO

ORIGINATOR:	JJ Meyer
APPROVED BY:	C Jarvis

FIGURE

1



The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.	83088
DRAWN:	01/28/09
DRAWN BY:	JJ Meyer
CHECKED BY:	LJBridges
FILE NAME:	Level3Eco_Figure2_02-04-09

Level III Ecoregions of the Four Corners Area

ENERGY FUELS RESOURCES
PINON RIDGE MILL SITE
MONTROSE COUNTY, COLORADO

ORIGINATOR: JJ Meyer
APPROVED BY: C Jarvis

FIGURE
2



The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.	83088
DRAWN:	01/28/09
DRAWN BY:	JJ Meyer
CHECKED BY:	LJBridges
FILE NAME:	Level4Eco_Figure3_02-04-09

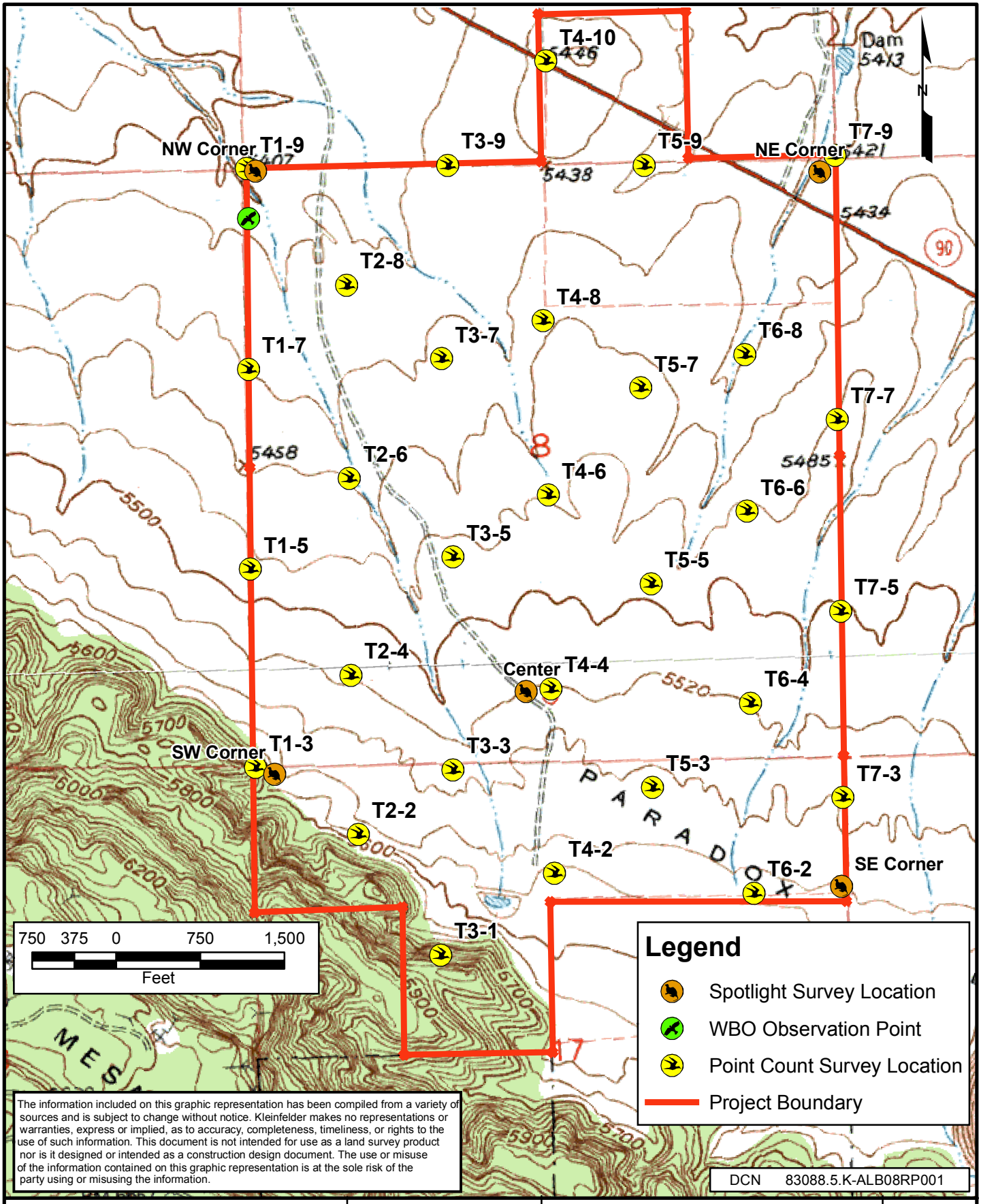
Level IV Ecoregions of Southwest Colorado

ENERGY FUELS RESOURCES
PIÑON RIDGE MILL SITE
MONTROSE COUNTY, COLORADO

ORIGINATOR:	JJ Meyer
APPROVED BY:	C Jarvis

FIGURE

3



The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.

DCN 83088.5.K-ALB08RP001

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.	83088
DRAWN:	8/14/08
DRAWN BY:	JJ Meyer
CHECKED BY:	C Jarvis
FILE NAME:	BirdNightPts_ Figure4_02-04-09

Night Observation and Bird Survey Points

ENERGY FUELS RESOURCES
PIÑON RIDGE MILL SITE
MONTROSE COUNTY, COLORADO

ORIGINATOR:	JJ Meyer
APPROVED BY:	C Jarvis

FIGURE

4

BIOLOGICAL SURVEY REPORT
ENERGY FUELS-PIÑON RIDGE MILL
MONTROSE COUNTY COLORADO



Cover Photo: View of site, looking northeast.

Prepared for:
ENERGY FUELS RESOURCES

Prepared by:
WestWater Engineering
2516 Foresight Circle #1
Grand Junction, CO 81505

August 2009

INTRODUCTION

Project Description

Energy Fuels Resources (Energy), requested WestWater Engineering (WWE) to provide a biological survey of a property in the Paradox Valley of western Colorado. Energy is proposing to develop a uranium mill at the site, which lies approximately 11.4 miles west of Naturita, Colorado, in Sections 7, 8, and 17, Township 46 North, Range 17 West (Figure 1). The site is within Montrose County, Colorado, and is entirely private land. The property consists of two parcels totaling approximately 960 acres (an 880 +/- acre parcel and an 80 +/- acre parcel). A 20 acre portion of the 880 acre parcel is located on the north side of Colorado Highway 90. Since no project activities are planned for this area, this survey and report includes only the 860 acre portion of the 880 acre parcel located south of Highway 90 (see Figure 1). Access to the project site is available via an unpaved road on the south side of Colorado Highway 90.

The primary use of the site and surrounding area is rangeland, wildlife habitat, and natural resource development. The general area has been subject to uranium and vanadium mining operations both currently and historically.

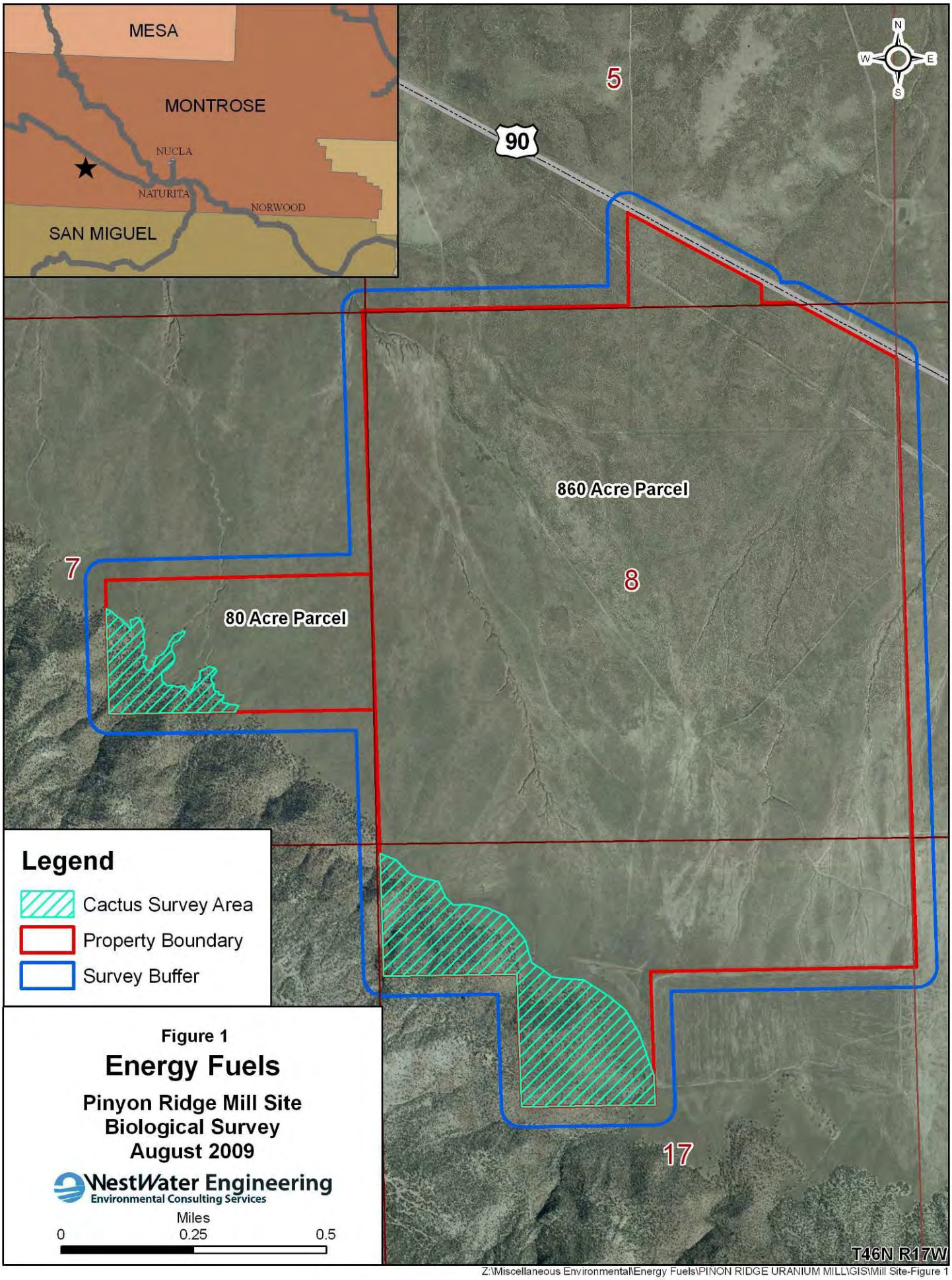
General Survey Information

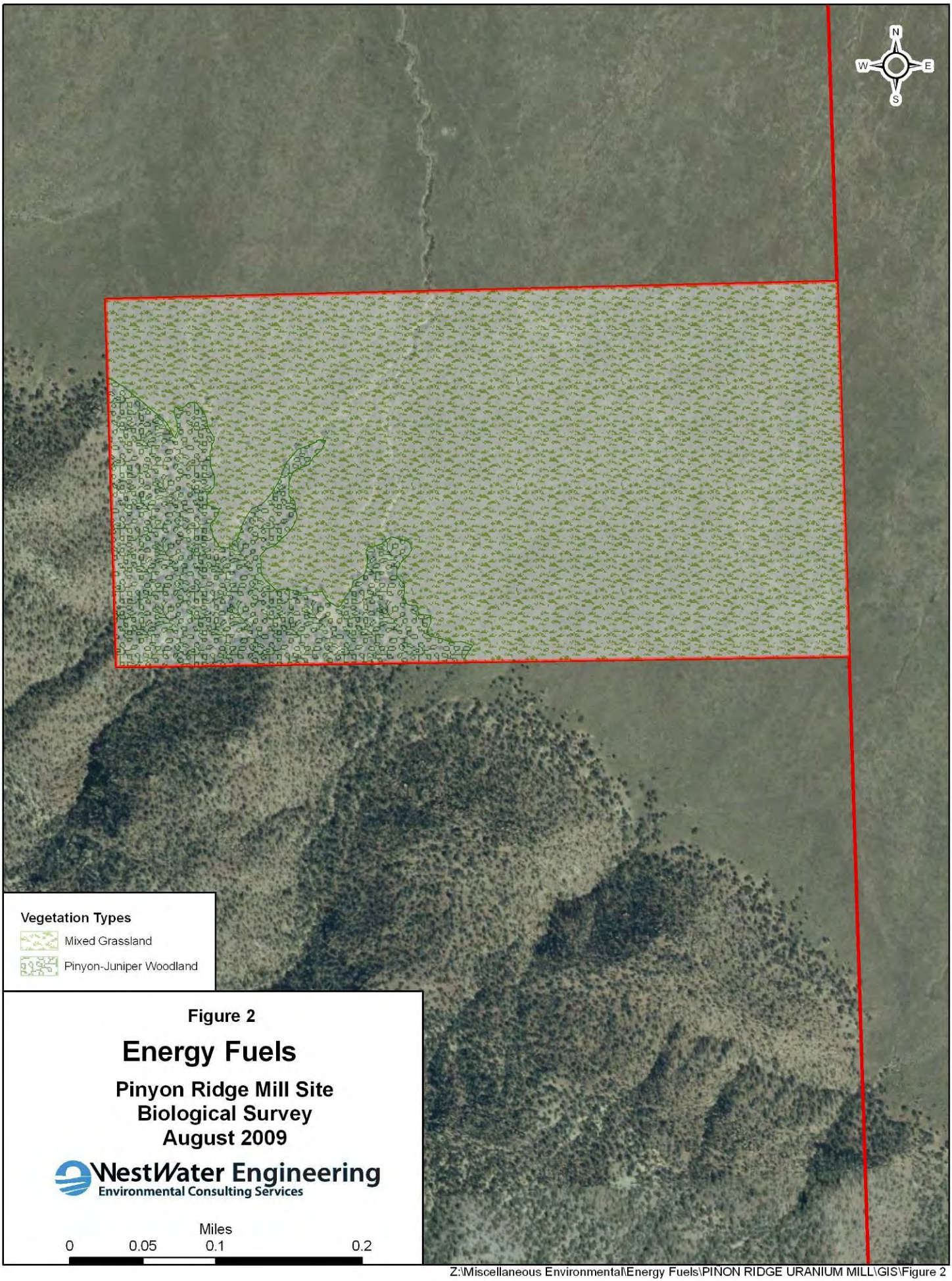
In preparation for developing the following report, WWE biologists performed field surveys and assessments of wildlife, wildlife habitats, and habitats for sensitive plant species on the site. WWE conducted surveys on August 24, 2009. The purpose of the survey was to determine the wildlife and sensitive plant species that occupy the project area at varying periods of the year, and species that would potentially be impacted as a result of development and operation of a uranium mill. Factors considered include: 1) absence or presence of wildlife and plant species including Gunnison's prairie dog, Burrowing Owl, Colorado hookless cactus, sensitive plants, raptors, and migratory birds; 2) the existing natural vegetation community. Surveys focused primarily on the 80 acre parcel, as the larger parcel was previously surveyed. This report provides written documentation that describes survey findings.

LANDSCAPE SETTING

Vegetation

Vegetation communities on the property range from piñon-juniper and mountain shrub communities on the steep, north facing slopes on the southern portion of the property to sagebrush dominated shrublands on the northern portion near the highway. Between the woodlands and shrublands lies a mixed grassland/shrubland dominated by four-wing saltbush (*Atriplex canescens*), prickly pear (*Opuntia spp*), and a variety of native and exotic grasses. The woodlands are dominated by Utah juniper (*Juniperus osteosperma*) and piñon pine (*Pinus edulus*) mixed with singleleaf ash (*Fraxinus anomala*), forbs, and grasses. The shrublands within the project area are characterized by big sagebrush (*Artemesia tridentata*), prickly pear, and various grasses. Invasive downy brome (*Bromus tectorum*), also known as cheatgrass, is prevalent on the site, especially in the mixed grassland and in the understory of the shrubland community. Dominant vegetation types on the 80 acre parcel are illustrated in Figure 2.


MESA
MONTROSE
NUCLA
NATURITA
NORWOOD
SAN MIGUEL
N
W
E
S
5
90
860 Acre Parcel
7
8
80 Acre Parcel
17
T46N R17W
Legend
Cactus Survey Area
Property Boundary
Survey Buffer
Figure 1
Energy Fuels
Pinyon Ridge Mill Site
Biological Survey
August 2009
WestWater Engineering
Environmental Consulting Services
Miles
0
0.25
0.5
Z:\Miscellaneous Environmental\Energy Fuels\PINON RIDGE URANIUM MILL\GIS\Mill Site-Figure 1



Z:\Miscellaneous Environmental\Energy Fuels\PINON RIDGE URANIUM MILL\GIS\Figure 2

Other common plants observed on the property include blue grama grass (*Condrosum gracile)*, galleta grass *(Pleuraphis jamesii)*, three-awn grass (Aristida spp.), Indian ricegrass *(Acnatherum hymenoides)*, needle-and-thread grass *(Hesperostipa comata)*, sand drop-seed *(Sporobolus cryptandrus),* broom snakeweed (*Gutierrezia sarothrae*), hedgehog cactus (*Echinocereus triglochidiatus*) nipple cactus (Coryphantha zizipara), plantain (*Plantago major*), yucca (*Yucca baccata),* four o'clock (*Mirabilis multiflora*), and mountain mahogany (*Cercocarpus montanus*). Photo 1 depicts some of the common species on the southern boundary of the 80 acre parcel.



Photo 1. Common vegetation on the southern edge of the 80 acre parcel of the property.

Climate

The climate for the Paradox Valley is considered arid with a wide annual range of temperatures and precipitation. The Nucla weather station, situated at an elevation of 5,859 feet, reflects general climate conditions for the region. The station records an average annual precipitation of 10.88 inches, with a record low temperature of minus 6° F and a record high temperature of 101° F. The Paradox Valley likely experiences higher summer temperatures than those recorded by the Nucla station.

Soils

Soil types include sandy loams and loams derived from shale and sandstone. Soil depths on the site are generally deep, with bedrock near or at the surface on the southern edge of the property. Soil types and vegetation vary with elevation and slope aspect. Mapped soil types, as published

by the Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture (USDA), were reviewed to determine the soil types and vegetation characteristics of the project site and surrounding property (NRCS 2009).Six soil types are found in the project area and include the following types, listed from most abundant to least, with slope description and approximate percentage of property:

1. Begay fine sandy loam; 1 to 6 percent slopes, 26.1%.
2. Paradox fine sandy loam; 1 to 4 percent slopes, 25.9%.
3. Barx fine sandy loam; 3 to 6 percent slopes, 19.3%.
4. Mikim loam; 1 to 6 percent slopes, 14.9%.
5. Rock outcrop; steep slopes, 8.6%.
6. Vananda silty clay; 1 to 6 percent slopes, 5.2%.

Terrain and Anthropogenic Features

The terrain varies from nearly flat to steep hillsides with elevations ranging from about 5,400 ft to about 6,100 ft. There are several small drainages dissecting the property, flowing in a south to north direction. At the southern end of the 860 acre parcel, a stock tank has been built. A series of unimproved roads is found on the property. Fencing consists of a drift fence which runs north-south, and a fence along the highway. Several air monitoring stations and water wells exist on the site.

WILDLIFE AND PLANT SURVEYS

Background Information

Descriptions of critical habitats for federally-listed threatened, endangered and candidate fish and wildlife species were reviewed in the Federal Register, U.S. Department of the Interior, U.S. Fish and Wildlife Service (USFWS). Wildlife habitat (activities) maps, provided via the internet by the Colorado Division of Wildlife's (CDOW) "Natural Diversity Information Source" (NDIS), were reviewed and incorporated into this report for wildlife distribution determinations (CDOW 2008a).

A list of Birds of Conservation Concern (BCC) and their habitats was reviewed. This list is published by the USFWS through a Memorandum of Understanding with the U.S. Bureau of Land Management (BLM) and the U.S. Forest Service (USFS), which places high conservation priorities for BCC species (USFWS 2008). Not all of these BCC species occur regularly in Colorado, and some are present only as seasonal migrants. Of those known to breed in Colorado, only a select few are known or suspected to breed within the vicinity of the property.

Avian literature sources such as the "Birds of Western Colorado Plateau and Mesa County" (Righter et al. 2004) and the "Colorado Breeding Bird Atlas" (Kingery 1998) were reviewed to determine the likelihood for species occurrence within the project area. Bird identification and taxonomic nomenclature are in accordance with that applied by the Colorado Breeding Bird Atlas Project (Kingery 1998).

The determination of the presence/absence of suitable habitat for threatened, endangered, and sensitive species (TESS) plants was based on previous WWE observations of typical habitat

occupied by BLM sensitive plants, the Colorado Natural Heritage Program (CNHP) Rare Plant Field Guide (Spackman et al. 1997), and locations of species documented in the CNHP statewide database.

Survey Methods

A review of the project area using aerial photographs, topographic maps, and an initial "drive-by" was conducted to familiarize personnel with vegetation types and terrain and as an aid to help determine the likelihood for the presence of threatened, endangered, or sensitive wildlife and plant species. Field data, including general project location, boundaries, and reported features, were verified and/or recorded with the aid of a handheld global positioning system (GPS) receiver utilizing NAD83/WGS84 map datum, with coordinate locations based on the Universal Transverse Mercator (UTM) coordinate system in Zone 12. Photographs were taken of the general project location, vegetation, and terrain.

After familiarizing themselves with the property WWE biologists conducted pedestrian surveys to identify and locate wildlife species, wildlife sign (tracks, fecal droppings, and vegetation disturbance), vegetation communities, and wildlife habitats. Pedestrian surveys were conducted within property boundaries, and a visual survey with the aid of binoculars was conducted in a 200 foot buffer from the property boundaries. Vegetation types were determined through field identification of plants, aerial photography, and on-the-ground assessments of plant abundance. Identification of plant species was aided by using pertinent published field guides (CWMA 2007, Kershaw et al. 1998, Weber and Wittman 2001, Whitson et al. 2004). Visual searches for raptor nests and bird species were focused on the woodlands, cliff habitat on the ridge to the south of the property, and the mixed grassland. Nest searches and bird identification were aided with the use of binoculars and song recognition where necessary.

Results

Federal Threatened, Endangered and Sensitive Species (TESS)

Special status species that may be present in the project area, and their habitats, are listed in Tables 1 and 2. The two categories of TESS listing considered here are 1) Federal Threatened, Endangered, and Candidate Species and 2) BLM Sensitive Species.

Table 1. Federally-listed threatened, endangered, and candidate species that may occur on the property

Common Name	Scientific Name	Status	Habitat Preference
Colorado hookless cactus	*Sclerocactus glaucus*	T	Endemic to western Colorado; prefers coarse soils on river and stream terrace deposits, or rocky surfaces on mesa slopes at 4,400 to 6,200 feet in elevation.
Gunnison prairie dog	*Cynomys gunnisoni*	C	Endemic to the four corners region; prefers flat areas with soils that permit burrowing. Habitat exists on the property, and it was formerly inhabited.

Table 1. Federally-listed threatened, endangered, and candidate species that may occur on the property

Common Name	Scientific Name	Status	Habitat Preference
Black-footed ferret	*Mustela nigripes*	E	Relies on prairie dog towns for cover and foraging throughout its range. No known population in Montrose County, though habitat does exist.

T= Federal Threatened; C=Federal Candidate

Table 2. BLM Sensitive Species that may occur in the project area

Common Name	Scientific Name	Habitat Preference
Naturita milkvetch	*Astragalus naturitensis*	Sandstone mesas, ledges, crevices and slopes in piñon-juniper woodlands. Elevation; 5000-7000 feet
Aromatic indian breadroot	*Pediomelum aromaticum*	Open piñon-juniper woodlands with sandy soils or adobe hills. Elevation; 4,800-5,700 feet.
Paradox Valley lupine	*Lupinus crassus*	Piñon-juniper woodlands within the Chinle formation in Paradox Valley. Elevation; 5,000-5,800 feet.
Gunnison Sage-grouse	*Centrocercus minimus*	Large, unbroken sagebrush shrublands with a diverse grass and forb understory.

An intensive survey of potential Colorado hookless cactus habitat present on the site was performed on August 24, 2009 (see Figure 1). WestWater biologists did not observe any individuals of this species. Colorado hookless cactus has not been found in the Paradox Valley area in previous survey efforts (USFWS 1990, Lyon and Sovell 2000, Ferguson 2009). No other TESS or sensitive plant species were observed during surveys of the property.

Gunnison prairie dogs (GUPD) are listed by the USFWS as a Candidate species. Prairie dogs are known to inhabit the Paradox Valley and were observed at two sites near the property by WWE biologists. A colony was observed approximately one mile east of the site. A larger colony was noted approximately 1 ½ miles west of the site. Both populations were observed from Highway 90. No active prairie dog towns were observed on the property; however there was evidence that prairie dogs have previously inhabited the property. Six locations were documented on the 80 acre parcel and are shown in Figure 3. Photos 2 and 3 depict typical abandoned prairie dog burrows on the property.

Black-footed ferrets are listed as Endangered by the USFWS in all of its former range in 6 states including Colorado and Montrose County. The ferret relies upon prairie dog towns for foraging as well as protection. There is potential habitat on the property, however no black-footed ferrets are known to inhabit Montrose County and no ferrets or their sign was observed during surveys.

No Sage-grouse or Sage-grouse sign was observed during the surveys, but the habitat along the northern edge of the property may be suitable for this species. The property is located outside the NDIS mapped habitat for Gunnison Sage-grouse. The nearest known population is in Dry

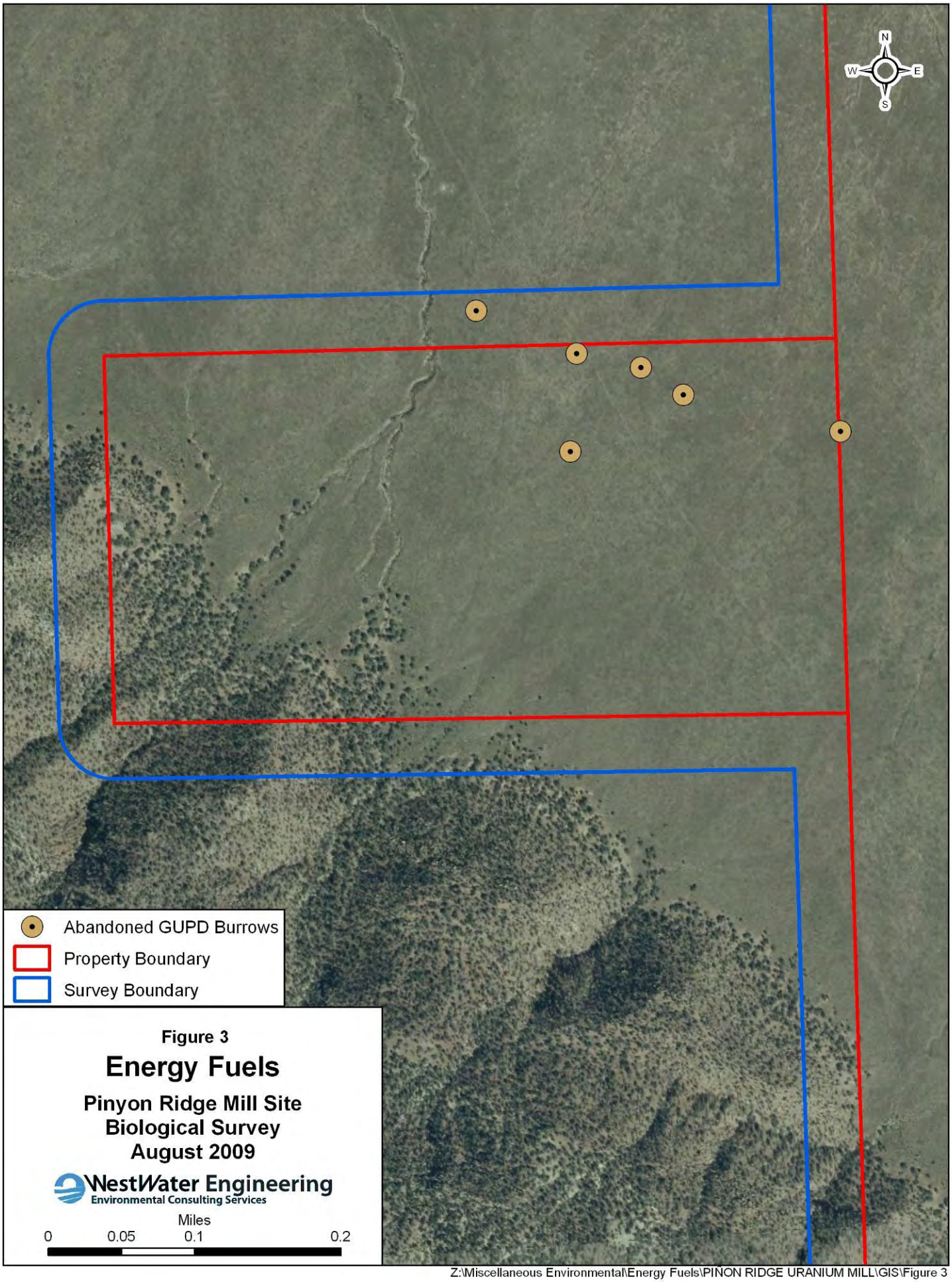


Figure 3

Energy Fuels

Pinyon Ridge Mill Site
Biological Survey
August 2009

WestWater Engineering
Environmental Consulting Services

Miles
0 0.05 0.1 0.2

Z:\Miscellaneous Environmental\Energy Fuels\PIÑON RIDGE URANIUM MILL\GIS\Figure 3



Photo 2: Typical abandoned Gunnison prairie dog burrows found on the property.



Photo 3: A close up of a burrow showing spider webs over the entrance, indicating the burrow has not recently been inhabited by prairie dogs or owls.

Creek Basin, and that population may no longer exist as recent spring lek counts have been unsuccessful in detecting breeding Sage-grouse (Ferguson 2009, pers. comm.).

Raptors

Several raptor species nest, reside, forage, or pass through the general project area. Raptor species that are common to the area include Golden Eagle, Red-tailed Hawk, American Kestrel, Peregrine Falcon, and Great Horned Owl. The piñon-juniper woodland and sandstone cliffs existing in and near the project area are of sufficient height and density to provide nesting habitat for tree and cliff nesting raptors.

Raptor species which may occur in the project area are listed in Table 4. Raptors that are considered Birds of Conservation Concern (USFWS 2008) are indicated.

No raptor nests were observed on the site during surveys. One Red-tailed Hawk was observed flying above the property. A pair of Golden Eagles, as well as two Burrowing Owls were observed approximately 1 ½ miles west of the property.

Burrowing Owls are known to inhabit rodent burrows in areas of sparse vegetation such as that found on the property. None were observed on the property and no sign of owls inhabiting abandoned burrows was found. Burrowing Owls are known to inhabit the Paradox Valley, and were observed in a Gunnison prairie dog town approximately 1 ½ mile west of the property on the day of surveys by WWE biologists.

No known Bald Eagle nest sites are located near the site. CDOW records indicate the property lies within a Bald Eagle winter forage area (NDIS 2007). Bald Eagles often feed on the carcasses of mule deer and other animals which have died due to winter stress or highway road-kills which may attract them to the property during winter months.

Table 4. Raptor species that may be present in the project area.

Common Name	Scientific Name	BCC	Habitat & Breeding Records
American Kestrel	*Falco sparverius*	N	• Coniferous and deciduous forests and open terrain with suitable perches. Nests in cavities in trees, cliffs and buildings. • Confirmed breeder in Montrose County.
Bald Eagle	*Haliaeetus leucocephalus*	Y	• Generally nest near larger bodies of water that support fish populations. Nests in large trees and cliffs. • Confirmed breeder in Montrose County.
Burrowing Owl	*Athene cunicularia*	Y	• Sparsely vegetated grasslands with an abundance of rodent burrows, especially in prairie dog towns. • Confirmed breeder in Montrose County. • Observed near the site.
Cooper's Hawk	*Accipiter cooperii*	N	• Cottonwood riparian to spruce/fir forests, including piñon/juniper woodlands. Nests most frequently in pines and aspen. • Confirmed breeder in Montrose County.
Ferruginous Hawk	*Buteo regalis*	Y	• Vast grassland/shrubland sites with hills/ridges nearby. • No breeding record in Montrose County.
Golden Eagle	*Aquila chrysaetos*	Y	• Grasslands, shrublands, agricultural areas, piñon-juniper woodlands, and ponderosa forests. Prefers nest sites on cliffs and sometimes in trees in rugged areas. • Confirmed breeder in Montrose County. • Observed near the property.
Great Horned Owl	*Bubo virginianus*	N	• Occupies diverse habitats including riparian, deciduous and coniferous forests with adjacent open terrain for hunting. • Confirmed breeder in Montrose County.
Long-eared Owl	*Asio otus*	N	• Occupies mixed shrublands near forests. Nests and roost in sites in dense cottonwoods, willows, scrub oak, junipers and dense forest of mixed conifers and aspens. • Possible breeder in Montrose County.
Northern Goshawk	*Accipiter gentilis*	N	• Large areas of coniferous or deciduous forests at all elevations. • Confirmed breeder in Montrose County.
Northern Harrier	*Circus cyaneus*	N	• Grassland, shrubland, agricultural areas, and marshes. Nests in areas with abundant cover (e.g., tall reeds, cattails, grasses) in grasslands and marshes. Also known to nest in high-elevation sagebrush. • Confirmed breeder in Montrose County.
Northern Pygmy Owl	*Glaucidium gnoma*	N	• Coniferous and deciduous forests including piñon-juniper woodlands. • Possible breeder in Montrose County.
Northern Saw-whet Owl	*Aegolius acadicus*	N	• Mountain and foothill forests and canyon country. Significant use of piñon-juniper woodland and Douglas-fir. • Confirmed breeder in Montrose County.

Table 4. Raptor species that may be present in the project area.

Common Name	Scientific Name	BCC	Habitat & Breeding Records
Peregrine Falcon	*Falco peregrinus*	Y	• Piñon-juniper woodlands and coniferous and riparian forest near cliffs. Nests on ledges of high cliffs away from human disturbance. • Confirmed breeder in Montrose County.
Prairie Falcon	*Falco mexicanus*	Y	• Grasslands, shrublands, and alpine tundra. Nests on cliffs or bluffs in open areas. • Possible breeder in Montrose County.
Red-tailed Hawk	*Buteo jamaicensis*	N	• Diverse habitats including grasslands, piñon-juniper woodlands and deciduous, coniferous and riparian forests. Nests in mature trees (especially cottonwood, aspen, and pines) and on cliffs and utility poles. • Confirmed breeder in Montrose County. • Observed near the property.
Sharp-shinned Hawk	*Accipiter striatus*	N	• High density young, or even-aged, stands of coniferous forest and deciduous forests of aspen or oak brush with small stands of conifers. • Confirmed breeder in Montrose County.
Swainson's Hawk	*Buteo swainsoni*	N	• Arid grassland, desert, and agricultural areas, shrublands, and riparian forests. Nests in trees in or near open areas. • Possible breeder in Montrose County.
Western Screech-owl	*Otus kennicottii*	N	• Primarily riparian woodland, but also found in piñon-juniper woodlands. • Probable breeder in Montrose County.

Birds of Conservation Concern (BCC)

WWE biologists surveyed the area for the presence of BCC and their habitat (Table 5) in order to evaluate the potential impacts of site development. BCC habitat and nesting records, as described in the Colorado Breeding Bird Atlas (Kingery 1998), Colorado Birds (Andrews and Righter 1992), and Birds of Western Colorado Plateau and Mesa County (Righter et al. 2004) in the vicinity, are summarized in Table 5.

Table 5. BCC species that may be present in the project area

Common Name	Scientific Name	Habitat & Breeding Records
Brewer's Sparrow	*Spizella breweri*	• Sagebrush shrublands. • Confirmed resident in Montrose County.
Gray Vireo	*Vireo vicinior*	• Canyons and mesas with scattered piñon-juniper woodlands. • Confirmed resident in Montrose County.

Table 5. BCC species that may be present in the project area

Common Name	Scientific Name	Habitat & Breeding Records
Gunnison Sage-grouse	*Centrocercus minimus*	• Sagebrush shrublands. • Confirmed resident in Montrose County.
Juniper Titmouse	*Baeolophus ridgwayi*	• Piñon-juniper woodlands. • Confirmed resident in Montrose County. • Observed on the site.
Lewis's Woodpecker	*Melanerpes lewis*	• Open pine forests, riparian woodlands, or piñon-juniper woodlands with open foraging habitat nearby. • Confirmed breeder in Montrose County.
Pinyon Jay	*Gymnorhinus cyanocephalus*	• Piñon-juniper woodlands. • Confirmed resident in Montrose County.

One BCC species was observed during the survey. A pair of Juniper Titmice was observed in the woodlands on the southeast side of the 80 acre parcel. Suitable habitat for the species listed in Table 5 was observed on the property.

Other Bird Species

The woodlands, shrublands, and mixed grasslands within the project area provide nesting and foraging habitats for migratory bird species at various times of year. Bird species observed during the surveys include Broad-tailed Hummingbird (*Selasphorus platycercus*), Common Raven *(Corvus corax)*, Loggerhead Shrike (*Lanius ludovicianus*), Mountain Bluebird (*Sialia currucoides*), Mourning Dove (*Zenaida macroura*), and Rock Wren (*Salpinctes obsoletus*).

Other birds that may inhabit the property include, but are not limited to, American Robin (*Turdus migratorius*), American Crow (*Corvus brachyrhynchos*), Black-billed Magpie *(Pica pica)*, Chipping Sparrow (*Spizella passerina*), Dark-eyed Junco (*Junco hyemalis*), Green-tailed Towhee (*Pipilo chlorurus*), Northern Flicker (*Colaptes auratus*), Spotted Towhee (*Pipilo maculatus*), Townsend's Solitaire (*Myadestes townsendi*), and Vesper Sparrow (*Pooecetes gramineus*), among others.

American Elk and Mule Deer

The property lies within CDOW Game Management Unit (GMU) 70. The project area is situated within mule deer and American elk severe winter range and an elk winter concentration area. During the survey, deer and elk droppings and tracks were observed throughout the project area.

Elk and mule deer utilize the winter range in the Paradox Valley extensively in winter when snow pushes them to lower elevations to find food. Mule deer rely on the existing sagebrush and shrubs for their primary food source, while elk rely primarily on grasses. Piñon-juniper woodlands, mixed grasslands, and sagebrush shrublands provide necessary forage and production areas as well as escape, thermal, and loafing cover for deer and elk.

Other Mammals

Coyote *(Canis latrans)* and bobcat (*Lynx rufus*) tracks were observed in damp soil in the vicinity of a recent well drilling site on the property. Desert cottontail rabbit *(Sylvilagus audubonii)* and black-tailed jackrabbit (*Lepus californicus*) were also observed during the survey.

Mountain lion (*Felis concolor*) likely follow wintering big game to the area. A variety of small mammal species may be present on the project site including long-tailed weasel (*Mustela frenata*), Ord's kangaroo rat (*Dipodomys ordii*), least chipmunk (*Tamias* minimus), Hopi chipmunk (*Tamias umbrinus*), valley pocket gopher *(Thomomys bottae),* and other rodent species.

Species of bats from the genera *Myotis* that may be present in the woodlands include Yuma myotis (*Myotis yumanensis)* and Fringed myotis (*Myotis thysanodes)*, California myotis (Myotis californicus), western small-footed myotis (*Myotis ciliolabrum*), and little brown myotis (*Myotis lucifugus.* No bats were observed during the surveys.

Reptiles

Western whiptail **(***Cnemidophorus tigris)*, collared lizard (*Crotaphytus collaris)*, and sagebrush lizard (*Sceloporus graciousus*), were observed during surveys. Other reptiles that may inhabit the property include plateau striped whiptail (*Cnemidophorus velox)*, side-blotched lizard (*Uta stansburiana*), tree lizard (*Urosaurus ornatus*), plateau lizard (*Sceloporus undulates*), short-horned lizard (*Phrynosoma hernandesi*), western terrestrial garter snake (*Thamnophis elegans*), striped whipsnake (*Masticophis taeniatus*), bull snake (*Pituophis catenifer*), and western rattlesnake (*Crotalus viridis).*

Amphibians

Tiger salamander *(Ambystoma tigrinum*) and Woodhouse's toad (*Bufo woodhousii*) may occur in the pond at the southern end of the 860 acre parcel, but none were observed. Other amphibians are unlikely to inhabit the property.

Fish

No fish were observed in the pond at the southern end of the 860 acre parcel and no other water bodies were encountered.

Weeds

The timing of the survey was not ideal for the detection of weeds. The most commonly observed weed was downy brome (a.k.a. cheatgrass) (*Bromus tectorum*) which was found throughout the property. Downy brome is listed as a State "C" List weed. Red-stemmed filaree (*Erodium cicutarium*) was observed in the mixed grassland, and is also a State "B" List weed (CWMA 2007). No other state or Montrose County listed weeds were detected.

REFERENCES

Andrews, R., and R. Righter. 1992. Colorado Birds: A Reference to Their Distribution and Habitat. Denver Museum of Natural History, Colorado.

BLM. 2000. Colorado BLM State Director's Sensitive Species List. U.S. Bureau of Land Management. Lakewood, Colorado.

CDOW. 2008a. Colorado Division of Wildlife. Natural Diversity Information Source. http://ndis.nrel.colostate.edu/wildlife.asp.

CDOW. 2008b. Colorado Division of Wildlife. Wildlife Species of Concern. Threatened and Endangered List. CDOW Web Home Page: http://wildlife.state.co.us/WildlifeSpecies/SpeciesOfConcern/ThreatenedEndangeredList.

CWMA. 2007. S. Anthony, T. D'Amato, A. Doran, S. Elzinga, J. Powell, I. Schonle, and K. Uhing. Noxious Weeds of Colorado, Ninth Edition. Colorado Weed Management Association, Centennial.

Ferguson, J. 2009. Personal Communication. WestWater Engineering. Grand Junction, Colorado. Retired wildlife biologist. Uncompahgre Field Office, BLM.

Kershaw, Linda, A. MacKinnon, and J. Pojar. 1998. Plants of the Rocky Mountains. Lone Pine Publishing, Auburn, Washington.

Kingery, H. E. 1998. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership, Colorado Division of Wildlife, Denver.

Lyon, Peggy and John Sovell. 2000. A Natural Heritage Assessment, San Miguel and Western Montrose Counies, Colorado. Colorado Natural Heritage Program. Fort Collins, Colorado.

NDIS. 2007. Natural Diversity Information Source, Colorado Division of Wildlife, 6060 Broadway, Denver: http://ndis.nrel.colostate.edu/index.html

NRCS. 2009. U. S. Department of Agriculture, Natural Resources Conservation Service. Web Soil Survey: http://websoilsurvey.nrcs.usda.gov/.

Righter, R., R. Levad, C. Dexter, and K. Potter. 2004. Birds of Western Colorado Plateau and Mesa Country. Grand Valley Audubon Society, Grand Junction, Colorado.

Spackman, S., B. Jennings, J. Coles, C. Dawson, M. Minton, A. Kratz, and C. Spurrier. 1997. Colorado Rare Plant Field Guide. Prepared for the U.S. Bureau of Land Management, the U.S. Forest Service and the U.S. Fish and Wildlife Service by the Colorado Natural Heritage Program.

U.S. Fish and Wildlife Service (USFWS). 1990. "Uinta Basin Hookless Cactus *Sclerocactus, Glaucus* Recovery Plan. Denver, Colorado." 26 pp.

USFWS. 2008. Birds of Conservation Concern 2008. U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia.

Weber, W. A., and R. C. Wittman. 2001. Colorado Flora Western Slope, Third Edition. University Press of Colorado, Boulder.

Whitson, T. D. (editor), L. C. Burrill, S. A. Dewey, D. W. Cudney, B. E. Nelson, R. D. Lee, and Robert Parker. 2004. Weeds of the West, Ninth Edition. Western Society of Weed Science in cooperation with Cooperative Extension Services, University of Wyoming. Laramie.

KLEINFELDER
Bright People. Right Solutions.

M E M O R A N D U M

Date:	November 4, 2008
To:	Alan Kuhn/Albuquerque
From:	Scott Dwyer/Seattle
cc:	NA
Project Number:	83088
Subject:	Ecological Screening of Raffinate Process Water

PURPOSE AND SCOPE

Kleinfelder has prepared this ecological screening of raffinate process water to address concerns about waterfowl exposure to the mill process water or raffinate. Dissolved concentrations of certain elements (e.g., arsenic, cadmium, copper, selenium) in the low-pH process water exceed levels of toxicological concern for waterfowl. However, dissolved metal concentrations in the process water are highly dependent on pH and decline for most metals with increasing pH, thus neutralization may reduce the potential ecological hazard of the raffinate process water.

This screening study was conducted to determine if neutralization of the raffinate process water could reduce the potential toxicity to wildlife. The study evaluates the raffinate at its original pH of 1.8, a partially neutralized pH of 4.5, and a fully neutralized pH of 7.5. Dissolved concentrations of 21 elements in raffinate process water at these three pH levels were measured. The concentrations were then compared to ecological screening levels to determine the relative toxicity of the raffinate process water at the three pH levels.

METHODS

Laboratory Testing and Analysis. J.E. Litz & Associates (Litz) performed amenability studies on representative ore samples from five mines in the Uravan Mineral Belt (Litz 2008). At the conclusion of these tests, filtrate samples (representative of pregnant process solution) from the Packrat and Pandora ores were further tested by Litz to determine the levels of soluble metals present in the solvent extraction raffinate before and after neutralization to 4.5 and 7.5 pH. The Packrat and Pandora ores had head grades of 0.527% and 0.266% U_3O_8 and 3.73 and 1.63% V_2O_5, respectively, which are

within the normal range of ore grades expected to be processed at the Piñon Ridge Mill. The Packrat Mine is part of the Whirlwind Mine complex and is located in Mesa County, Colorado near the town of Gateway. The Pandora Mine is located in San Juan County, Utah near the town of La Sal.

The bulk of the vanadium and uranium in the filtrate samples was stripped using a solvent consisting of ten percent alamine and three percent decyl alcohol in kerosene. This was done to more closely approximate the chemical makeup of the barren raffinate solution. An aliquot was collected from each stripped raffinate prior to neutralization. The pH of the filtrates was then gradually increased by adding a slurry of hydrated lime. Aliquots of the solution were collected after the pH stabilized at both 4.5 and 7.5 standard units. The six collected aliquots were submitted to Energy Laboratories, Inc. of Casper, Wyoming where metal concentrations were measured using inductively-coupled plasma mass spectrometry. The Energy Laboratories report for these analyses is provided in Attachment A.

Data Evaluation. Analytical data were evaluated for use in the ecological screening based on EPA guidance for assessing the usability of analytical data for health risk assessment (EPA 1992). In summary, data are evaluated on six criteria:

- Data sources
- Documentation
- Analytical methods and detection limits
- Data quality indicators
- Data review
- Reports to risk assessors

Data used in this ecological screening evaluation were reviewed based on the six criteria and meet a level of quality appropriate for use in a health risk assessment (Table 1).

Ecological Screening Evaluation. Dissolved process water concentrations for most of the analytes were compared to National Ambient Water Quality Criteria for acute duration exposures of ecological receptors to surface water (RAIS 2008) (Table 2). These criteria were not available for all 21 analytes; therefore, three other ecological screening values were applied, based on the following hierarchy:

- Tier II Secondary Acute Values (SAV),
- EPA Region 4 Surface Water Screening Benchmark values, and
- NAWQC for chronic duration exposure to surface water (Table 2).

The Tier II SAVs are developed using methodology similar to the acute duration NAWQC but require fewer data. If a Tier II SAV was not available, then EPA Region 4 benchmark values were selected as an appropriate surrogate for Tier II SAVs because these values are also developed to address acute duration exposures in surface water.

The NAWQC for chronic duration exposure to surface water was selected only for iron based on the lack of other values but similar derivation as the acute duration NAWQC.

Sixteen other ecological screening criteria were also considered for use in this evaluation. The four selected, however, appeared to be most appropriate because they were developed by regulatory agencies in the United States, they are based on acute duration exposures in surface water, and are intended to protect 95% of the species that may be exposed. A summary of the four selected ecological screening criteria is presented in Attachment B.

RESULTS

Dissolved water concentrations were reported for 21 analytes without neutralization of the acidic process water outflow and with neutralization to pH 4.5 and pH 7.5 (Table 3). For most metals, neutralization significantly decreased the dissolved concentration, in some cases to below the laboratory reporting limit. Neutralization did not affect barium, boron, manganese, nickel, and selenium concentrations as significantly as for other elements. Three elements were not detected in any sample: antimony, mercury, and thallium.

Although neutralization significantly reduces the concentrations of most elements in the raffinate process water, approximately one-third of the elements remain at concentrations that exceed the ecological screening levels applied in this evaluation (Table 3). The most notable was selenium, which had concentrations of 5.93 and 1.84 milligrams per liter (mg/L) in the Pack Rat and Pandora pH 7.5 samples, respectively. This level is approximately two orders of magnitude greater than the EPA surface water screening benchmark for acute duration exposure of 0.02 mg/L.

CONCLUSIONS AND DISCUSSION

Based on a comparison of the concentrations of 21 elements in raffinate process water to ecological screening levels, neutralization of the acidic raffinate process waters before discharge to surface impoundments may not be adequate to protect waterfowl. The dissolved concentrations of boron, cadmium, copper, manganese, selenium, and uranium concentrations exceed ecological screening levels even at neutral pH while several other metals (barium, nickel and zinc) were elevated above screening levels in the pH 7.5 Pandora sample, but below screening levels in the pH 7.5 Pack Rat sample. The selenium concentrations observed in the neutralized process water are of most concern given their elevated concentrations compared to the screening level. Should the neutralized water support fish and other aquatic organisms, the selenium in the water could also be further concentrated in the food organisms eaten by waterfowl

LIMITATIONS

The ecological screening values applied in this evaluation are not specific for waterfowl. Ecological screening values for the protection of aquatic life (i.e., NAWQC, Tier II SAVs,

and EPA Region 4 surface water benchmarks) are generally based on aquatic organisms that remain submerged or mostly submerged for their lifetimes, including benthic organisms, fish, and aquatic plants. Waterfowl, however, live only a portion of their lives actually in contact with surface water and are rarely totally immersed. Waterfowl also typically visit and spend time at other surface water bodies; therefore, the magnitude of waterfowl exposure to raffinate process water is likely to be less than for organisms that reside in the water column and the ecological screening values used in this assessment may overestimate the actual hazard to waterfowl.

REFERENCES

EPA. 1992. Final Guidance for Data Useability in Risk Assessment (Part A). OSWER Directive 9285.7-09A. Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency. Washington DC. June 2.

Litz. 2008. Amenability of Uravan Mineral Belt Ore Samples to Pinon Mill Leach Conditions. J. E. Litz & Associates, L.L.C., Golden, CO. October 31, 2008.

Risk Assessment Information System (RAIS). 2008. Available on-line at: http://rais.ornl.gov/. Accessed October 31, 2008.

ATTACHMENTS

A – Energy Laboratories, Inc. Analytical Report
B – Summary of Ecological Screening Criteria

TABLE 1. DATA USABILITY EVALUATION FOR ANALYSIS OF RAFFINATE PROCESS WATER

Data Usability Criteria	Importance	Action
Data Sources	Data sources must be comparable if data are combined for quantitative use in risk assessment.	All data developed for the evaluation of raffinate process water were based on one set of samples collected by a single team and analyzed by one laboratory. Thus, all data are assumed to be comparable.
Documentation	Deviations from the SAP and SOPs must be documented to identify potential limitations in the data set.	No deviations from the investigation work plan were noted in the laboratory case narrative; therefore, no limitations were noted for this data set.
Analytical Methods and Detection Limits	The method chosen must test for the chemical of potential concern at a detection limit that will meet the concentration levels of concern in applicable matrices.	Inductively coupled plasma-mass spectrometry was used to analyze each of the raffinate process water samples evaluated in the ecological screening. This method is an industry standard for analysis of metals in environmental media. Laboratory reporting limits (RLs) for the 21 metals were equivalent to, or less than, the highest ecological screening level identified for this evaluation (RAIS 2008). Therefore, the RLs were sufficiently sensitive to identify concentrations of ecological concern.

TABLE 1. DATA USABILITY EVALUATION FOR ANALYSIS OF RAFFINATE PROCESS WATER (continued)

Data Usability Criteria	Importance	Action
Data Quality Indicators	Completeness – this criterion addresses the possibility of lost or compromised samples that prevent the inclusion of a given sample in the data set. Comparability – if more than one data set is used in a risk assessment, the data must be from comparable sources (see Data Sources) Representativeness – Sample data must accurately reflect the site characteristics to effectively represent the site's risk to human health and the environment. Hot spots and exposure area media must have representative data. Precision – If reported concentrations are near the concentration of concern then it is necessary to be as precise as possible in order to quantify the likelihood of false negatives and false positives. Accuracy – Quantitative accuracy information is critical when results are reported near the level of concern. Contamination in the field, during shipping, or in the laboratory may bias the analytical results. Instruments that are not calibrated or tuned according to Statement of Work requirements may also bias results.	Completeness – No samples were noted as lost or compromised in the laboratory case narrative. Comparability – Only one data set was used for the evaluation of compliance with variance conditions. Thus, no issue of comparability between data sets had to be addressed. Representativeness – Two water samples were collected from the raffinate process outflow identified as "Pandora Raffinate" and "Pack Rat Raffinate." Two additional samples were collected from each of these sources, one neutralized to a pH of 4.5 and another neutralized to a pH of 7.5. Thus, six water samples from the two sources were evaluated. This approach should provide a representative profile of raffinate process water with and without neutralization. Precision – The relative percent differences (RPD) between the matrix spike sample and the matrix spike duplicate sample, were well within acceptable limits indicating an acceptable level of precision. Accuracy – The accuracy of the analytical data was addressed using a laboratory control sample (LCS) spiked with 18 of the 21 elements for which analysis was performed. All recovery measurements were within control limits indicating an acceptable level of accuracy.

TABLE 1. DATA USABILITY EVALUATION FOR ANALYSIS OF RAFFINATE PROCESS WATER (continued)

Data Usability Criteria	Importance	Action
Data Review	Use of preliminary data or partially reviewed data can conserve time and resources by allowing modification of the sampling plan while an investigation is in process. Critical analytes and samples used for quantitative risk assessment require a full data review.	Only process water analyses reported in the final report from Energy Laboratories, Inc., were used in the evaluation described in this report. Data review included method blanks, laboratory control samples, matrix spikes/duplicates, reporting limits, data qualifiers, and raw data.
Reports to Risk Assessors	Data reviewer should report data in a format that provides readability as well as clarifying information. SQLs, a narrative, and qualifiers that are fully explained reduce the time and effort required in interpreting and using the analytical results. Limitations can be readily identified and documented in the risk assessment report.	Report from laboratory was adequate and sufficient to perform an ecological screening evaluation.

TABLE 2
ECOLOGICAL SCREENING VALUES USED TO ASSESS RAFFINATE PROCESS WATER AT THREE PH LEVELS

Parameter	Acute NAWQC[a]	Tier II SAV Surface Water Screening Benchmark[b]	EPA Region 4[c]	Chronic NAWQC[d]
Aluminum	X	-	-	-
Antimony	-	X	-	-
Arsenic	X	-	-	-
Barium	-	X	-	-
Beryllium	-	X	-	-
Boron	-	X	-	-
Cadmium	X	-	-	-
Chromium	X	-	-	-
Copper	X	-	-	-
Iron	-	-	-	X
Lead	X	-	-	-
Manganese	-	X	-	-
Mercury	X	-	-	-
Molybdenum	-	X	-	-
Nickel	X	-	-	-
Selenium	-	-	X	-
Silver	X	-	-	-
Thallium	-	X	-	-
Uranium	-	X	-	-
Vanadium	-	X	-	-
Zinc	X	-	-	-

[a] National Ambient Water Quality Criteria for acute duration exposure to analytes in surface water (RAIS 2008).
[b] Tier II Secondary Acute Value (SAV) developed by the same method but using fewer data than acute NAWQC (RAIS 2008).
[c] EPA Region 4 surface water screening benchmark for acute duration exposure (RAIS 2008).
[d] National Ambient Water Quality Criteria for chronic duration exposure to analytes in surface water (RAIS 2008). Expected to be more protective (i.e., lower concentration) than acute duration exposure NAWQC.

TABLE 3
COMPARISON OF DISSOLVED RAFFINATE PROCESS WATER CONCENTRATIONS OF 21 ELEMENTS TO ECOLOGICAL SCREENING CONCENTRATIONS[a]

Elements	Pandora Raff (PR)	PR pH 4.5	PR pH 7.5	Pack Rat Raff (PRR)	PRR pH 4.5	PRR pH 7.5	Acute NAWQC	Tier II SAV	EPA Region 4	Chronic NAWQC
Aluminum	**2100**	**12.6**	0.5	**5960**	**5.6**	0.6	0.75	-	-	-
Antimony	<0.05	<0.05	<0.05	<0.5	<0.05	<0.05	-	0.18	-	-
Arsenic	**11.5**	0.031	<0.001	**58.9**	<0.001	<0.001	0.34	-	-	-
Barium	**0.3**	**0.3**	**0.3**	**0.5**	**0.3**	0.1	-	0.11	-	-
Beryllium	**0.2**	<0.01	<0.01	**0.28**	<0.01	<0.01	-	0.035	-	-
Boron	**2.7**	**1.3**	**1.1**	**1.5**	**0.8**	**0.2**	-	0.03	-	-
Cadmium	**1.19**	**0.94**	**0.82**	**3.67**	**1.04**	**0.06**	0.002	-	-	-
Chromium	**3.27**	**2.48**	<0.05	**2.56**	<0.05	<0.05	0.57	-	-	-
Copper	**3.96**	**0.33**	**0.14**	**5.62**	**0.26**	**0.11**	0.013	-	-	-
Iron	**2760**	0.36	0.13	**2190**	**8.09**	0.62	-	-	-	1
Lead	**3.07**	<0.05	<0.05	**0.52**	<0.05	<0.05	0.065	-	-	-
Manganese	**259**	**227**	**192**	**45.6**	**23.2**	**2.63**	-	2.3	-	-
Mercury	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0014	-	-	-
Molybdenum	0.2	<0.1	<0.1	0.4	<0.1	<0.1	-	16	-	-
Nickel	**7.96**	**4.97**	**4.5**	**8.83**	**2.51**	0.06	0.47	-	-	-
Selenium	**5.49**	**2.02**	**1.84**	**14**	**7.68**	**5.93**	-	-	0.02	-
Silver	**0.34**	**0.03**	<0.01	**0.53**	<0.01	<0.01	0.0032	-	-	-
Thallium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	0.11	-	-
Uranium	**366**	**60.2**	**2.36**	**369**	**15.6**	**0.568**	-	0.046	-	-
Vanadium	**97.9**	**0.6**	<0.1	**195**	**0.4**	0.2	-	0.28	-	-
Zinc	**48.4**	**25.3**	**9.35**	**40.6**	**3.48**	0.07	0.12	-	-	-

[a] Only ecological screenings that were used for comparison to analytical results are reported here to maintain consistency with Table 2. All concentrations are presented in milligrams per liter (mg/L)

BOLD/SHADED concentrations indicate that the ecological screening level is exceeded.

ATTACHMENT A

ENERGY LABORATORIES, INC. ANALYTICAL REPORT

ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (82601) • P.O. Box 3258 • Casper, WY 82602
Toll Free 888.235.0515 • 307.235.0515 • Fax 307.234.1639 • casper@energylab.com • www.energylab.com

ANALYTICAL SUMMARY REPORT

October 07, 2008

Energy Fuels Resources Corporation
31525 Hwy 90
Nucla, CO 81424

Workorder No.: C08080093

Project Name: Pinon

Energy Laboratories, Inc. received the following 6 samples from Energy Fuels Resources Corporation on 8/4/2008 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C08080093-001	Pandora Raff	07/31/08 15:00	08/04/08	Aqueous	Metals by ICP/ICPMS, Total Mercury, Total Metals Preparation by EPA 200.2
C08080093-002	Pandora-4.5 pH	07/31/08 15:00	08/04/08	Aqueous	Same As Above
C08080093-003	Pandora-7.5 pH	07/31/08 15:00	08/04/08	Aqueous	Same As Above
C08080093-004	Pack Rat Raff	07/31/08 15:00	08/04/08	Aqueous	Same As Above
C08080093-005	Pack Rat-4.5 pH	07/31/08 15:00	08/04/08	Aqueous	Same As Above
C08080093-006	Pack Rat-7.5 pH	07/31/08 15:00	08/04/08	Aqueous	Same As Above

As appropriate, any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

If you have any questions regarding these tests results, please call.

Report Approved By: STEVE CARLSTON

ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (82601) • P.O. Box 3258 • Casper, WY 82602
Toll Free 888.235.0515 • 307.235.0515 • Fax 307.234.1639 • casper@energylab.com • www.energylab.com

LABORATORY ANALYTICAL REPORT

Client: Energy Fuels Resources Corporation
Project: Pinon
Lab ID: C08080093-005
Client Sample ID: Pack Rat-4.5 pH

Revised Date: 10/07/08
Report Date: 08/26/08
Collection Date: 07/31/08 15:00
DateReceived: 08/04/08
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS - TOTAL							
Aluminum	5.6	mg/L		0.1		E200.7	08/07/08 15:00 / cp
Antimony	ND	mg/L		0.05		E200.8	08/08/08 01:27 / ts
Arsenic	ND	mg/L		0.001		E200.8	08/08/08 01:27 / ts
Barium	0.3	mg/L		0.1		E200.8	08/08/08 01:27 / ts
Beryllium	ND	mg/L		0.01		E200.8	08/08/08 01:27 / ts
Boron	0.8	mg/L		0.1		E200.7	08/07/08 15:00 / cp
Cadmium	1.04	mg/L		0.01		E200.8	08/08/08 01:27 / ts
Chromium	ND	mg/L		0.05		E200.8	08/12/08 02:49 / sml
Copper	0.26	mg/L		0.01		E200.8	08/08/08 01:27 / ts
Iron	8.09	mg/L		0.03		E200.7	08/07/08 15:00 / cp
Lead	ND	mg/L		0.05		E200.8	08/08/08 01:27 / ts
Manganese	23.2	mg/L		0.01		E200.8	08/08/08 01:27 / ts
Mercury	ND	mg/L		0.001		E245.1	08/06/08 15:01 / eli-b
Molybdenum	ND	mg/L		0.1		E200.8	08/08/08 01:27 / ts
Nickel	2.51	mg/L		0.05		E200.8	08/08/08 01:27 / ts
Selenium	7.68	mg/L	D	0.002		E200.8	08/08/08 01:27 / ts
Silver	ND	mg/L		0.01		E200.8	08/12/08 02:49 / sml
Thallium	ND	mg/L		0.1		E200.8	08/08/08 01:27 / ts
Uranium	15.6	mg/L		0.0003		E200.8	08/08/08 01:27 / ts
Vanadium	0.4	mg/L		0.1		E200.8	08/08/08 01:27 / ts
Zinc	3.48	mg/L		0.01		E200.8	08/08/08 01:27 / ts

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (82601) • P.O. Box 3258 • Casper, WY 82602
Toll Free 888.235.0515 • 307.235.0515 • Fax 307.234.1639 • casper@energylab.com • www.energylab.com

LABORATORY ANALYTICAL REPORT

Client: Energy Fuels Resources Corporation
Project: Pinon
Lab ID: C08080093-006
Client Sample ID: Pack Rat-7.5 pH

Revised Date: 10/07/08
Report Date: 08/26/08
Collection Date: 07/31/08 15:00
DateReceived: 08/04/08
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
METALS - TOTAL							
Aluminum	0.6	mg/L		0.1		E200.7	08/07/08 15:04 / cp
Antimony	ND	mg/L		0.05		E200.8	08/08/08 01:34 / ts
Arsenic	ND	mg/L		0.001		E200.8	08/08/08 01:34 / ts
Barium	0.1	mg/L		0.1		E200.8	08/08/08 01:34 / ts
Beryllium	ND	mg/L		0.01		E200.8	08/08/08 01:34 / ts
Boron	0.2	mg/L		0.1		E200.7	08/07/08 15:04 / cp
Cadmium	0.06	mg/L		0.01		E200.8	08/08/08 01:34 / ts
Chromium	ND	mg/L		0.05		E200.8	08/08/08 01:34 / ts
Copper	0.11	mg/L		0.01		E200.8	08/08/08 01:34 / ts
Iron	0.62	mg/L		0.03		E200.7	08/07/08 15:04 / cp
Lead	ND	mg/L		0.05		E200.8	08/08/08 01:34 / ts
Manganese	2.63	mg/L		0.01		E200.8	08/08/08 01:34 / ts
Mercury	ND	mg/L		0.001		E245.1	08/06/08 15:03 / ell-b
Molybdenum	ND	mg/L		0.1		E200.8	08/08/08 01:34 / ts
Nickel	0.06	mg/L		0.05		E200.8	08/08/08 01:34 / ts
Selenium	5.93	mg/L		0.001		E200.8	08/12/08 02:55 / sml
Silver	ND	mg/L		0.01		E200.8	08/12/08 02:55 / sml
Thallium	ND	mg/L		0.1		E200.8	08/08/08 01:34 / ts
Uranium	0.0568	mg/L		0.0003		E200.8	08/14/08 22:09 / sml
Vanadium	0.2	mg/L		0.1		E200.8	08/08/08 01:34 / ts
Zinc	0.07	mg/L		0.01		E200.8	08/08/08 01:34 / ts

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (82601) • P.O. Box 3258 • Casper, WY 82602
Toll Free 888.235.0515 • 307.235.0515 • Fax 307.234.1639 • casper@energylab.com • www.energylab.com

CLIENT: Energy Fuels Resources Corporation
Project: Pinon
Sample Delivery Group: C08080093

Date: 07-Oct-08

CASE NARRATIVE

The following Case Narrative contains exceptions or comments pertaining to the analysis of samples submitted by Energy Fuels Resources Corporation on 8/4/2008 09:30:00. These samples were assigned ELI Workorder Number C08080093.

REVISED/SUPPLEMENTAL REPORT
The attached analytical report has been revised from a previously submitted report due to a request from Zach Rogers to change sample ID's for sample -005 from Pandora-4.5pH to Pack Rat-4.5pH and Sample -006 from Pandora-7.5pH to Pack Rat 7.5pH.

ORIGINAL SAMPLE SUBMITTAL(S)
All original sample submittals have been returned with the data package.

SAMPLE TEMPERATURE COMPLIANCE: 4°C (±2°C)
Temperature of samples received may not be considered properly preserved by accepted standards. Samples that are hand delivered immediately after collection shall be considered acceptable if there is evidence that the chilling process has begun.

GROSS ALPHA ANALYSIS
Method 900.0 for gross alpha and gross beta is intended as a drinking water method for low TDS waters. Data provided by this method for non potable waters should be viewed as inconsistent.

RADON IN AIR ANALYSIS
The desired exposure time is 48 hours (2 days). The time delay in returning the canister to the laboratory for processing should be as short as possible to avoid excessive decay. Maximum recommended delay between end of exposure to beginning of counting should not exceed 8 days.

SOIL/SOLID SAMPLES
All samples reported on an as received basis unless otherwise indicated.

ATRAZINE, SIMAZINE AND PCB ANALYSIS USING EPA 505
Data for Atrazine and Simazine are reported from EPA 525.2, not from EPA 505. Data reported by ELI using EPA method 505 reflects the results for seven individual Aroclors. When the results for all seven are ND (not detected), the sample meets EPA compliance criteria for PCB monitoring.

SUBCONTRACTING ANALYSIS
Subcontracting of sample analyses to an outside laboratory may be required. If so, ENERGY LABORATORIES will utilize its branch laboratories or qualified contract laboratories for this service. Any such laboratories will be indicated within the Laboratory Analytical Report.

BRANCH LABORATORY LOCATIONS
eli-b - Energy Laboratories, Inc. - Billings, MT
eli-g - Energy Laboratories, Inc. - Gillette, WY
eli-h - Energy Laboratories, Inc. - Helena, MT
eli-r - Energy Laboratories, Inc. - Rapid City, SD
eli-t - Energy Laboratories, Inc. - College Station, TX

CERTFICATIONS:
USEPA: WY00002; FL-DOH NELAC: E87641; Arizona: AZ0699; California: 02118CA
Oregon: WY200001; Utah: 3072350515; Virginia: 00057; Washington: C1903

ISO 17025 DISCLAIMER:
The results of this Analytical Report relate only to the items submitted for analysis.

ENERGY LABORATORIES, INC. - CASPER,WY certifies that certain method selections contained in this report meet requirements as set forth by the above accrediting authorities. Some results requested by the client may not be covered under these certifications. All analysis data to be submitted for regulatory enforcement should be certified in the sample state of origin. Please verify ELI's certification coverage by visiting www.energylab.com

ELI appreciates the opportunity to provide you with this analytical service. For additional information and services visit our web page www.energylab.com.

THIS IS THE FINAL PAGE OF THE LABORATORY ANALYTICAL REPORT.

ATTACHMENT B

SUMMARY OF ECOLOGICAL SCREENING CRITERIA
(from RAIS 2008)

National Ambient Water Quality Criteria (NAWQC). These criteria are calculated by the EPA as half the Final Acute Value (FAV), which is the fifth percentile of the distribution of 48- to 96-hour LC50 values or equivalent median effective concentration (EC50) values for each criterion chemical (Stephan et al. 1985). The acute NAWQC are intended to correspond to concentrations that would cause less than 50% mortality in 5% of exposed populations in a brief exposure. They may be used as a reasonable upper screening benchmark because waste site assessments are concerned with sublethal effects and largely with continuous exposures, rather than the lethal effects and episodic exposures to which the acute NAWQC are applied. The chronic NAWQC are the FAVs divided by the Final Acute-Chronic Ratio (FACR), which is the geometric mean of quotients of at least three LC50/CV ratios from tests of different families of aquatic organisms (Stephan et al. 1985). It is intended to prevent significant toxic effects in chronic exposures and is used as a lower screening benchmark. NAWQC for several metals are functions of water hardness. Values for hardness-dependent metals default to 100 mg CaCO3/L, but equations are provided to obtain values based on site-specific hardness values. Recommended values for metals are expressed in terms of dissolved metal in the water column.

EPA. 2002. National Recommended Water Quality Criteria. EPA Publication Number EPA 822-R-02-047. Office of Water, U.S. Environmental Protection Agency, Washington, D.C. November.

EPA Region 4 Surface Water Screening Benchmark (Acute). These benchmarks, derived by the EPA's Southeastern region, are criteria or test endpoints divided by a factor of 10. The Region IV surface water screening values were obtained from Water Quality Criteria documents and represent the chronic ambient water quality criteria values for the protection of aquatic life. They are intended to protect 95% of the species, 95% of the time. If there was insufficient information available to derive a criterion, the lowest reported effect level was used with the application of a safety factor of ten to protect for a more sensitive species. A safety factor of ten was also used to derive a chronic value if only acute information was available. Since these numbers are based on conservative endpoints and sensitive ecological effects data, they represent a preliminary screening of site contaminant levels to determine if there is a need to conduct further investigations at the site. Note that equations for hardness dependent metals do not match those in EPA (2002). The EPA Region 4 Acute criteria are available on-line at:

www.epa.gov/region04/waste/ots/ecolbul.htm#tbl1.

Tier II Secondary Acute Value (SAV). Tier II values were developed so that aquatic benchmarks could be established with fewer data than are required for National Ambient Water Quality Criteria. The Tier II SAV is derived by taking the lowest genus mean acute value from data meeting specified criteria and dividing it by a Final Acute Value Factor whose value depends on the number of acute data requirements that are met. Values provided here are from Suter and Tsao (1996).

Suter, G.W. , II, and C.L. Tsao. 1996. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision. Publication Number ES/ER/TM-96/R2. Oak Ridge National Laboratory, Oak Ridge, TN. June.

Chronic National Ambient Water Quality Criteria. These criteria are calculated by the EPA as half the Final Acute Value (FAV), which is the fifth percentile of the distribution of 48- to 96-hour LC50 values or equivalent median effective concentration (EC50) values for each criterion chemical (Stephan et al. 1985). The acute NAWQC are intended to correspond to concentrations that would cause less than 50% mortality in 5% of exposed populations in a brief exposure. They may be used as a reasonable upper screening benchmark because waste site assessments are concerned with sublethal effects and largely with continuous exposures, rather than the lethal effects and episodic exposures to which the acute NAWQC are applied. The chronic NAWQC are the FAVs divided by the Final Acute-Chronic Ratio (FAC), which is the geometric mean of quotients of at least three LC50/CV ratios from tests of different families of aquatic organisms (Stephan et al. 1985). It is intended to prevent significant toxic effects in chronic exposures and is used as a lower screening benchmark. NAWQC for several metals are functions of water hardness. Values for hardness-dependent metals default to 100 mg CaCO3/L, but equations are provided to obtain values based on site-specific hardness values. Recommended values for metals are expressed in terms of dissolved metal in the water column.

EPA. 2002. National Recommended Water Quality Criteria :2002. Office of Water, U.S. Environmental Protection Agency, Washington, D.C. November. EPA 822-R-02-047.