# United States Department of the Interior
# Bureau of Land Management

**Environmental Assessment**
**DOI-BLM-CO-S010-2009-0076**

**October 2012**

# RM Potash Exploration Project

***Location:*** T. 43 N., R. 19 W., sec. 11, 14 (COC73567);
T. 43 N., R. 19 W., sec. 13, 23-26 (COC73569);
T. 43 N., R. 18 W., sec. 20, 29, 32; T. 42 N., R. 18 W., sec. 5 (COC73572);
T. 43 N., R. 18 W., sec. 28, 33; T. 42 N., R. 18 W., sec. 4, 9, 16 (COC73574)
T. 42 N., R. 18 W., sec. 3, 10, 15 (COC73576);
T. 42 N., R. 19 W., sec. 4, 5, 9, 10, 13; T. 42 N., R. 18 W., sec. 29, 32 (COC74370).

Dolores and San Miguel Counties, Colorado

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# RM Potash Exploration Project

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# RM Potash Exploration Project

**DOI-BLM-CO-S010-2009-0076**

## 1.0 PURPOSE & NEED

### 1.1 Introduction

This Environmental Assessment (EA) has been prepared to disclose and analyze the environmental consequences of the RM Potash Exploration Project (Project), as proposed by RM Potash, Inc. An EA is a site-specific analysis of potential effects that could result with the implementation of a Proposed Action or alternatives to the Proposed Action. It assists the Bureau of Land Management (BLM) in project planning and ensuring compliance with the National Environmental Policy Act (NEPA), and in making a determination as to whether any "significant" effects could result from the analyzed actions. "Significance" is defined by NEPA and is found in regulation 40 CFR 1508.27.

An EA provides evidence for determining whether to prepare an Environmental Impact Statement (EIS) or a statement of "Finding of No Significant Impact" (FONSI). If the decision maker determines that this Project has "significant" effects following the analysis in the EA, then an EIS would be prepared for the Project. If not, a Decision Record (DR) may be signed for the EA approving the selected alternative, whether the Proposed Action or another alternative. A DR, including a FONSI statement, documents the reasons why implementation of the selected alternative would not result in "significant" environmental effects (effects) beyond those already addressed in the San Juan/San Miguel Resource Management Plan (RMP) (December 1985). The Tres Rios Field Office (TRFO) of the BLM is responsible for implementing this RMP, including the lands where the proposed RM Potash Exploration Project would occur.

The RM Potash Exploration Project EA has been prepared in accordance with NEPA of 1969 and the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR 1500-1508); the Federal Land Policy and Management Act (FLPMA) of 1976; the 1985 San Juan/San Miguel RMP and Record of Decision (ROD), and BLM guidance on implementing NEPA, including the BLM NEPA Handbook H-1790-1 (BLM 2008). Information gathered from federal, state, and local agencies, RM Potash, and publicly available literature, as well as in-house BLM sources such as the RMP, were used in the preparation of this EA.

In this EA, the BLM is analyzing potential effects of approving up to six potassium prospecting permit applications and implementing the associated Exploration Plan(s) that RM Potash submitted for the proposed exploration Project. The exploration plan was initially submitted in December 2009, and was revised most recently in March of 2012 to reflect changes in drill pad size from 100 feet x 100 feet to 250 feet x 250 feet. These

changes were made to reasonably accommodate larger drill rigs and additional tanks required for closed-loop drilling systems resulting in added protection for surface and ground water. The locations of drill holes and access roads remain the same and are located within the resource survey areas. In addition, the Project includes improving existing access roads, most of which would be within the lands under permit application. A legal access agreement with private land owners would be needed by RM Potash to access sites 2 and 6.

Potash is the common name for the element potassium (symbol K). Potash is generally found associated with salt deposits or salt brines and is one of three key ingredients in fertilizer. Potash is also used in the manufacture of TV and computer screens, soaps, perfumes, water softeners, de-icers, aluminum recycling, metal electroplating, steel heat-treating, drilling mud, ceramics, potassium hydroxide, pharmaceuticals, and livestock and poultry feed. Currently, over 90 percent of required potash in the United States is imported.

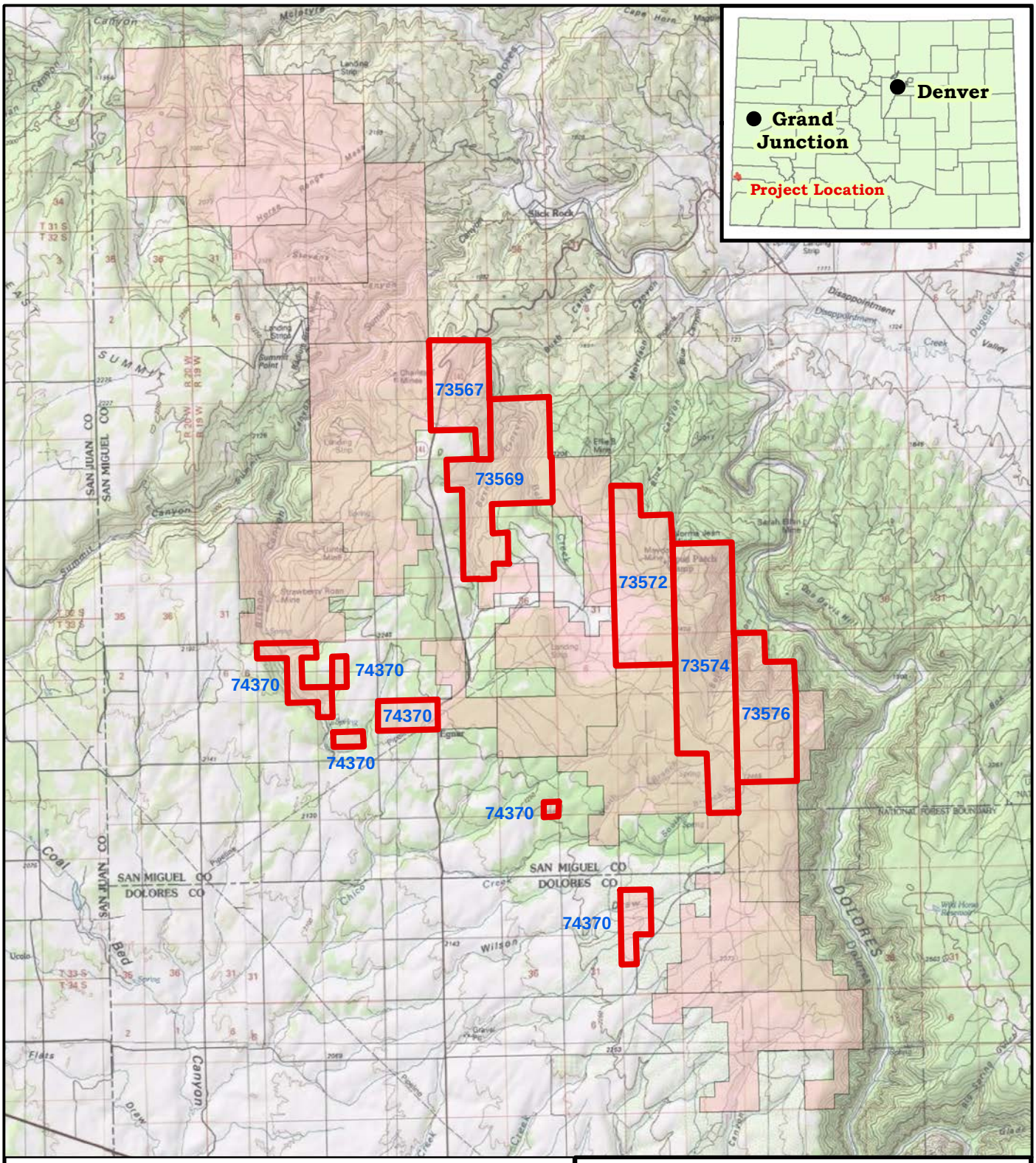
Core drilling is proposed on the six permit application sites to confirm the presence of potash and determine its thickness and grade. Geophysical logs from petroleum exploration wells drilled in the prospecting permit areas indicate the presence of potash layers in the evaporite sequences of the Paradox Formation in the Dolores Anticline at thicknesses and depths which may be amenable to commercial production.

## 1.2 Background

RM Potash has submitted 21 Prospecting Permit Applications (Applications) over a combined area of approximately 40,000 acres (**Figure 1**). However, this document is analyzing the issuance of up to six individual permit applications for this exploration Project: COC73567, COC73569, COC73572, COC73574, COC73576, and COC74370. If RM Potash determines that the results of core drilling indicate the deposit would not be economical, further drilling could be discontinued. If the results of drilling on the six individual permit holes are promising, RM Potash could submit additional drilling plans on other permit applications requiring additional site-specific NEPA analysis.

The six permit applications cover a total of 9,954 acres and disturbance for each core hole would be limited to a 250 foot by 250 foot pad (~1.4 acres) and associated road improvements (up to 20 feet wide) on 3 access roads (**Tables 2.2, 2.3**). Total disturbance is estimated to be approximately 19 acres for all drill pads and road improvements; this is defined as the Project Area (see **Figure 2 in Chapter 2**).

RM Potash needs geologic, geochemical, and technical information to delineate and assess the potash resources within the permit application areas and proposes to conduct an initial “proof of concept” drilling program to test the continuity and thickness of the potash beds and provide core for geochemical analysis.




Base Map: Copyright:© 2011 National Geographic Society, i-cubed
(http://goto.arcgisonline.com/maps/USA_Topo_Maps)
Nucla, CO., 1983 and Delta, CO., 1980, 1:100,000 Topographic Maps.
Coordinate System: NAD83 UTM Zone 12

**Legend**

- Evaluated RM Potash Prospecting Permit Boundaries
- RM Potash Prospecting Permit Boundaries

N

0 2 Miles

RM POTASH
POTASH EXPLORATION PROJECT

FIGURE 1
GENERAL PROJECT LOCATION

JBR

| DRAWN BY | DATE DRAWN |
|---|---|
| CP | 6/7/2012 |

SCALE
1:150,000

E:\drawings\Colorado Potash Exporation EA RM Potash\EA\Fig1 General Project Location Map.mxd

RM Potash hopes to determine the thickness and grade of potash initially in any or all of the six proposed drill hole locations presently under consideration in this EA, and ultimately across the larger (approximately 40,000 acres) area covered by their 21 prospecting permits. This would be done by additional drilling and other exploration methods, such as seismic profiling or geologic mapping. Once the deposit has been adequately delineated, RM potash could apply for preference right leases on those lands (43 CFR 3507.11). BLM would need to prepare a mineral report based on the results of exploration and determine whether RM Potash had indeed discovered a *valuable deposit* of potash and whether the lands under permit application were *chiefly valuable* for potash (as defined at 43 CFR 3501.5).

If RM Potash considers the results of the initial coring to be favorable, new drilling plans for additional permit application areas may be submitted. However, because the locations of future drilling would be based on data obtained through the proposed exploratory drilling analyzed in this EA (if approved), future activities have yet to be determined and are considered to be beyond the scope of this EA. Any additional drilling not analyzed in this EA would be subject to additional NEPA review if later proposed.

RM Potash would be required to obtain all necessary permits from other agencies. In coordination with appropriate state and federal regulatory agencies, RM Potash would comply with all applicable state and federal drilling and exploration rules, regulations, policies, orders, notices, guidelines, standards, etc. when conducting the proposed exploration activities and operations.

## 1.3 Purpose(s) of the Proposed Action

The BLM is responsible for managing the public lands and federal mineral estate within the prospecting permit areas. The BLM's purpose for the Proposed Action is to consider authorization of six prospecting permit applications and exploration activities described in the Exploration Plan(s).

## 1.4 Need for the Proposed Action

The need for the Proposed Action is established by BLM's responsibility to respond to the Applications submitted by RM Potash under the Mineral Leasing Act of 1920, as amended (MLA) and FLPMA.

## 1.5 Decision to be Made

The BLM would decide which, if any prospecting permits submitted by RM Potash would be approved or declined, and if so, under what terms and conditions. Prospecting Permits are mineral leasing-related actions and decided by the BLM State Director (as delegated), while exploration plans may be approved at the Field Office level.

## 1.6 Conformance with BLM Land Use Plan

The Proposed Action is subject to and has been reviewed for conformance with the following plan (43 CFR 1610.5, BLM 1617.3):

- Name of Plan: San Juan/San Miguel Resource Management Plan and Record of Decision

- Date Approved/Amended: September 1985, as amended

Although the potassium exploration drilling is not explicitly mentioned in the plan, it is consistent with the objectives, goals, and decisions as they relate to the management of mineral resources as stated on pages 16 and 17 of the RMP. The San Juan/San Miguel RMP and ROD from 1985 (BLM 1985) does not have a separate section covering solid non-energy leasable minerals (i.e. potash), or the issuance of permits, licenses, or leases, and the exploration drilling and mining activity that would be associated with them. However, in the permit application areas, lands are *open for all mineral activity*, including oil and gas leasing, and the effects of potash core hole drilling are very similar to the drilling of petroleum stratigraphic test holes. The Mineral Management section of Chapter 2 of the RMP ROD, on pages 16 and 17 states:

The following principles will guide the BLM in managing mineral resources on public lands (per BLM Instruction Memorandum No. 84-568, dated June 28, 1984).

1. Except for Congressional withdrawals, public lands shall remain open and available for mineral exploration and development unless withdrawal or other administrative action is clearly justified in the national interest.
2. BLM actively encourages and facilitates the development by private industry of public land mineral resources so that national and local needs are satisfied and economically and environmentally sound exploration, extraction, and reclamation practices are provided.
3. BLM will process mineral patent applications, permits, operating plans, mineral exchanges, leases, and other use authorizations for public lands in a timely and efficient manner.
4. BLM's land use plans and multiple use management decisions will recognize that mineral exploration and development can occur concurrently or sequentially with other resource uses. BLM further recognizes that land use planning is a dynamic process and decisions will be updated as new data are evaluated.
5. Land use plans will reflect geologic, energy, and mineral values on public lands through more effective data assessment of those values.
6. BLM will monitor saleable and leasable mineral operations to ensure proper resource recovery and evaluation, production verification, diligence and

inspection, and enforcement of the lease, sale, or permit terms. BLM will ensure receipt of fair market value for mineral commodities unless otherwise provided for by statute.

7. BLM will maintain effective professional, technical, and managerial personnel knowledgeable in mineral exploration and development.

In addition, a solid, non-energy mineral lease for sodium was in existence from 1934-1997 within the planning area of the 1985 RMP (COD-46504) to produce sodium brine. This implicitly acknowledges solid leasable mineral production in the 1985 RMP.

The majority of the prospecting permit application areas are in land designated as being management area A (livestock), J (forestry), E (mineral resources), and H (public land disposal), and is open for mineral development. A small portion near the Dolores River canyon may be designated as management areas B (wildlife) and C (recreation). However, the specific proposed drill sites are located in the following management areas:

| **Drill Site Number** | **Land Management Designation** |
|---|---|
| Drill Site 1 | E (mineral resources) |
| Drill Site 2 | A (livestock) |
| Drill Site 3 | A (livestock) |
| Drill Site 4 | A (livestock) |
| Drill Site 5 | J (forestry) |
| Drill Site 6 | A (livestock) |

The Oil and Gas Plan Amendment to the San Juan/San Miguel Resource Management Plan was completed in October 1991 and specifically deals with Oil and Gas development within the planning area. The area covered by the plan amendment has moderate to high potential for oil and gas development and is available for oil and gas leasing, although limited areas along the Dolores River Canyon may have no-surface occupancy (NSO) stipulations. Additionally, there may be timing restrictions for some areas and site specific NSO or no-leasing for site specific resource issues (e.g., sage grouse leks, cultural resource sites) not directly addressed in the 1991 amendment. Surface disturbance, road access, and water use for potash exploration and development is similar to oil and gas exploration and development. Because of these similarities, management direction for oil and gas activities will be applied to potash activities, including, but not limited to using the same NSO areas, timing stipulations, etc., as set forth in the 1985 RMP, or any applicable supplemental guidance documents, standards, or guidelines, requiring similar drilling and surface management plans and mitigation measures, which may be incorporated as design features (see section 2.2.8, below) and/or conditions of approval.

## 1.7 Relationship to Statutes, Regulations, or other Plans

Exploration of mineral resources (the Proposed Action) is consistent with NEPA and the federal guidelines for implementing NEPA including the CEQ regulations for implementing the Procedural Provisions of NEPA outlined in 40 CFR 1500-1508, and USDI and BLM policies and manuals (BLM NEPA Handbook H-1790-1 [BLM 2008]). The Proposed Action is also consistent with other plans, programs, and policies of Affiliated Tribes, other federal agencies, as well as state and local governments to the extent practical, including but not limited to the following:

- The FLPMA of 1976, as amended in 43 United States Code (USC) 1701 et seq.
- The CEQ's *Considering Cumulative Effects under the NEPA* (CEQ 1997)
- 43 CFR Part 46, Implementation of the NEPA of 1969; Final Rule, effective November 14, 2008
- USDI requirements provided in Part 516, Chapters 1 through 15, of the Departmental Manual (USDI 2004)
- Mineral Leasing Act of 1920
- Clean Air Act (42 USC 1857 et seq.), as amended and recodified (42 USC 7401 et seq.)
- Clean Water Act (33 USC 1251 et seq.)
- Executive Order 11988, Floodplain Management
- Executive Order 11990, Protection of Wetlands
- FSM 2542.05, Municipal Supply Watersheds
- Public Law 93-523, Safe Drinking Water Act
- Rangeland Health Standards as developed by the Secretary of the Interior on February 22, 1995
- Endangered Species Act (ESA) (16 USC 1531 et seq.)
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
- Migratory Bird Treaty Act (MBTA) (16 USC 703 et seq.)
- National Historic Preservation Act of 1966 (NHPA), as amended (16 USC 470 et seq.).
- Protection of Historic Properties (36 CFR 800)
- Native American Graves Protection and Repatriation Act of 1990 and 43 CFR Part 10
- American Indian Religious Freedom Act of 1978
- Native American Trust Resource Policy standards as presented in the Department of the Interior Comprehensive Trust Management Plan dated March 28, 2003
- U.S. Fish and Wildlife Service (USFWS) Bald and Golden Eagle Protection Act, as amended

*State of Colorado and Local Compliance:*

- Dolores County Development and Land Use Regulation (Dolores County 2007)
- San Miguel County Land Use Code (San Miguel County 2010)

*Other Regulations which May be Consulted for Guidance*

- Best Management Practices (BMPs) as defined in *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development, Fourth Edition* (Gold Book) (USDI and USDA 2007)
- BLM Oil and Gas Onshore Orders 1, 2, and 6
- Colorado Oil and Gas Commission Rules

Some of these federal and state programs are described more fully below.

### 1.7.1 Climate Change Policy

The federal government released the Global Climate Change Initiative and Policy Book in 2002. The plan comprehensively addresses climate change and includes a goal to reduce the greenhouse gas intensity of the U.S. economy by 18 percent between 2002 and 2012. It also provides initiatives to reduce greenhouse gas emissions and encourage renewable energy resources development (U.S. Global Change Research Program 2002).

### 1.7.2 Section 7 of the Endangered Species Act (ESA)

The ESA of 1973 provides for conservation of species that are endangered or threatened throughout all or a significant portion of their range, as well the ecosystems on which they depend. Under Section 7(a) (2) of the ESA, federal agencies must consult with the USFWS on activities that may affect a listed species.

### 1.7.3 Section 106 of the National Historic Preservation Act (NHPA)

Section 106 of the NHPA requires federal agencies to consider the effects of their undertakings on historic properties through a mandated review process (relevant regulations at 36 CFR 800). Section 106 of the NHPA also mandates that the Advisory Council on Historic Preservation is given a reasonable opportunity to comment.

## 1.8 Identification of Issues

The RM Potash Exploration Project was posted on the BLM's NEPA Register and Schedule of Proposed Actions (SOPA). A Notice of Scoping was also posted on the BLM Newsroom web page on June 28, 2011 and a public scoping letter was mailed to 74 addresses on June 24, 2011. A scoping meeting was held at the Dove Creek High School Commons in Dove Creek, Colorado on July 12, 2011 to identify potential issues. Written scoping comments were accepted via mail, e-mail, and fax resulting in a total of 15 scoping letters.

The Interdisciplinary Team (IDT) met on August 25, 2011 to review public scoping comments and identify resource issues. Minutes taken from this meeting formed the basis of the analysis in this EA and are included in the Project Record. Based upon either the resource not being present in the Project Area or the lack of the resource being impacted by the proposed Project, several resources were dismissed from further analysis in this EA (**Appendix A** - Interdisciplinary Team Checklist).

The relevant issues were identified through the scoping process and through the IDT meeting. Those issues that are potentially affected are carried forward through analysis in this EA include the following:

### 1.8.1 Cultural Resources

- Proposed disturbances could impact cultural resources eligible and potentially eligible for the National Register of Historic Places (NRHP).

### 1.8.2 Geology and Minerals

- The Proposed Action could impact or disrupt existing oil and gas leases, exploration, and development. The oil and gas formations are within or near the same depths as the exploratory drilling targets. Drilling activities may adversely impact leased federal oil and gas resources.
- Uranium development has occurred in the area and drilling activities may interfere with uranium proposals. Drilling may penetrate uranium-bearing horizons.
- Geological hazards typically associated with petroleum drilling, such as over-pressurized gas reservoirs or hydrogen sulfide ($H_2S$) releasing strata may be encountered.

### 1.8.3 Land Use and Realty

- The Proposed Action could change the land use of the area.
- The Proposed Action would impact private property.
- The Proposed Action would occur in two counties with different codes and regulations. For regulations not superseded by state and/or federal regulations, the design of the Project needs to take into account these differences.

### 1.8.4 Livestock Grazing

- Proposed disturbances may result in forage loss (i.e. AUM loss).

### 1.8.5 Migratory Birds

- Depending upon the timing of Project activities, migratory birds and their nests could be impacted.

### 1.8.6 Noise

- Equipment noise may exceed human health dBA restrictions or other standards and restrictions.

### 1.8.7 Recreation

- The Project could impact recreational opportunities, such as hunting.

### 1.8.8 Socioeconomics

- The Project could burden local infrastructure funded by municipalities, counties, the state, and federal governments.
- The Project could have beneficial or adverse effects on the San Miguel and Dolores County economies.
- Project activities could adversely impact people living and working in close proximity to Project activities.

### 1.8.9 Soils

- The Project may impact soil productivity through compaction and loss of topsoil and may increase erosion potential through the removal of ground cover and/or constructing roads and/or drilling on steep slopes.
- Accidental surface spills and releases of drilling fluids, mud additives, and other chemicals or materials used in the proposed operations could contaminate native soils and degrade soil productivity.

### 1.8.10 Federal Endangered, Threatened, and Candidate Species; BLM Sensitive Species and Species of Concern; State of Colorado Endangered and Threatened Species, and Federal Birds of Conservation Concern

- Increased noise, traffic, and human presence from Project activities could impact raptor foraging, roosting, breeding, or nesting behavior.
- BLM Special Status Species and Birds of Conservation Concern, such as Gunnison sage grouse, and associated habitats could be impacted.
- Mexican spotted owl which is federally listed as threatened may be affected by Project activities which are proposed adjacent to potential habitat.

### 1.8.11 Transportation

- Project activities would adversely impact local roads and access to private and public lands.

### 1.8.12 Vegetation, Including Invasive Species/Noxious Weeds

- Ground disturbances would impact shrub/grass vegetation.
- Ground disturbance could spread or introduce invasive species/noxious weeds.
- Dolores and San Miguel Counties host a number of rare and BLM sensitive plant species and communities that could be impacted by Project activities.

### 1.8.13 Waste - Hazardous, Fluid, and Solid

- Formations containing naturally occurring radioactive materials (NORMs) could be encountered, potentially contaminating water resources, soils, surface conditions, etc.
- The Project would generate solid waste that may require special measures for disposal.

- Liquid waste products, some of which could be hazardous, will be generated by the Project. Improper handling, storage, and disposal of these products could negatively impact natural resources in the area.

### 1.8.14 Water Resources/Quality (drinking/surface/ground)

- Soil disturbance and erosion may impact surface water quality.
- Accidental spills or releases of drilling/cementing fluids, additives, or waste products may degrade surface water quality.
- Improper drilling, casing, cementing, and abandonment techniques may degrade groundwater quality and/or quantity by introducing non-native fluids into existing aquifer systems, establishing communication pathways between two or more naturally isolated aquifers, or creating zones of cross-contamination between hydrocarbon-bearing and water-bearing intervals.

### 1.8.15 Wildlife

- Project activities could impact big game, such as mule deer and elk, which use the area for winter concentration areas and critical winter range.
- The Project could impact wildlife habitat, including raptor nesting areas.
- The Project could cause habitat fragmentation.

### 1.8.16 Air quality and Climate Change

- The Project would release carbon dioxide and/or other gasses associated with climate change.

## 1.9 Issues and Resources Considered but Eliminated

In addition to the resources listed above, the potential effects of the Project on other issues and resources were also evaluated. However, these resources and concerns are either not present/applicable or will be addressed through Project design, management requirements, and/or Environmental Protection Measures (EPMs). It is emphasized that as described in the proposed action, all surface and downhole activities associated with the Project would comply with applicable State of Colorado and federal mining and environmental laws and regulations. State and federal Oil and Gas rules, regulations, policies, orders, notices, best management practices (including Colorado Oil and Gas Conservation Commission Rules and Policies, Onshore Oil and Gas Federal Regulations 43 CFR Part 3160, Department of Interior Onshore Oil and Gas Operating Orders, BLM National and BLM State of Colorado Notice to Lessees, BLM Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development), and any other standards, guidelines, and policies would be used as guidance in developing mitigation measures and Conditions of Approval by the TRFO. Such compliance would mitigate effects to potential resources and ensure public health and safety throughout the Project. These concerns will not be carried through in **Chapters 3** and **4**.

### 1.9.1 Air Quality

The Project Area lies within an area designated as an attainment area. Air emissions resulting from the Project would consist of emissions from mobile sources and the disturbance of soil. Best Management Practices (BMPs) for dust control would be

employed. All Project vehicles would have legally mandated on-board emission controls; traffic and drilling would only create a small amount of dust. Effects to air quality would be short term and negligible.

### 1.9.2 Paleontological Resources

A Project-specific paleontological survey was completed for the Project (Blair 2011). No fossil resources were observed with the exception of a single pebble, which may have been a gastrolith (i.e., a stone swallowed to aid in digestion) at proposed Drill Site 3. If any suspected vertebrate paleontological resources are uncovered during the Project, disturbance would cease and BLM would be notified to determine the significance and need for documentation and protection.

### 1.9.3 Special Designations

The Project Area is not within any special designation areas (i.e. Wilderness, Wilderness Study Areas, Areas of Critical Environmental Concern, Wild and Scenic Rivers, research natural areas). The area is identified as natural landscape with limited management and is near areas identified as special areas and unique landscapes (BLM and USFS 2007).

### 1.9.4 Potash Production Concerns

Several public comments (BLM 2011a) expressed concerns regarding the potential effects of leasing and commercial potash production and recovery facilities, such as the demands on infrastructure, requirements of natural gas pipelines, emissions from boilers, the amount of water required for potash pumping, potential subsidence, and other geotechnical issues. These concerns cannot be meaningfully evaluated until the potash deposit has been adequately delineated and a mining and production plan has been proposed. If exploration results indicate that economically viable potash resources may be present and a leasing or production proposal is received, these concerns will be fully evaluated in a site-specific NEPA document or documents analyzing the effects of leasing and development of the resource.

### 1.9.5 Public Health and Safety

Many of the drilling activities associated with the Project can be dangerous without proper precautions. General risks to public health and safety that may be associated with this Project include, but are not limited to, encountering hydrogen sulfide gas in subsurface formations, possibly drilling through over-pressured and/or under-pressured formations potentially resulting in well control problems, and potential health issues related to working around oil-based mud systems. At a minimum, the Project would be adhering to all applicable state and federal mining and oil and gas drilling regulations, rules, policies, orders, and notices, in order to eliminate potential risks to public health and safety.

### 1.9.6 Additional Issues and Resources Considered But Eliminated from Analysis

The following critical elements and/or natural resources are not present or do not occur within or near the Project Area, would not be affected by the Proposed Action and/or any Alternatives, including the No Action Alternative and will not be carried forward in the analysis.

- **Areas of Critical Environmental Concern:** No ACEC's occur within the Project Area.
- **Environmental Justice (Executive Order 12898):** Given the scale of the Project, and that the proportion of minorities and overall income level of people living near the Project Area is likely similar to those figures for San Miguel and Dolores Counties, it is not expected that the Project would cause disproportionate adverse human health or environmental effects on minority or low-income communities.
- **Fish Habitat:** There are no fisheries in or near the Project Area.
- **Floodplains (Executive Order 11988):** No floodplains occur in the Project Area.
- **Native American Religious Concerns:** Potentially affected Native American tribes were included in the distribution of the NOS. No responses or concerns from any of the notified tribes have been received or expressed.
- **Prime or Unique Farmlands:** No prime or unique farmlands occur within the Project Area.
- **Wetlands/Riparian Zones (Executive Order 11990):** The proposed disturbance within the Project Area does not include any wetlands or riparian zones.
- **Wilderness:** The Project Area is not located within a designated wilderness, proposed Wilderness Area or wilderness study area.
- **Wild Horses and Burros:** No wild horses or burros, or wild horse/burro management areas, occur within or near the Project Area.
- **Wild and Scenic Rivers:** There are no wild and scenic rivers within the Project Area.
- **Visual Resources:** Based on a preliminary review of data provided in the DEIS for San Juan Public Lands, it appears that the Project Area has a visual resource management (VRM) designation of Class III. The Project would be in conformance with the VRM objectives for the Project Area.

## 1.10 Summary

This chapter has presented the purpose and need of the proposed RM Potash Exploration Project, as well as the relevant issues, i.e., those elements of the human environment that could be affected by the implementation of the proposed Project. The Proposed Action, as well as a No Action Alternative, is presented in **Chapter 2**. **Chapter 3** presents the affected environment of the Project. The potential environmental effects or consequences resulting from the implementation of each alternative are then analyzed in **Chapter 4** for each of the identified issues.

# 2.0 DESCRIPTION OF ALTERNATIVES, INCLUDING PROPOSED ACTION

## 2.1 Introduction

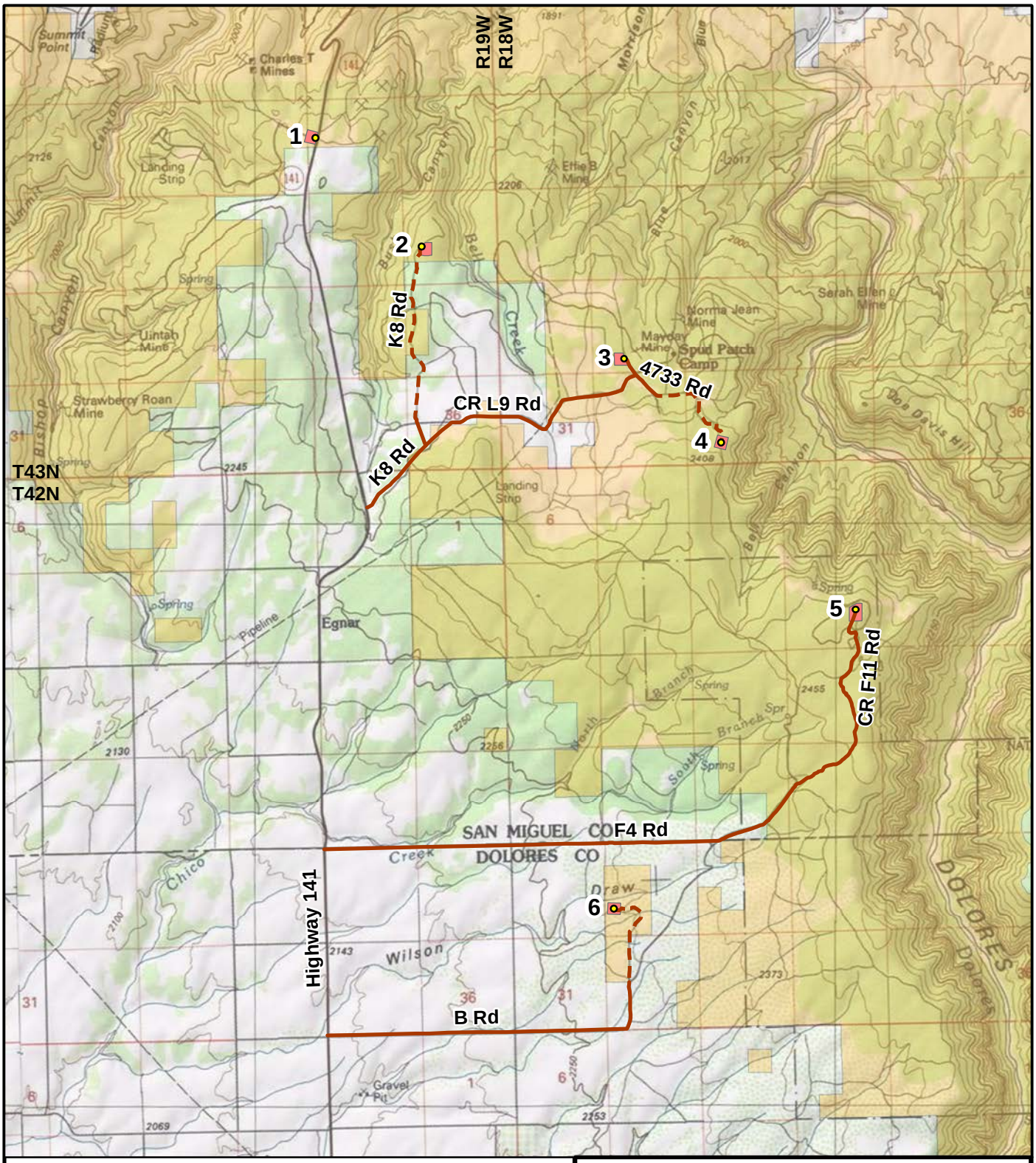
Two alternatives were considered for analysis in this EA: the Proposed Action (Alternative A) and the No Action Alternative (Alternative B). The No Action Alternative is required to be considered by NEPA and the CEQ implementing regulations under 40 CFR 1500-1508. This chapter describes both of these alternatives in detail.

## 2.2 Alternative A – Proposed Action

The current proposal includes six prospecting permit applications and associated Exploration Plan(s), potentially resulting in the construction of exploration drill pads and drilling up to six sites (**Figure 2**). In addition, existing road alignments would be used for access; no new roads would be constructed. However, short segments of potential access roads en-route to Drill Sites 2, 4, and 6 would need substantial improvement to accommodate drilling equipment, including, but not limited to, blading, graveling, and/or road-fill. Because these specific roads are infrequently travelled and require substantial improvement, this is being treated as 'new disturbance' for the purposes of calculating disturbance area in this document.

Drill Site 1 is located immediately adjacent to a state highway and Drill Sites 3 and 5 are located immediately adjacent to existing county roads. Some road maintenance may occur as-needed, but no substantial improvements have been identified and these access roads are not treated as 'new disturbance'.

The following subsections detail the specific construction and operational procedures that comprise the Proposed Action and are the subject of the analysis of this EA.




Base Map: Copyright:© 2011 National Geographic Society, i-cubed
(http://goto.arcgisonline.com/maps/USA_Topo_Maps)
Nucla, CO., 1983 and Delta, CO., 1980, 1:100,000 Topographic Maps.
Coordinate System: NAD83 UTM Zone 12

**Legend**

- Proposed Drill Holes
- 10 Acre Study Areas
- Access Roads
- Access Roads Requiring Improvement

**Land Ownership**

- BLM
- Private

N

0 2 Miles

RM POTASH
POTASH EXPLORATION PROJECT

FIGURE 2
PROJECT AREAS AND LAND STATUS

JBR

| DRAWN BY | DATE DRAWN |
|---|---|
| CP | 6/7/2012 |

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### 2.2.1 Land Ownership and Location

The six prospecting permit applications are on the National System of Public Lands administered by the TRFO in the BLM. They are located in Dolores and San Miguel Counties, Colorado, between 7 to 16 miles north of Dove Creek in Dolores County (**Figure 1**). The legal locations of the six prospecting permit application areas are presented in **Table 2-1**.

**Table 2-1 Legal Locations of the Prospecting Permit Application Areas**

| Prospecting Permit Application Number | Township/Range | Section | County | Associated Drill Site |
|---|---|---|---|---|
| COC73567 | T. 43 N., R. 19 W. | sec. 11 all; N½ and E½ SE¼ sec. 14 | San Miguel | 1 |
| COC73569 | T. 43 N., R. 19 W. | sec. 13 all; E½ and E½ NW¼ sec. 23, N½ and N½ S½ sec. 24; SW¼ NW¼ and NW¼ SW¼ sec. 25; E½ sec. 26 | San Miguel | 2 |
| COC73572 | T. 43 N., R. 18 W. | SW¼ sec. 20; sec. 29 all; sec. 32 all | San Miguel | 3 |
| | T. 42 N., R. 18 W. | N½ sec. 5 | | |
| COC73574 | T. 43 N., R. 18 W. | S½ sec. 28; sec. 33 all | San Miguel | 4 |
| | T. 42 N., R. 18 W. | sec. 4 all; sec. 9 all; E½ sec. 16 | | |
| COC73576 | T. 42 N., R. 18 W. | NW¼ and S½ sec. 3; sec. 10 all; S½ sec. 15 | San Miguel | 5 |
| COC74370 | T. 42 N., R. 19 W. | SE¼ NW¼, NE¼ SW¼, and SW¼ SW¼ sec. 4; N½ N½, SW¼ NE¼, NW¼ SE¼, and S ½ SE ¼ sec. 5; NW¼ NW¼, NE¼ SW¼, and NW¼ SE¼ sec. 9; N½ sec. 10; SE¼ NW¼ sec. 13 | San Miguel and Dolores | 6 |
| | T. 42 N., R. 18 W. | S½ NW¼ and SW¼ sec. 29; W½ NW¼ sec. 32 | | |

### 2.2.2 Overview of Drill Sites

The drill sites are located along the crest of the geological structure named the Dolores Anticline, a broad northwest-southeast trending fold. The geological formations exposed at the surface in the vicinity of these areas range in age from the Cretaceous-age Mancos Shale (primarily outcropping above the rim of the Dolores Canyon) down to, and including, the upper part of the Permian-age Cutler Formation (primarily exposed at the base of the Dolores Canyon). The Paradox Formation (previously Paradox member of the Hermosa Formation) has been subdivided into evaporative salt cycles by Hite (1960) that were numbered 1 through 29 from the top down. Potash occurrences were noted by Hite in 18 of the 29 salt cycles. The intended exploration target is potash beds in Salt Cycles #5, #6, and possibly #9 in the upper 500 feet of the middle evaporate member of the Paradox Formation. The upper part of this formation is composed of a series of interbedded layers of salt (halite and potash), siltstone, anhydrite, dolomite, and black shale. Several of the salt layers within the Paradox Formation contain layers of potassium minerals (potash) including the minerals sylvite (KCl) and carnalite (KMgCL3 6H20).

Six possible drill sites are being proposed (**Figure 2**; **Appendix B**); from these sites one to three sites would initially be selected. The final selection of sites to be drilled would depend partly on environmental considerations and prospective geologic data. Each drilling site would be on a pad approximately 250 by 250 feet in size (1.4 acres).

Drill Site 1 is located adjacent to Highway 141 about 1,500 feet south of an old petroleum well drilled in 1955 (Reynolds Mining #1 Egnar, API#05-113-05004). No road construction would be needed to reach it. This old bore hole appears to have intersected about 6.7 meters (22 feet) of potash, according to geophysical logs. The drill site is located on prospecting permit application COC-73567. The site access is on an existing road just west of Highway 141.

Drill Site 2 is located along existing dirt road extending from County Road K8. The drill site is located on prospecting permit application COC-73569 and was positioned to intersect a region of flat dipping stratigraphy. The drill site is accessible by approximately 1.5 miles of existing dirt roads, but substantial improvements to a segment of the existing dirt road may be necessary. The proposed drill hole would be located adjacent to the road and would not block existing access.

Drill Site 3 is located about 1,000 feet north of County Road L9 along an existing unimproved dirt road. The drill site is located on prospecting permit application COC-73572 and was positioned to intersect a region of flat dipping stratigraphy. The proposed drill hole would be located adjacent to the road and would not block the existing thoroughfare. Site access would not require new road construction or improvements.

Drill Site 4 is located along an existing 4-wheel drive (4WD) road, utilizing County Roads K8 and L9 roads, on prospecting permit application COC-73574. The proposed drill site was positioned to intersect a region of flat dipping stratigraphy and is located

about 500 feet west of the Dolores Canyon rim. Access to the site requires substantial improvement of about 3,500 feet of existing 4WD road.

Drill Site 5 is located along existing roads (County Roads F4 and F11) on prospecting permit application COC-73576. The proposed drill site was positioned to intersect a region of flat dipping stratigraphy and is located about 500 feet west of the Dolores Canyon rim. Access to the site would not require substantial road improvement.

Drill Site 6 is located on prospecting permit application COC-74370 and was positioned to intersect a region of flat dipping stratigraphy. It is accessible by about 1 mile of existing 4WD road extending from Sand Rock Road (also known as B Road). However, substantial improvements to the existing 4WD road will be necessary to facilitate drilling operations.

### 2.2.3 Drill Pad Layout and Equipment

The anticipated cores and tests would require moderate size drilling equipment capable of reaching depths of 6,500 feet and would employ a pitless closed loop drilling system. Each drill pad would measure 250 by 250 feet (1.43 acres) and include: four 400 barrel (16,800 gallon) tanks to hold mud and four rectangular tanks holding roughly 700 barrels (29,400 gallons) each to do premixing of chemicals for fresh water- and oil-based muds, a drill rig with blowout preventer, shale shaker, centrifuge, mud pumps, two personnel trailers, a topsoil storage stockpile from initial grading of the drill pad area, a bermed and lined pad for drying and temporary storage of fresh water-based drill cuttings (40 feet by 35 feet), a temporary storage area for the steel drums that would contain the oil-based cuttings (30 by 30 feet), a flare pad (15 by 35 feet), and a portable toilet (**Figure 3**). A 10 barrel (420 gallon) tank with secondary containment of 150 percent of the tank volume would be used to store diesel fuel to run the drilling rig engines.

The drill rig would be a large truck-mounted drilling rig such as a Schramm T130XD type (**Photo 1**), or similar, depending on availability. This rig is capable of mud drilling to at least 5,500 feet and coring up to 7,000 feet. A shale shaker is set up behind the drill rig to remove cuttings for minimum water and mud consumption, and effective mud re-circulation. The drill rig is 9 feet by 43 feet by about 14 feet high at transport; when extended, the drill rig with the extended derrick is about 70 feet high. The wellhead would be equipped with a blowout preventer (BOP) stack, rated to handle any expected high pressure zones (at least 3,000 psi), and related equipment.

**Photo 1 Schramm T130XD Drill Rig. Not shown are associated infrastructure such as trailers, topsoil stockpile, tanks, flare pad, and other support facilities.**

Each well would be drilled to approximately 5,500 feet using water-based mud. Any water-based mud cuttings from the drilling operation would be stored and allowed to dry on a temporary lined and bermed pad and later sampled and tested. If potential contaminants are below maximum allowable concentrations and levels, the material would be buried on location. A typical well would have conductor casing set at approximately 40 feet, surface casing set at about 1,500 feet, and intermediate casing set at roughly 5,500 feet. After setting the intermediate casing with cement and reaching the applicable depth, the mud would be changed from water based to an oil based mud system. The used water-based mud would be removed from the storage tanks and transported offsite to either the next drilling location for reuse or to a permitted commercial waste facility for disposal. The mud tanks would be washed out and filled with oil-based mud made with diesel and calcium chloride (CaCl) solutions in the premix tanks. Coring operations would be conducted using the oil-based mud system. Any solid cuttings drilled with oil-based mud would be put in steel containers and transported to a permitted commercial waste disposal facility. The oil-based mud would be entirely contained within tanks and the wellbore. When coring operations are complete, the oil-based mud would be transported offsite for reuse, recycling, or disposal at a permitted commercial waste facility.

After completion of all drilling operations, the water-based drill cuttings would be allowed to dry on the temporary pad and then sampled and tested to determine whether onsite or offsite disposal is required. All water-based and oil-based muds would ultimately be disposed of or recycled at a licensed commercial waste facility. See also **Section 2.2.8** on Hazardous Materials.

The flare pad would contain a burner used for disposal of hydrocarbons during clean-up, emergency shut downs, and for disposal of small volume waste streams of mixed gasses that cannot easily or safely be separated or stored on location. The flare pad would be an area 15 by 35 feet in size surrounded by a 3 foot high berm (**Figure 3**).

<u>Drill Holes</u>

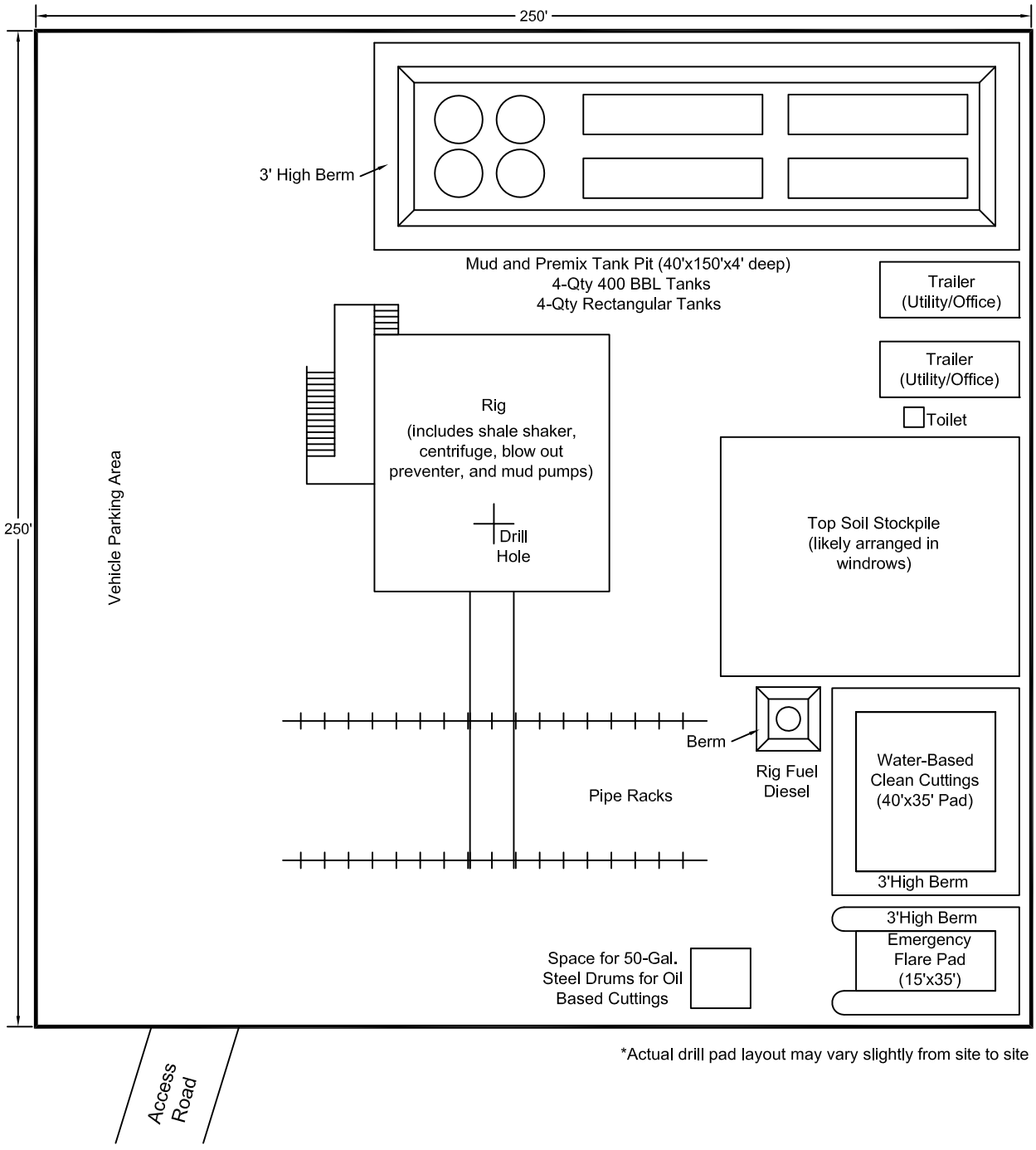
Each wellbore would be drilled in three sections: an upper 10-inch diameter rotary drilled section, an intermediate 8-inch diameter rotary drilled section, and a lower 6-inch diameter core drilled section (**Figure 4**). The upper 10-inch diameter hole would be drilled to about 1,000 to 1,500 feet below ground surface (bgs), and a 9 5/8-inch surface casing string would be set at least 50 feet into the Chinle Formation. The hole would be lined with steel casing and cemented all the way back to ground surface. Next, an 8-inch diameter hole section would be rotary drilled to approximately 5,500 feet bgs and lined with temporary steel 7-inch casing. This intermediate casing string would be cemented at the base to roughly 150 feet above the intermediate casing shoe. From 5,500 to 6,000 feet bgs a 6-inch diameter core hole would be drilled into the Paradox formation. Oil-based mud would be used in the deepest part of the wellbore to prevent dissolution of

potash salts, and the 7-inch casing string above would prevent contact of oil-based mud with any fluid-bearing intervals above the Paradox Formation. After drilling was completed, the intermediate casing string would be removed and the entire borehole would be cemented from bottom to top and the well permanently plugged and abandoned. The uppermost 4 feet of the casing would be excavated and cut off before being buried below the ground surface.

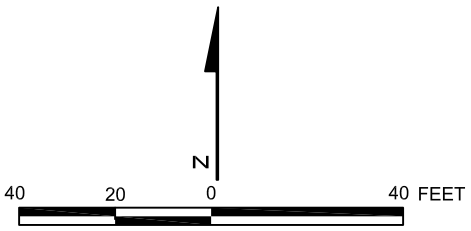
Drilling of the upper portion of the well (i.e. Surface and Intermediate Hole Sections) would be done with conventional tri-cone drill tools (**Figure 4**), similar to those used to drill oil or water wells. In this part of the drilling, water-based mud would be circulated in the drill hole to remove cuttings. Cuttings would be de-watered with centrifuges and stored on a lined and bermed cuttings pad. Water-based mud cuttings that are at or below the maximum allowable concentrations and levels for contaminants specified in the COGCC's 900 series rules, Table 910-1, may be buried in a trench on site. If the water-based cuttings exceed these thresholds, the material would be hauled offsite to a permitted commercial solid waste disposal facility (also known as a "land farm" facility). Water-based drilling fluids would be mixed and stored in above ground tanks and would be reused at future drilling locations or transported to a commercial waste facility for recycling or disposal.

In the Core Hole portion of the well (**Figure 4**), an oil-based mud would be required because water-based mud, even salt-saturated water-based mud, would dissolve the highly soluble potassium minerals before they could be successfully cored and recovered. The oil-based mud would be recirculated in a pitless, closed loop drilling system. Once drilling was completed, any residual oil-based mud would be flushed out of the hole using a non-toxic drilling fluid, that would be captured in tanks, and reused, recycled, or disposed of, prior to plugging and abandonment. Oil-contaminated drill cuttings from this hole section would be temporarily stored in steel drums and hauled offsite to a licensed commercial (land farm) waste facility. Oil-based fluids would be reused on other drill holes, recycled, or disposed of at a licensed commercial waste facility. When using the oil-based mud, a 7-inch intermediate casing string would extend from ground level down to the depth where coring begins and would be cemented at the bottom in order to isolate the upper portions of the drill hole and any potential aquifers from the oil-based mud. Oil-based mud would be mixed and stored in separate tanks, and completely contained during the drilling process.

Drill holes would be permanently plugged and abandoned by cementing the open hole from bottom to top, all the way back to ground level, in order to prevent any migration of water or hydrocarbons within the wellbore. The intermediate casing string would be removed prior to cementing. The uppermost 4 feet of the abandoned casing would be excavated, cut off below ground level, and filled with soil according to COGCC rules for oil well abandonment. A metal plate with the name of the core hole would be welded to the top of the casing before burial.




*Actual drill pad layout may vary slightly from site to site




# RM POTASH
# POTASH EXPLORATION PROJECT

## Figure 3
## Drill Pad Schematic

| | | |
|---|---|---|
| JBR | DRAWN BY CP | DATE DRAWN 06/07/2012 |
| | SCALE 1'=40' | |

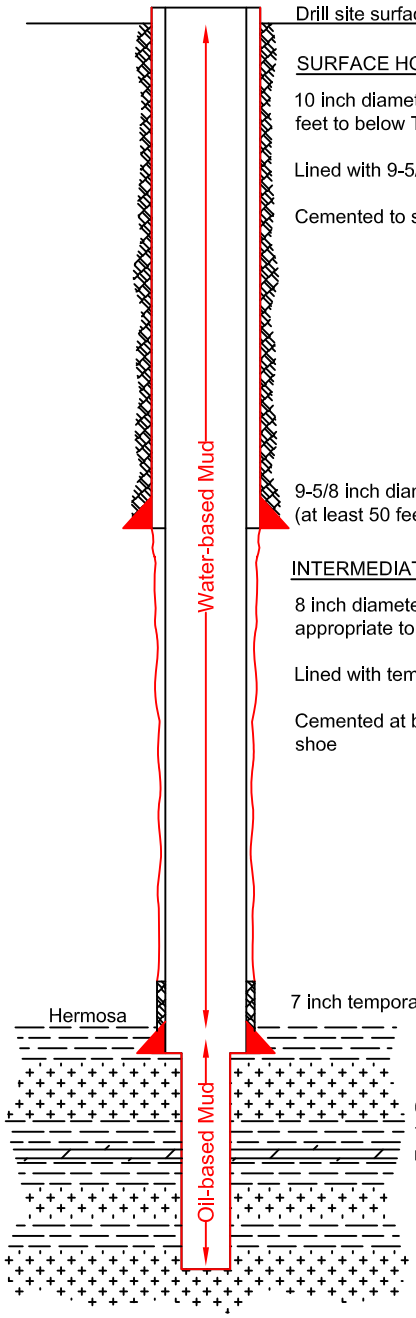
E:\drawings\Colorado Potash Exporation EA RM Potash\EA\Fig3 Drill Pad Schematic.dwg

Drill Hole ID: To Be Determined (TBD)
Location: TBD
Objective: Paradox Salt, cycles 5 through 9

Ground elevation: TBD

| Geology/Formation Tops | Depth in Feet BGS* |
|---|---|
| Dakota | 0 |
| Burro Canyon | 100 |
| Brushy Basin | 200 |
| Saltwash | 500 |
| Summerville | 850 |
| Entrada | 920 |
| Carmel | 1050 |
| Kayenta | 1100 |
| Wingate | 1230 |
| Chinle | 1470 |
| 9-5/8 Inch surface casing shoe | 1520 |
| Moenkopi | 2010 |
| Cutler | 2140 |
| Hermosa | 3960 |
| Upper Paradox | 4930 |
| 7 Inch temporary casing shoe | 5500 |
| Paradox Salt | 5550 |
| Potash bed 5 | 5600* |
| Potash bed 6 | 5800 |
| Potash bed 9 | 6400 |
| TD | 6500 |

*Note that actual depths may vary from site to site.




SURFACE HOLE:

10 inch diameter hole from 0 feet to approximately 1000-1500 feet to below Top of Chinle Formation

Lined with 9-5/8 diameter steel surface casing

Cemented to surface

9-5/8 inch diameter surface casing shoe at approximately 1500 feet (at least 50 feet below Top of Chinle Formation)

INTERMEDIATE HOLE:

8 inch diameter hole from 1000-1500 feet to 5500-6000 feet as appropriate to site

Lined with temporary 7 inch diameter steel intermediate casing

Cemented at base of intermediate casing to 150 feet above casing shoe

7 inch temporary intermediate casing shoe at approximately 5500 feet

CORE HOLE:

6 inch diameter hole from approximately 5500-6000 feet to 6500 feet as appropriate to site. Core to be retrieved.

Paradox Salt with potash beds

Proposed Total Depth approximately 6500 feet

PERMANENT ABANDONMENT; Immediately after drilling and testing, the entire well (i.e. Surface Hole, Intermediate Hole, and Core Hole sections) will be plugged by filling with cement from total depth to surface.

RM POTASH
POTASH EXPLORATION PROJECT

FIGURE 4
SCHEMATIC WELL CONSTRUCTION DIAGRAM

JBR

| DRAWN BY | DATE DRAWN |
|---|---|
| CP | 06/07/2012 |

SCALE: Not to Scale

E:\drawings\Colorado Potash Exporation EA RM Potash\EA\Fig4 Schematic Well Construction Diagram.dwg

### 2.2.4 Access Roads

Existing roads would be used to access the drill sites; no new access roads would be constructed. From Highway 141, various county and local roads would be used to access the drill sites (**Table 2-2**).

**Table 2-2 Access Roads**

| Associated Drill Site | Main Access Road off Highway 141 | Secondary Access Road | Tertiary Access Road | Total Length of Access (miles) |
|---|---|---|---|---|
| Drill Site 1 | Immediately off Hwy 141 on unnamed road | n/a | n/a | <0.1 |
| Drill Site 2 | K8 Road | 8K Road | n/a | 3.2 |
| Drill Site 3 | K8 Road | L9 Road | n/a | 3.8 |
| Drill Site 4 | K8 Road | L9 Road | 4733 Road | 5.0 |
| Drill Site 5 | F4 Road | F11 Road | n/a | 7.7 |
| Drill Site 6 | B Road | Sand Rock Road | unnamed 4WD Road | 4.8 |
| Total Access | | | | 24.6 |

Three of the roads would need some improvement in order to get equipment to the drill site (**Table 2-3**). Road improvements would consist of gravelling, blading, and filling as needed and would be identified in a pre-authorization walk-through with the BLM. Road improvements would be kept to a minimum, but may require some widening. Although wider than the actual disturbance would be in most cases, acres of road disturbance were calculated using a 20 foot width. The Counties may also identify additional segments of road and types of improvements and/or maintenance, such as blading and gravelling, which they might require for use of County roads.

**Table 2-3 Disturbance from Access Road Improvements**

| Associated Drill Site | Road Name | Land Owner | Length (in feet) | Length (in miles) | Acres |
|---|---|---|---|---|---|
| Drill Site 2 | 8K Road | Private | 6,657.24 | 1.3 | 3.1 |
| | | BLM | 3,738.55 | 0.7 | 1.7 |
| Drill Site 4 | 4733 Road | BLM | 5,907.00 | 1.1 | 2.7 |
| Drill Site 6 | Unnamed 4WD Road | Private | 2,236.36 | 0.4 | 1.0 |
| | | BLM | 3,673.71 | 0.7 | 1.7 |
| Total | | | 22,212.86 | 4.2 | 10.2 |

### 2.2.5 Location and Source of Water Supply

Water would be needed for drilling operations, construction and compaction of pads, and for dust control. Up to approximately 5,000 gallons of water per day could be required for each drill site throughout the 60 day drilling period at each drill site. Water would be stored in the mud tanks. Additional water may also be needed and used for dust control;

however, the amount needed for dust abatement is highly variable and depends upon site-specific conditions when needed. Water use could range from zero to several thousand gallons per day.

Water needed for construction and drilling operations would be purchased and trucked from nearby sources on private land.

### 2.2.6 Construction Workforce

Only one drilling unit would be operating at any time. The drilling unit would require a workforce of approximately 3 to 5 workers. Work would be conducted 24 hours per day, seven days a week at each hole until it is completed.

Each drill hole would take approximately 2 months (60 days) to drill and core. In addition, another 15 days would be required for plugging and abandonment activities per drill site.

Once the equipment is setup, there would be approximately 6 to 8 vehicle trips per day to each drill site location, depending on the day's activities. Vehicles would likely be mostly passenger vehicles of the workers travelling to the worksite and water trucks used for dust suppression. In addition, there would be an additional truck trip to the site on a bi-weekly (i.e., every other week) basis to service the portable toilet.

### 2.2.7 Reclamation

Schedule

Core holes would be cement plugged and abandoned immediately after they are no longer needed for core recovery, or downhole testing. Reclamation earthwork and seeding would be completed within 180 days of drill hole abandonment.

Methods

The naturally occurring topsoil from the drill sites would be stripped and saved for final reclamation. All topsoil stockpiles would be placed in long, shallow windrows (rather than a large single heap) and seeded and maintained in weed-free condition in order to preserve soil productivity. Drill sites would be re-graded and re-contoured with equipment appropriate to return the disturbed land as closely as possible to its original contour. Topsoil, striped and saved at the initial disturbance of the site, would be mixed with available shrub/wood slash material, and then spread, re-contoured, and compacted over the regraded site in order to inhibit soil erosion and promote re-vegetation. The sites would be raked to create a rough surface and promote natural seed collection and if necessary reseeded by broadcasting an approved seed mix, and the soil would be compacted over the seed with the tread of tires of the re-grading and re-contouring equipment to help prevent soil erosion.

Seed-Mix

The type and mix of grasses, forbs, and other plant seeds would be appropriate and approved to be consistent with the surrounding natural vegetation. The following BLM-approved seed-mixes would be used (**Tables 2-4** and **2-5**).

**Table 2-4 Pinyon-Juniper Seed-Mix**

| **Common Name** | **Species Name** | **Variety** | **PLS lbs/ac*** |
|---|---|---|---|
| Indian Ricegrass | *Achnatherum hymenoides* | Paloma | 3.7 |
| Blue Grama | *Chondrosum gracile* | Alma | 0.5 |
| Muttongrass | *Poa fendleriana* | CO Source ID | 0.2 |
| Squirreltail | *Elymus elymoides* | Tusas | 2.3 |
| Total | | | 6.7 |

*This reflects the drilled seeding rate of 40 Pure Live Seed (PLS)/ $ft^2$; it needs to be doubled if broadcast.

**Table 2-5 Sage Flats Seed-Mix**

| **Common Name** | **Species Name** | **Variety** | **PLS lbs/ac*** |
|---|---|---|---|
| Sand Dropseed | *Sporobolus cryptandrus* | VNS | 0.05 |
| Galleta | *Hilaria jamesii* | Viva, florets | 1.6 |
| Wyoming Big Sagebrush | *Artemisia tridentata var. wyomingensis* | VNS | 0.1 |
| Winterfat | *Krasheninnikovia lanata* | VNS | 0.25 |
| Four-wing Saltbrush | *Atriplex canescens* | VNS | 0.25 |
| Indian Ricegrass | *Achnatherum hymenoides* | Paloma | 2.5 |
| Blue Grama | *Chondrosum gracile* | Alma | 0.3 |
| Squirreltail | *Elymus elymoides* | Tusas | 1.4 |
| Muttongrass | *Poa fendleriana* | CO Source ID | 0.1 |
| Total | | | 6.6 |

*This reflects the drilled seeding rate of 40 PLS /$ft^2$; it needs to be doubled if broadcast.
VNS=Variety Not Specified, get most local variety available.

Monitoring and Reporting

Photographic monitoring of each site before, during, and after reclamation would be undertaken to document the reclamation process at each site. A rehabilitation report documenting the reclamation would be submitted to BLM within 12 months of completing the drilling.

### 2.2.8 Design Features, Environmental Protection Measures (EPMs), and Best Management Practices (BMPs)

As noted previously, all surface and downhole activities associated with the Project would comply with applicable State of Colorado and federal mining and environmental laws and regulations. To address issues related to deep drilling conditions, typically associated with oil and gas development, the project would also conform to all applicable state and federal Oil and Gas rules, regulations, policies, orders, notices, BMPs (including COGCC Rules and Policies, Onshore Oil and Gas Federal Regulations 43 CFR Part 3160, Department of Interior Onshore Oil and Gas Operating Orders, BLM National and BLM State of Colorado Notice to Lessees, BLM Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development), and any other standards, guidelines, and policies that the TRFO deems necessary. In addition to complying with permit stipulations, RM Potash would implement EPMs and BMPs to mitigate the potential adverse effects of the Project.

<u>Reclamation</u>

Reclamation activities would be implemented as described in **Section 2.2.7** above. Following the reclamation activities, each drill site area would be fenced with three-strand wire and t-posts to aid in reclamation success by preventing livestock and/or big game access to seeded areas. Once the reclamation has been deemed successful according to appropriate criteria, the fence would be removed (see below).

All of the access roads that would be used for the Project are existing roadways. A few segments (**Table 2-3**) of these roads would need some improvement. Reclamation of improved roads would depend on the amount of improvement (i.e. increased width) and use the road receives during Project activities. If the vegetation currently present on the road bed appears to retain the ability to recover, ripping and seeding would not be necessary. If the vegetation is beyond recovery and compaction of the road bed has occurred, then the following measures could be necessary:

- Re-grading any cuts and fills to re-establish the original ground contours and drainages.
- Construction of drainage dips at the appropriate spacing.
- Access to Drill Site 6 across public land would be completely obliterated and re-seeded back to its original condition. Any gravel or non-native fill would be removed and disposed of properly.
- Any access across private land would be reclaimed back to the original condition, or may be left in its improved state, as per the desires of the private land owner.
- Ripping the new road construction to a depth of 12 to 18 inches.
- Placing 6 inches of loose topsoil in locations where topsoil was removed (if applicable).
- Seeding the soil with a BLM-approved seed mix following ripping and before physical crusts form on the soil surface.

- Placing slash (shrubs and woody material removed from the route to make it passable) on the reclaimed road bed as a final step, alternately slash may be incorporated into the topsoil and the road compacted to prevent erosion.
- Approximately the first 100 feet of the access road may be ripped, seeded, and blocked even if the rest of the road does not need reclamation treatment, at BLM's discretion.

Additional applicable general reclamation measures would also be implemented for the overall Project and include:

- Closed loop, pitless drilling systems would be used. Water-based cuttings would be dried on site and stored on pads for future onsite burial or offsite disposal. Oil-based cuttings would be stored in steel containers and transported offsite to a licensed, commercial waste disposal facility.
- Reclamation of drill sites and access roads would include weed control for three years post reclamation.
- Post reclamation success would be gauged by 70 percent vegetation and crown cover over the entire disturbed area and 60 percent ground cover (vegetation, rock, litter) or until equivalent of surrounding vegetation is reached.
- The operator may be directed to gravel portions of affected roads prior to or during Project implementation if needed to prevent mud or rutting. Any gravel applied may be removed after the end of operations, or left in place with the consent of the county and BLM.

Water

A Storm Water Pollution Prevention Plan (SWPPP) would be completed for the Project, as an attachment to the Exploration Plan. The Project-specific SWPPP would identify structural and non-structural controls that would be put in place to minimize erosion and run-off of pollutants and sediment. The SWPPP supports compliance with the terms and conditions of the National Pollutant Discharge Elimination System (NPDES) permit and complies with the Clean Water Act.

Prior to drilling, baseline water quality samples would be taken from the groundwater well located closest to each drill hole that would be drilled, contingent upon consent of the well's owner. Results of these samples would be used to ensure that there is no degradation of groundwater supplies as a result of the Project. Since there are no wells near proposed Drill Site 5, Quakie Spring or Sawmill Spring would be sampled to get a representative baseline analysis of groundwater quality.

Diesel fuel for the drilling rig and support equipment would be stored in approved tanks positioned in bermed areas lined with at least 35 millimeter (mil) impermeable plastic so that any spills would be contained. These bermed areas would be of sufficient volume to contain at least 150 percent of the entire contents of the tank should a full tank rupture. Drilling mud would be contained within a pitless, closed loop drilling system used to drill both the fresh water-based and oil-based mud sections. This mud system would be fully contained (i.e. closed system, not released to the environment) and would be reused at

future drilling locations or transported to a commercial waste facility for recycling or disposal. Oil-based mud and oil-contaminated cuttings would be stored in steel drums and hauled off-site for proper disposal at a permitted solid waste facility.

Noxious and Invasive Weed Species

A weed management plan would be implemented (**Appendix C**) to provide preventative BMPs and control treatment.

- Ground and vegetation disturbance would be kept to the minimum possible.
- Equipment would be cleaned of all mud, plant parts, and seed prior to entering BLM lands.
- Seeded topsoil stockpiles would be maintained in weed-free condition.

Range Management

- All range improvements would be protected during exploration and/or drilling.
- Fences must be kept in good repair during operations. No fences would be cut unless absolutely necessary and agreed to in writing by the BLM. Any fences damaged as a result of the Project would be repaired immediately by RM Potash.
- Any pasture gates would remain closed when cattle are in or adjacent to affected pastures. RM Potash would coordinate with the BLM on rotation schedules.

Soils

The naturally occurring topsoil from the improved access roads and drill sites would be stripped from the sites, stockpiled in long, shallow windrows, seeded and maintained weed-free, and saved for future final reclamation. When the disturbed ground is reclaimed, the topsoil would be spread back over the re-contoured surface and raked to create a rough surface to promote natural seed collection, then seeded by broadcasting.

Drill sites would be graded so that any soil eroded from the drill site would be contained on-site. If needed, water bars would be constructed on access roads to minimize soil erosion and approved culverts would be used where access roads cross gulleys or drainages, as approved by landowner (i.e., BLM, County, or private).

Wildlife

- **NSO (No Surface Occupancy) Stipulation**: NSO stipulation within 0.6 mile radius of a Gunnison sage grouse lek complex.
- **CSU (Controlled Surface Use) Stipulation**: CSU stipulation for project occupation, noise and operational time limits will be applied within 4 mile radius of mapped Gunnison sage grouse production area.
- **Timing Limitation Stipulation**: Timing limitation to protect big game (deer/elk) crucial winter range *December 1 to March 30*. Timing limitation to protect big game production areas *April 15 to June* 30. Timing limitation to protect Gunnison sage grouse nesting habitat from *March 1 to June 30* within the 4 mile radius of mapped Gunnison sage grouse production area.

Additional wildlife stipulations for the Project Area include:

**1.)** Big Game Production Areas: Elk and Deer, Timing Limitation Stipulation April 15 - June 30
**2.)** Big Game Winter Range: Elk and Deer, Timing Limitation Stipulation December 1 - March 30
**3.)** Big Game Critical/Severe Winter Range: Elk and Deer, Timing Limitation Stipulation December 1 - March 30
**4.)** Sage Grouse Lek Complex (Mapped): No Surface Occupancy within 0.6 mile radius
**5.)** Sage Grouse Production Areas: Timing Limitation Stipulation and Controlled Surface Use between March 1 - June 30
**6.)** Mexican spotted owl: Timing limitation stipulation-no authorized activities will take place within ½ mile of the Dolores River canyon rim between March 1 – Aug 31

Wildlife timing restrictions and associated noise restrictions are shown in Figure F1 and Table F1 of **Appendix F**.

Migratory Birds

If possible, construction would be limited to outside the nesting season for migratory birds (April 1 – July 31). If construction were to be initiated prior to the end of the nesting season, a pre-construction nest survey would be conducted in areas where Project activities could impact existing vegetation so that active nests could be avoided until after fledging. Pre-construction surveys would be conducted for Sensitive bird species in conjunction with migratory birds in suitable habitat. If any migratory bird nests were discovered along the route, BLM would be notified and the nest would be avoided until birds had fledged.

Hazardous Materials

Diesel fuel for the drilling rig and support equipment would be stored in approved tanks positioned in bermed areas lined with at least 35 mil impermeable plastic so that any spills would be contained. These bermed areas would be of sufficient volume to contain 150 percent of the entire contents of the tank should a full tank rupture. The water-based and oil-based drilling mud would be contained and re-circulated from tanks within a lined (at least a 35 mil impermeable liner), bermed area designed for 150 percent containment for any potential spills. The oil-based mud system would be fully contained, and oil-contaminated cuttings would be stored in steel drums and hauled off-site for proper disposal at licensed, commercial waste facilities.

All heavy equipment and service vehicles would have a supply of absorbent and other cleanup materials on hand for initial containment of spills and the Project would adhere to the Hazardous Substance Spill Plan in case of accidents. Stationary equipment would have absorbent pads or trays placed beneath them.

Refueling areas would be a minimum of 300 feet from perennial and intermittent stream channels, seeps and springs, wetlands, lakes and reservoirs, stock water developments, and other water features.

A Spill Prevention, Control, and Countermeasure (SPCC) Plan would be completed for the Project, as an attachment to the Exploration Plan. The Project-specific SPCC would identify structural and non-structural controls that would be put in place to prevent spills and minimize effects in the event of a spill.

A hydrogen sulfide ($H_2S$) contingency plan would be completed for the Project, as an attachment to the Exploration Plan. This plan would ensure that all rig personnel are properly trained to work in a hydrogen sulfide environment and fully understand the purpose of hydrogen sulfide monitors and alarms, and the action to take when alarms visual/audible initiate. All crew members would be trained to understand the buddy system, safe briefing areas, muster stations, emergency evacuation procedures, and individual duties.

The Project would conform to the *Joint Agency Guidelines for Uranium Exploration Drilling Reclamation* (USFS et al. 2007). Prior to exploration disturbance, background radiation level readings would be taken at each drill site. This data would be used as a reclamation standard for cleanup of each drill site. These guidelines contain stipulations for radiation readings, drill hole abandonment, on-site drill cuttings disposal (non-diesel only), radiation reclamation, and overall reclamation (**Appendix D**). Water-based drill cuttings that do not meet state COGCC standards for cuttings disposal set forth in Table 910 **(Appendix D)** would be hauled off site to a permitted land farm facility.

Solid Waste

Dried, water-based cuttings would only be stored onsite within a bermed, lined cuttings pad. If the chemical makeup of the dry cuttings material is below contaminant thresholds by the State of Colorado (COGCC Rule 907d), this material could be buried in an onsite trench. Cuttings not meeting State of Colorado thresholds would be transported offsite to a licensed commercial waste disposal facility.

In accordance with the *Joint Agency Guidelines for Uranium Exploration Drilling Reclamation* (USFS et al. 2007), if any of the dried water-based cuttings show radioactive readings in excess of background readings (see Hazardous Materials section above), they shall be buried and covered with no less than 3 feet of earthen material to bring radiation readings back to background levels. The goal of radiation reclamation is for all exploration drill hole locations to be abandoned with radiation levels that are no more than the level that was measured for the background readings. Following drill hole abandonment, radiological data shall be obtained at each drill location to verify.

No construction or domestic refuse or garbage would be disposed of by burning; all such material would be hauled away for disposal at permitted facilities.

Fluid Waste

All drilling fluids would be contained within a closed-loop mud system. Upon completion of drilling, all water-based and oil-based drilling fluids will either be reused at a future drilling locations or transported to a commercial waste facility for recycling or disposal.

Noise

Personnel would be required to comply with all applicable federal, state, and local laws and regulations concerning prevention and control of noise during project construction and operation.

In areas within sage grouse habitat, noise stipulations would apply. CDOW's Controlled Surface Use (CSU) lease stipulation would be implemented to muffle or otherwise control noise from drill sites and roads, so that drilling and operational noise would not exceed 49 dBA measured at 30 feet from the source in areas between 0.6-4.0 miles from a lek year round (CDOW 2010).

Fire

The drilling operations area, approximately 250 by 250 feet, would be prepared by grading and leveling. All vegetation and topsoil would be stockpiled. This drill site size would allow for drilling operations to be conducted within an area that has a periphery of bare earth between the drilling and support equipment and adjacent vegetation. Drilling and support equipment would have approved fire suppression equipment and the drilling crews would be trained in its use. Any gas flaring equipment would be located on an area of bare soil in a 25 foot radius from the flare. The flare would be directed vertically upwards to prevent ignition.

Public Safety

The public would be warned of the dangers of equipment and drilling operation by adequate signage. Where possible, drill sites would be gated or chained to prevent public access. No firearms would be allowed on the drill site. Vehicles would not exceed posted speed limits and if necessary, speeds would be reduced, especially when other vehicles are present or wildlife is active near access roads. Blow out prevention (3000 psi minimum) and a hydrogen sulfide contingency plan would protect the public from well control issues.

## 2.3 Alternative B – No Action

The No Action Alternative is required to be considered by NEPA and the CEQ implementing regulations under 40 CFR 1500-1508.

The No Action Alternative is considered and analyzed to provide a baseline for comparison of the effects of the Proposed Action. Under the No Action Alternative, no surface disturbance and exploration would occur. The Applications would not be approved and the availability of a known and sufficient potash resource in the area would be undetermined. Implementation of the No Action Alternative would not meet the stated purpose and need for the Project.

## 2.4 Alternatives Considered but Eliminated from Further Analysis

NEPA directs the BLM and other federal agencies to "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal that involves unresolved conflicts concerning alternative uses of available resources" (42 USC 4332). Applicable design features have been incorporated into the Proposed Action to avoid and minimize disturbance to resources present within the proposed Project Area. There have been no other alternatives suggested that would meet the purpose and need for the Proposed Action while altering the impact on the resources identified. Further, the Proposed Action was precisely designed to recover the necessary geological and geochemical data and deviation from it would fail to produce the data and result in an inadequate evaluation of the potential potash resources at the relevant prospecting permit application areas. For these reasons, the EA only focuses on the Proposed Action and No Action Alternative, as described above in **Sections 2.2** and **2.3**.

# 3.0 AFFECTED ENVIRONMENT

## 3.1 Introduction

This chapter presents the potentially affected existing environment (i.e., the physical, biological, social, and economic values and resources) of the Project Area as identified from the IDT meeting and presented in **Chapter 1** of this assessment. This chapter provides the baseline for comparison of effects/consequences described in **Chapter 4**.

## 3.2 General Setting

The Project Area is located in western San Miguel and Dolores Counties, in an area of plateaus and canyons between elevations of about 5,600 and 8,200 feet above mean sea level (amsl), with a semi-arid climate. Much of the area is covered with pinyon-juniper woodlands; small areas of the more exposed and less moist plateaus contain patches of open lands covered by a mixture of grasses, shrubs, and sagebrush. Some of the steeper and moister slopes may contain stands of scattered ponderosa pine trees. The area is largely undeveloped, although it is crossed by Colorado State Highway 141. The area has a well-developed network of gravel and dirt roads and trails, constructed for petroleum and uranium exploration and production, as well as residential use. Some of the Project Area is adjacent to private ranch lands that have been cleared for pasture.

Vegetation is a mixture of sagebrush, grasses, scrub oak, and pinion-juniper woodlands. Vegetation is thicker at higher elevations and ponderosa pines may be present in conjunction with the other vegetation. Precipitation averages about 15 inches per year (WRCC 2011).

## 3.3 Resources and Issues Brought Forward for Analysis

### 3.3.1 Cultural Resources

Cultural resources consist of definite locations of human activity, occupation, or use identified through field inventory, historic documentation, or oral evidence. The term includes archaeological, historic, and architectural properties and sites or places of traditional cultural or religious importance to Native American Tribes or other social or cultural groups. The BLM is responsible for identifying, protecting, and managing cultural resources located on public lands and on non-federal lands that may be affected by BLM actions.

Decisions regarding the management of cultural resources are dependent on determinations of significance in their evaluation for the National Register of Historic Places (NRHP). In order for a cultural resource site to be eligible for the NRHP, the site must meet certain criteria (36 CFR 60.4) and retain aspects of integrity including location, design, setting, materials, workmanship, feeling, and association.

Cultural resource surveys were performed on a 10-acre area surrounding each proposed drill hole location and within a 100-foot wide corridor centered on the proposed access

routes. These areas are identified as the "Study Areas" on **Figure 2**. A Project-specific cultural resource inventory was conducted at each of the six 10-acre blocks surrounding the drill site locations (Davidson 2012). Three new cultural resource sites (5SM7095, 5SM7096, and 5SM7097) and two previously recorded cultural resource sites (5SM4822 and 5SM4936) were encountered during the inventory (**Table 3-1**). An additional previously recorded site (5SM1410) was not relocated. The three newly recorded sites are all recommended as not eligible for the NRHP. Site 5SM4822 was previously recommended and officially determined as needing data to evaluate for the NRHP. Site 5SM4936 was officially determined as not eligible for the NRHP. Two prehistoric isolated finds (5SM7098 and 5SM7099) were also noted; isolated finds are not eligible for the NRHP.

**Table 3-1 Cultural Resource Sites within the Study Areas**

| Site Number | Age | Type | NRHP Evaluation | Drill Site Study Area |
|---|---|---|---|---|
| 5SM7095 | Prehistoric | Lithic scatter | Not Eligible | 1 |
| 5SM7096 | Historic | Trash Scatter | Not Eligible | 1 |
| 5SM7097 | Historic | Trash Scatter | Not Eligible | 3 |
| 5SM1410* | Prehistoric | Lithic Scatter | Not Eligible | 3 |
| 5SM4822 | Prehistoric | Lithic Scatter | Needs Data | 5 |
| 5SM4936 | Prehistoric | Lithic Scatter | Not Eligible | 4 |

*Not Relocated

### 3.3.2 Geology and Minerals

The Project Area is located on lands within the Paradox Basin portion of the Colorado Plateau physiographic province (BLM 2010). Rocks exposed at the surface in the vicinity of the Project Area range in age from Permian to Cretaceous, and include (from oldest to youngest) the Cutler Formation (Permian), Chinle Formation (Triassic), Dolores Formation (Triassic), Wingate Sandstone (Triassic), Kayenta Formation (Jurassic), Navajo Sandstone (Jurassic), Entrada Formation (Jurassic), Summerville Formation (Jurassic), the Brushy Basin and Salt Wash members of the upper Morrison Formation (Jurassic), the Lower Cretaceous Burro Canyon Formation, the Lower Cretaceous Dakota Sandstone, and Upper Cretaceous Mancos Shale. (Cater 1955a,b,and c).

The Project Area is located along the crest of a geologic feature known as the Dolores Anticline, a salt-cored anticline capped by late Paleozoic and Mesozoic sedimentary rock, within the greater Paradox Basin portion of the Colorado Plateau. The Project Area also lies within the Uravan mineral belt – a uranium and vanadium mining district which stretches from Dove Creek to Gateway along the Utah border.

The target formation for potassium is the Pennsylvanian Paradox Formation which contains cyclical evaporite rocks including shale, dolomite, gypsum, and rock salt. It is not exposed at the surface in the Project Area. The surface rocks include the following units (Cater 1955a and 1955b):

Quaternary Alluvium – Qal

Wind Deposited Sand and Silt and Alluvial Gravels, undifferentiated. In the Project Area, the Qal unit appears to mostly be eolian silt and loess in nature, rather than fluvial, alluvial, or other deposits.

Upper Jurassic Morrison Formation – Salt Wash member – Jms

The Upper Jurassic Morrison Formation includes white to gray, light buff, and rusty red sandstone with some interbeds of red shale and mudstone and a few thin beds of dense gray limestone. The sandstone generally forms ledges and consists of lenticular beds. It is interpreted to have been formed in a fluvial environment. Fossil wood, carbonaceous matter, and saurian bones occur locally. The formation is generally 260-300 feet thick in the Egnar quadrangle and 230-360 feet in the Joe Davis Hill quadrangle. Uranium deposits in the Uravan mineral belt are generally in the Salt Wash member and are associated with reducing conditions caused by organic materials, including dinosaur bone and wood.

Upper Jurassic Morrison Formation – Brushy Basin Shale member – Jmb

This formation is composed predominantly of varicolored bentonitic shale and mudstone with intercalated beds and lenses of conglomerate and sandstone. It forms smooth slopes covered with blocks and boulders. Its contact with the overlying Burro Canyon Formation is gradational and is generally mapped as the base of the lowermost conglomerate. Silicified saurian bones and wood are much more common in the Brushy Basin member than in the underlying Salt Wash member, especially in conglomerate beds. It is generally 320 to 420 feet thick in the Egnar quadrangle.

Lower Cretaceous Burro Canyon Formation – Bbc

The formation consists of white, gray, and red lenticular sandstone and conglomerate with interbedded green and purplish shale. It outcrops as a cliff or a series of thick, resistant ledges. Cross bedding is common throughout. The conglomerate consists mostly of chert pebbles, but also quartzite, sandstone, and shale. The formation is 50 to 140 feet thick in the Egnar quadrangle and about 45 feet thick on the crest of the Dolores Anticline in the Joe Davis Hill quadrangle.

Lower and Upper Cretaceous Dakota Sandstone – Kd

Dakota sandstone is yellowish, lenticular sandstone and conglomerate with interbedded carbonaceous shale and impure coal. The sandstone is generally gray, yellow, and buff colored and is flaggy bedded. Some is fine grained and thin bedded, but much is coarse grained and cross bedded. Irregular, discontinuous lenses of conglomerate, with pebbles up to 2 inches in diameter are scattered throughout the sandstone. Inter-fingered with the sandstone are black carbonaceous shale and thin coal seams and beds. Plant impressions are common in both the shale and sandstone. The entire thickness is not exposed in the Egnar quadrangle due to erosion, but the beds that remain are up to 150 feet thick and 120 feet thick in the Joe Davis Hill quadrangle.

Upper Cretaceous Mancos Shale – Km

Mancos shale is dark gray, soft, homogeneous fissile rock that erodes to smooth landforms or badlands. Large, calcareous concretionary masses are present in some horizons. Greater than 3,000 feet thick, but only a few hundred feet of the bottom of this formation is present in the Joe Davis quadrangle (Cater 1955c).

Uranium mining was once common in the area and small adits, prospects, and mines are common, as are trash dumps from miners who occupied the area. Where the salt was close to the surface, mining was often done by using a Geiger counter to high grade small hotspots, particularly in areas such as the Spud Patch.

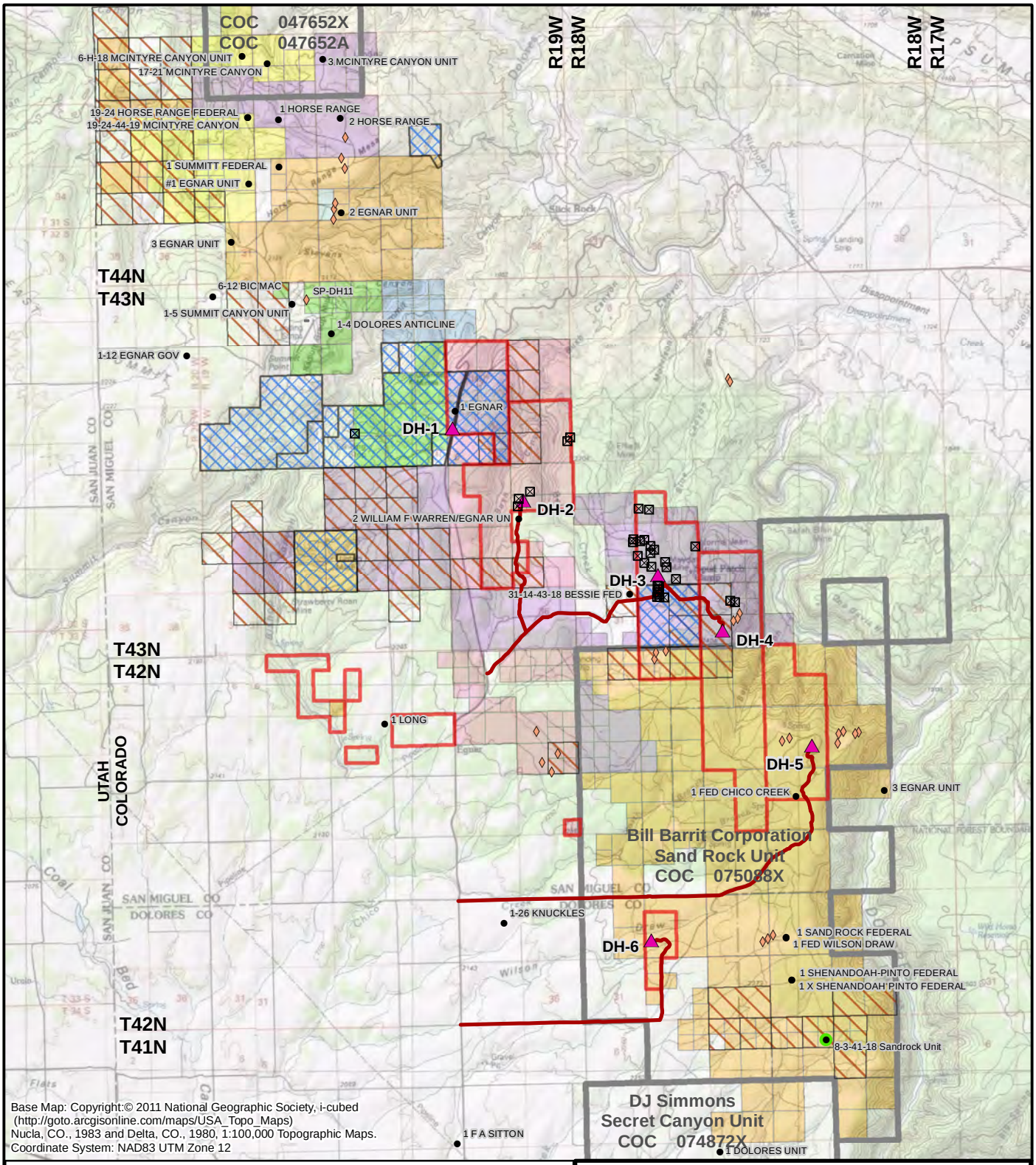
## Potash Deposits

Several USGS reports identify potash deposits of the middle Paradox Formation (Hite 1960, 1961; Raup and Hite 1992). The lowermost member of the Paradox Formation consists of alternating black dolomite shale, carbonates, and anhydrite, but contains no bedded salt. The upper member of the Paradox Formation is similar to the lower member. The middle member of the Paradox Formation exhibits 29 evaporite cycles of which 18 have been shown to contain some potash. Cycles #5, #6, and #9 are the targets of this proposal. The Paradox Formation is not exposed anywhere at the surface in the area of this proposal, but is exposed in Big Gypsum, Little Gypsum, and Paradox valleys to the north. In these valleys the salt reached the surface, but because of the solubility of sodium and potassium chlorides, the surface is now mostly composed of a residue of insoluble gypsum, dolomite, and clay.

## Mineral and Energy Resources

There are several Department of Energy (DOE) Uranium Lease Tracts and oil and gas leases in the Project Area. **Figure 5** displays the locations of oil and gas leases, oil and gas units, existing and permitted wells, inactive and under review DOE uranium leases, mining claims, and abandoned mine features in and around the prospecting permit application areas and beyond. There are two oil and gas units in proximity to the Project Area: the Bill Barrett Corporation's Sand Rock Unit (COC-075088X) and the DJ Simmons' Secret Canyon Unit (COC-074872X). Drill Sites 5 and 6 are within the Sand Rock Unit. In addition, there are producing and proposed gas wells in the vicinity. There are also several hundred mining claims in the greater prospecting permit application areas. There are no active mining permits in the area; however, there have been several drilling notices in the last few years. There are five drilling notice case files (4 lynx royal, 1 energy fuels) currently in reclamation status.

The DOE Uranium leasing program is currently enjoined pending a Programmatic EIS; however, the surface management and non-locatable minerals within the lease tract areas are administered by the BLM and remain open to non-uranium mineral leasing.




Base Map: Copyright:© 2011 National Geographic Society, i-cubed
(http://goto.arcgisonline.com/maps/USA_Topo_Maps)
Nucla, CO., 1983 and Delta, CO., 1980, 1:100,000 Topographic Maps.
Coordinate System: NAD83 UTM Zone 12

**Legend**

- Proposed RM Potash Drill Hole Locations
- Access Roads
- Evaluated RM Potash Prospecting Permit Applications
- Legal Subdivisions Containing Mining Claim(s)
- Inventoried Abandoned Mine Feature
- DOE Uranium Lease Program Withdrawal
- Active Notice Drill Hole Locations
- Oil and Gas Unit Outlines
- Existing Well / Drilled
- Permitted Well / Not Yet Drilled

**Oil and Gas Leases**

- BILL BARRETT CORP
- GASCONADE OIL CO
- IMPACT ENERGY RESOURCES LLC
- KLURFELD GREGOR
- LIBERTY PETRO CORP
- PATARA OIL & GAS LLC
- WILLIAMS PRODUCTION RMT CO

N

0 2 Miles

# RM POTASH
# POTASH EXPLORATION PROJECT

## FIGURE 5
## OIL, GAS, AND MINING

JBR

| DRAWN BY | DATE DRAWN |
|---|---|
| CP | 7/5/2012 |

SCALE 1:144,400

Path: E:\drawings\Colorado Potash Exporation EA RM Potash\EA\Fig5 Oil, Gas, and Mining.mxd

### 3.3.3 Land Use and Realty

The Project Area is located in San Miguel and Dolores Counties, Colorado and includes BLM-administered and private lands. The San Miguel / Dolores County lines bisect the Project Area with Drill Sites 1 through 5 in San Miguel County and Drill Site 6 in Dolores County.

The Project Area would be accessed via State Highway 141 that traverses north-south. The major land uses in the area include irrigated and non-irrigated cropland, pastureland, rangeland, wildlife habitat, mineral extraction, and recreation such as off-highway vehicle use, hunting, and camping. Public lands are available for recreational use. Recreation in the area is generally dispersed.

According to the San Miguel County Management Plan, tourism, real estate, and construction are the primary economic generators in the county (SMCMP 2008). In San Miguel County, the Project Area is located in the West End zone. The "West End" of the county, including Egnar, Slick Rock, and Disappointment and Big Gypsum Valleys, is primarily high desert country bisected by the Dolores River and its sandstone canyons. Ranching is the livelihood for many West End residents, who number about 200.

According to the Dolores County Master Plan (DCMP; DCPC 1997), current land uses in Dolores County are primarily ranching and farming, and the timber industry. Western Dolores County also includes oil, gas, and carbon dioxide production. The western end of Dolores County has historically been agricultural, and there is a desire for this heritage to be sustained. Two planning themes noted in the DCMP (DCPC 1997 p. 22) include:

- Future land use patterns should sustain a rural quality of life, with special recognition of unique community histories, traditions, and values.
- Public lands should be preserved while remaining open for a diversity of social purposes and human activities.

### 3.3.4 Livestock Grazing

Domestic livestock grazing has occurred on public lands in Colorado since the late 1870s. The livestock industry has been an integral part of community development, as well as overall lifestyle, in southwestern Colorado. Public lands supply winter, spring, and summer grazing for dependent livestock producers, and represent a significant portion of their total operations. In Colorado, nearly 1,500 livestock operators are authorized for grazing use on 2,500 grazing areas called allotments through an approved grazing permit/lease (BLM 2011b). Grazing is managed by the terms and conditions specified for each allotment on the permit/lease, e.g., kind and number of livestock, season of use, and amount of use permitted each grazing year. Permit/leases are generally issued for a term of 10 years.

Livestock grazing is a primary land use in the Project Area. Most allotment lands are managed by the BLM, but there may be inholdings of state or private land. Livestock use levels are measured in Animal Unit Months, or AUMs. An AUM is the amount of forage it takes to support one cow/calf pair, one bull, five sheep, or one horse for one month.

Vegetation composition varies slightly among the six drill sites; however, in general the Project Area is located at an average of approximately 7,500 feet elevation and is dominated by pinion-juniper forest and typical associated vegetation: big sagebrush (*Artemisia tridentata*), Gambel oak (*Quercus Gambelii*), and alder-leaf mountain mahogany (*Cercocarpus montanus*).

**Table 3-2** provides the basic information of each of the four grazing allotments in the Project Area.

**Table 3-2 Grazing Allotments**

| Allotment Number | Allotment Name | Management | Acres | AUMs | Type | Period of Use | Associated Drill Site |
|---|---|---|---|---|---|---|---|
| 17015 | Bush Canyon | Maintain | 4,677 | 76 | Cattle | 6/1 – 7/15<br>8/25 – 10/8 | 2 |
| 17034 | Slick Rock | Improve | 53,572 | 2,492 | Cattle | 11/1 – 2/28<br>3/1 – 4/30 | 1 |
| 17038 | Spud Patch | Maintain | 11,880 | 878 | Cattle | 5/16 – 11/14 | 3, 4, 6 |
| 08063 | Sandrock | Maintain | 6,276 | 590 | Cattle | 6/1 – 10/15 | 5 |

### 3.3.5 Migratory Birds

During summer 2011, a biological survey of each of the drill sites was conducted and all observations of bird species were documented (JBR 2011a). In addition, all areas within 0.5 mile of proposed drill sites were surveyed for raptor nests that may occur in cliff faces, trees, and rock outcrops.

Migratory birds are found in the vicinity of the Project Area as either seasonal residents or as migrants. Provisions of the Migratory Bird Treaty Act (16 USC 701-718h) prohibit the taking, killing, or possession of any migratory birds, including the taking of any nest or egg. As of November 2010, all native birds commonly found in the United States are protected under the Migratory Bird Treaty Act, except for resident native and introduced game birds, house sparrows (*Passer domesticus*), European starlings (*Sturnus Vulgaris*), rock doves (pigeons; *Columba livia*) and Eurasian collared doves (*Streptopeleia decaocto*). There are numerous species of migratory birds that have the potential to use habitat in the Project Area. **Table 3-3** lists the birds observed during the survey.

**Table 3-3 Birds Observed in the Project Area**

| Common Name | Scientific Name |
|---|---|
| Black-Chinned Hummingbird | *Archilochus alexandri* |
| Black-Throated Gray Warbler | *Dendroica nigrescens* |
| Blue-Gray Gnatcatcher | *Polioptila caerulea* |
| Chipping Sparrow | *Spizella passerina* |
| Common Raven | *Corvus corax* |
| Mourning Dove | *Zenaida macroura* |
| Northern Flicker | *Colaptes auratus* |
| Spotted Towhee | *Pipilo maculatus* |
| Turkey Vulture | *Cathartes aura* |
| Western Bluebird | *Sialia mexicana* |
| Western Scrub-Jay | *Aphelocoma californica* |
| Yellow-Rumped Warbler | *Dendroica coronata* |
| Red-tailed Hawk | *Buteo jamaicensis* |

The Project Area is within bald eagle winter range and potential peregrine nesting habitat is within 0.5 mile of Drill Sites 4 and 5. Raptor nest surveys were conducted by scanning cliff faces, trees, rock outcrops, etc. with binoculars and spotting scopes from vantage points providing coverage of the area. No raptor nests were identified. However, given the number of trees available within the 0.5-mile buffer area, a nest could have been missed during the one-day survey.

### 3.3.6 Noise

The Project Area is rural and generally undeveloped. Sources of noise are limited to occasional vehicles on county roads, winds, and wildlife. Sensitive receptors include a few residences, a few motorists, recreationists on BLM lands, and wildlife (including sensitive species). The settlement of Egnar and the town of Dove Creek are characterized as rural communities. Ambient or background noise in the majority of the Project Area is typically natural outdoor and wildlife sounds. Additional noise in areas adjacent to the Project Area results from agricultural activities and Highway 141. Local traffic and community activity are also noise sources associated with Egnar and Dove Creek and are classified as ambient noise.

### 3.3.7 Recreation

The Project Area is accessed via State Highway 141, beyond that are public and private lands. Recreation in the area is generally dispersed. The area provides a variety of dispersed outdoor settings and opportunities. The lands are somewhat remote and rustic with primitive settings, suitable for camping, picnicking, hiking/walking, hunting, enjoying wildlife, sightseeing, and other dispersed uses. There are no developed recreation areas in the Project Area.

While the West End has few public trails, the opportunity to explore BLM land often draws people to the slickrock country near the Dolores River (SMCMP 2008). Bikers and hikers find abundant roads built during the height of uranium/vanadium exploration and extraction, and climbers have found numerous sandstone routes in the West End.

### 3.3.8 Socioeconomics

*San Miguel County – Background, Population, and Economy*

San Miguel County was established in 1883 and named for the nearby San Miguel River. The county seat is the town of Telluride. The county was settled by ranchers and miners. Beginning in the late 1800s, radium was discovered in southwestern Colorado. San Miguel County was part of the Uravan mineral belt, a zone of uranium-vanadium deposits located in San Miguel, Montrose, and Mesa counties, Colorado, and Grand County, Utah. The Uravan mineral belt supplied about half the world's radium from 1910 to 1922, and vanadium and uranium were byproducts. The mines closed in 1923, when deposits in the Belgian Congo forced down the price of radium. Mining revived in 1935 when the price of vanadium rose, and boomed after World War II when the government stockpiled uranium for nuclear weapons programs. The uranium boom of the late 1940s revived the search for uranium orebodies. Uranium was produced from a number of mines, but the orebodies were small and discontinuous.

The 2010 population of San Miguel County is 7,359, an 11.6 percent increase over the 2000 population of 6,594 (US Census Bureau 2011). Land area in the county is 1,286.61 square miles which equates to 5.7 persons per square mile. Egnar, located in the west end of San Miguel County, is the only county community in close proximity to the Project Area, and is unincorporated. According to the 2000 Census Data, the population of the Egnar area (which includes Slickrock) is 129 persons (US Census Bureau 2011). There has been some growth in the county as 47 building permits were issued in 2010 (US Census Bureau 2011).

*Dolores County – Background, Population, and Economy*

Dolores County was created in 1881 from a part of Ouray County. The town of Rico, incorporated in 1879, became the county seat. Rico was a thriving mining town until the Silver Crash in 1893. Although some mining continued in the area, a substantial portion of the population moved away during this time. In 1945, the county seat was moved from Rico to Dove Creek. Rico and Dove Creek are the only incorporated towns in the county.

Western Dolores County, where the Project Area is located, has been a major dry land farming area for short season crops. In an effort to expand the agricultural base, an irrigation water system was constructed to irrigate 7,500 acres of farmland. The agricultural sector in western Dolores County was built on dry land farming with pinto beans as the primary crop along with oil seed crops, dry land winter wheat, and alfalfa.

The 2010 population of Dolores County was 2,064, an 11.9 percent increase over the 2000 population of 1,844. The land area in Dolores County is 1,067.1 square miles, which equates to 1.9 persons per square mile (US Census Bureau 2011). The town of Dove Creek is south of the Project Area. Settlement of the Dove Creek area started

around 1912 with ranchers and farmers moving into the area. The western part of the county was one of the last areas in the United States to be homesteaded. The Stokes Brothers built a store around 1914-1916. There was a post office and many businesses in the early 1920s, but the Town of Dove Creek was not incorporated until 1939. The 2009 population of Dove Creek was 689 (US Census Bureau, 2005-2009 American Community Survey).

No building permits were issued in Dolores County in 2010 (US Census Bureau 2011).

### 3.3.9 Soils

Using the NRCS web soil surveys (San Miguel Area, Colorado, Parts of Dolores, Montrose, and San Miguel Counties; Animas-Dolores Area, Colorado, Parts of Archuleta, Dolores, Hinsdale, La Plata, Montezuma, San Juan, and San Miguel Counties; Cortez Area, Colorado, Parts of Dolores and Montezuma Counties), seven soil units or soil associations have been identified in the Project Area (NRCS 2011, 2010, and 2008). Soils in the Project Area are mostly of the order Mollisols and are dominantly loam (e.g., Monticello-Witt loams, Gurley-Skein loams, Nortez-Fivepine loams, and Granath loam). Other soils in the area include rock outcrops (e.g., Borolls-Rock outcrop complex, and Gladel-Bond-Rock outcrop complex) and the Nortez-Granath and Ormiston-Fivepine complexes (NRCS 2009). Generally, soils include loams over unweathered bedrock on the tops of ridges, terraces, and mesas, to loams on the sideslopes of hills and mesas. The soil units and descriptions are provided in **Appendix E**.

### 3.3.10 Federal Threatened, Endangered, and Candidate Species; BLM Sensitive Species and Species of Concern; State of Colorado Endangered and Threatened Species, and Federal Birds of Conservation Concern

A total of 17 plant and animal federal Threatened, Endangered, and Candidate (TEC) species were reviewed for their potential to occur in the Project Area (JBR 2011b). Two of the 12 wildlife TEC species or their habitats that are known or expected to occur on lands administered by the TRFO and private lands within San Miguel and Dolores Counties was determined to potentially be present in the Project Area; Mexican spotted owl (threatened) and the Gunnison sage grouse (candidate). None of the five TEC plant species are potentially present in the Project Area. The biological report (JBR 2011b) contains species and habitat descriptions for the species having the potential to occur within the Project Area.

There are 28 BLM plant and animal Sensitive Species (13 wildlife and 15 plant sensitive species) known or expected to occur on lands administered by the TRFO and private lands within San Miguel and Dolores Counties (JBR 2011b). Of these, 13 were determined as having the potential to occur in the Project Area (**Table 3-4**).

**Table 3-4 Sensitive Species Potentially Present in Tres Rios Field Office Resource Area**

| Common Name | Scientific Name | Status | Known/ Suspected to be present? | Suitable habitat present? |
|---|---|---|---|---|
| BIRDS | | | | |
| American peregrine falcon | *Falco peregrines anatum* | BLM | Yes | Yes |
| Bald Eagle | *Haliaeetus leucocephalus* | BLM | Yes | Yes |
| Brewer's sparrow | *Spizella breweri* | BLM | Yes | Yes |
| Ferruginous hawk | *Buteo regalis* | BLM | Yes | Yes |
| Gunnison sage grouse | *Centrocercus minimus* | BLM, federal candidate | Yes | Yes |
| Mexican Spotted Owl | | BLM, federal threatened | Yes | Yes |
| Northern goshawk | *Accipiter gentilis* | BLM | Yes | Yes |
| MAMMALS | | | | |
| Allen's big-eared bat | *Idionycteris phyllotis* | BLM | Yes | Yes |
| Big free-tailed bat | *Nyctinomops macrotis* | BLM | Yes | Yes |
| Fringed myotis | *Myotis thysanodes pahasapensis* | BLM | Yes | Yes |
| Spotted bat | *Euderma maculatum* | BLM | No | Yes |
| REPTILES and AMPHIBIANS | | | | |
| Longnose leopard lizard | *Gambelia wislizenii* | BLM | Yes | Yes |
| PLANTS | | | | |
| Naturita milkvetch | *Astragalus naturitensis* | BLM | No | Yes |
| Aromatic Indian breadroot | *Pediomelum aromaticum* | BLM | No | Yes |

Other than raptors, species-specific surveys for special status wildlife species were not conducted (JBR 2011a and 2011b). Occupied habitat does exist for the Gunnison sage-grouse (*Centrocercus minimus*) within the Project Area. This occupied habitat consists of both leking and production habitat. The Project Area also provides habitat for several Sensitive raptors and bats, for the longnose leopard lizard (*Gambelia wislizenii*), and two plant species (**Table 3-4**). The Project Area does not provide habitat for any Threatened or Endangered wildlife species. In addition, no special status plant species were observed, and based on actual, on-the-ground surveys, it does not appear that the Project Area provides habitat for any sensitive plants (JBR 2011a and 2011b).

### 3.3.11 Transportation

The main access into the Project Area is Highway 141. Highway 141 begins about two miles west of Dove Creek, Colorado heading north from US Route 491 (previously known as US Route 666). Highway 141 is a two-lane rural highway. The annual average daily traffic (AADT) is 590 vehicles between US Route 491 and milepost 9.38 (intersection with County Road 6) and the AADT is 350 from there to Egnar (CDOT 2010). From Egnar north, the AADT drops to 250. Nearer US Route 491, 10 percent of vehicles utilizing Highway 141 are trucks; further north toward the Project Area, the number of trucks increases to about 25 percent (CDOT 2010).

The US Route 491 AADT between Cortez and Dove Creek ranges between 2,500 to 3,800 vehicles (CDOT 2010). From the Colorado-Utah border to the intersection with Highway 141, the US Route 491 AADT ranges from 2,100 to 3,100 at the intersection.

There are few towns in the vicinity of the Project Area that could provide personnel, materials, and services. Nearby communities include Dove Creek, Egnar, and Slick Rock (**Table 3-5**). The two closest (within 50 miles) large towns include Cortez, Colorado which is about 37 miles southeast of Highway 141 on US Route 491 and Monticello, Utah which is about 25 miles west on US Route 491.

**Table 3-5 Towns and Communities in Proximity to the Project Area**

| Town/Community | Population | Distance in miles from Highway 141 at Egnar |
|---|---|---|
| Cortez | 8,632 | 47 |
| Dove Creek | 689 | 12 |
| Egnar | 129 | 0 |
| Monticello | 2,028 | 33 |
| Slick Rock | * | 13 |

*population included in Egnar total

From Highway 141, the Project Area is accessed via a system of unpaved county and private roads (**Table 3-6**). These roads are used to access BLM lands and the scattered private residences and ranches.

**Table 3-6 Project Area Access Roads**

| Associated Drill Site | Main Access Road off Highway 141 | Secondary Access Road | Tertiary Access Road | Total Length of Access (miles) | County |
|---|---|---|---|---|---|
| Drill Site 1 | Immediately off Hwy 141 on unnamed road | n/a | n/a | <0.1 | San Miguel |
| Drill Site 2 | K8 Road | 8K Road | n/a | 3.2 | San Miguel |
| Drill Site 3 | K8 Road | L9 Road | n/a | 3.8 | San Miguel |
| Drill Site 4 | K8 Road | L9 Road | 4733 Road | 5.0 | San Miguel |
| Drill Site 5 | F4 Road | F11 Road | n/a | 7.7 | San Miguel |
| Drill Site 6 | B Road | Sand Rock Road | unnamed 4WD Road | 4.8 | Dolores |

### 3.3.12 Vegetation, including Noxious & Invasive Weeds

The Project Area lies in the Colorado Plateaus Ecoregion (CEC 2010):

> The ecoregion has a dry, mid-latitude steppe climate. It is marked by hot summers with low humidity, and cool to cold dry winters. Low elevation basins and canyons [are] sparsely vegetated with blackbrush, shadscale, fourwing saltbush, and galleta grass. Uplands and higher valleys have Wyoming big sagebrush, black sagebrush, pinyon-juniper woodlands and at higher elevations some areas of Gambel oak, mountain mahogany, aspen, and some Douglas-fir. There are many ephemeral and intermittent streams. Perennial streams originate in adjacent mountainous ecoregions. Rugged tableland topography with precipitous side-walls mark abrupt changes in local relief, often from 300 to 600 meters [985 to 1,970 feet]. The region has large low lying areas in river canyons. The uplifted, eroded, and deeply dissected tableland of sedimentary rock contains benches, mesas, buttes, cliffs, canyons, and salt valleys.

**General Vegetation**

Based on Provisional Southwest Regional GAP data (USGS 2004), the majority of the Project Area occurs within the following three landcover categories.

Inter-Mountain Basins Big Sagebrush Shrubland. This category is described as (USGS 2005):

> This ecological system occurs throughout much of the western US, typically in broad basins between mountain ranges, plains and foothills between 1,500-2,300 meters [4,920 to 7,544 feet] elevation. Soils are typically deep, well-drained, and non-saline. These shrublands are dominated by *Artemisia tridentata tridentata* and/or *Artemisia tridentata wyomingensis*. Scattered *Juniperus* spp., *Sarcobatus vermiculatus*, and *Atriplex* spp. may be present in some stands. Perennial herbaceous components typically contribute less than 25 percent vegetative cover. Common graminoid species include *Achnatherum hymenoides*, *Bouteloua gracili*s, *Elymus lanceolatus*, *Festuca idahoensis*, *Hesperostipa comata*, *Leymus cinereus*, *Pleuraphis jamesii*, *Pascopyrum smithii*, *Poa secunda*, or *Pseudoroegneria spicata*.

Colorado Plateau Pinyon-Juniper Woodland. This category is described as (USGS 2005):

> This ecological system occurs in dry mountains and foothills of the Colorado Plateau region including the Western Slope of Colorado to the Wasatch Range, south to the Mogollon Rim and east into the northwestern corner of New Mexico. It is typically found at lower elevations ranging from 1,500-2,440 meters [4,920 to 8,000 feet]. These woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus, and ridges. P*inus edulis* and/or *Juniperus osteosperma* dominate the tree canopy. Understory layers are variable and may be dominated by shrubs, graminoids, or be absent. Associated species include *Arctostaphylos patula*, *Artemisia tridentata*, *Cercocarpus intricatus*, *Cercocarpus montanus*, *Coleogyne ramosissima*, *Purshia stansburiana*, *Purshia tridentata*, *Quercus gambelii*, *Bouteloua gracilis*, *Pleuraphis jamesii*, or *Poa fendleriana*.

Rocky Mountain Gambel Oak-Mixed Montane Shrubland. This category is described as (USGS 2005):

> This ecological system occurs in the mountains, plateaus and foothills in the southern Rocky Mountains and Colorado. These shrublands are most commonly found along dry foothills, lower mountain slopes, and at the edge of the western Great Plains from approximately 2,000 to 2,900 meters [6,560 to 9,512 feet] in elevation, and are often situated above pinyon-juniper woodlands. The vegetation is typically dominated by *Quercus gambelii* alone or codominant with *Amelanchier alnifolia*,

*Amelanchier utahensis, Artemisia tridentata, Cercocarpus montanus, Prunus virginiana, Purshia stansburiana, Purshia tridentata, Robinia neomexicana, Symphoricarpos oreophilus, or Symphoricarpos rotundifolius*.

The Project Area was surveyed in order to describe and map the existing vegetative communities (JBR 2011a). While vegetation composition varied slightly among the six drill sites, the greater Project Area is located at approximately 7,500 feet elevation and is dominated by pinion-juniper forest and typical associated vegetation: big sagebrush (*Artemisia tridentata*), Gambel oak (*Quercus Gambelii*), and alder-leaf mountain mahogany (*Cercocarpus montanus*). Drill Site 5 is slightly higher in elevation (8,180 feet) and vegetation is dominated by ponderosa pine (*Pinus ponderosa*) and Gambel oak. Drill Site 6, the most southern drill site, is dominated by alder-leaf mountain mahogany and big sagebrush vegetation. The remaining drill sites are all dominated by pinion-juniper.

**Noxious and Invasive Weed Species**

There are 71 species on the Colorado noxious and non-native invasive weed list (CDOA 2011). These species are classified in one of three categories.

**List A species**

List A weed species in Colorado that are designated by the Commissioner for eradication.

**List B species**

List B weed species are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, develops and implements state noxious weed management plans designed to stop the continued spread of these species.

**List C species**

List C weed species are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, will develop and implement state noxious weed management plans designed to support the efforts of local governing bodies to facilitate more effective integrated weed management on private and public lands. The goal of such plans will not be to stop the continued spread of these species but to provide additional education, research, and biological control resources to jurisdictions that choose to require management of List C species.

The only noxious or non-native, invasive species observed during surveys was cheatgrass (*Bromus tectorum*), also known as downy brome (JBR 2011a).

### 3.3.13 Waste - Hazardous, Fluid, and Solid

The Project Area is generally undeveloped and shows no signs of solid or hazardous waste. The exception to this is historic debris/trash associated with uranium exploration/mining in a few adjacent areas. Previous drilling has occurred in the vicinity of the exploration drill sites; these locations have been reclaimed. Naturally occurring radioactive materials (NORMs) are present in the Project Area, where the Morrison Formation is at or near the surface, as evidenced by historic uranium mining or prospecting in the vicinity of Drill Sites 1, 2, 3, and 4.

The closest solid waste landfill is the Cahone Landfill near Dove Creek, Colorado. In addition, there is the Montezuma County Landfill located in Cortez, Colorado; it is a 360-acre facility with 40 acres currently active for receiving solid waste.

There is no hazardous waste disposal facility located in the immediate area so any hazardous materials generated locally and disposed in permitted hazardous waste facilities would be trucked by authorized carriers to existing, permitted facilities in Colorado. Safety Kleen Systems (Safety Kleen) has a location (#605201) in Grand Junction, Colorado, approximately 185 miles away. Safety Kleen collects used oil which is then recycled and re-refined. Safety Kleen provides other removal services as well, including drummed waste, hydraulic fluids, compressor oils & filters, and hydrocarbon (solids & liquid) collection. Safety Kleen services include soil testing and lab services (Safety Kleen 2010). Safety Kleen also has additional locations in Englewood and Pueblo, both over 300 miles away.

Certain oil and gas exploration and production wastes are exempt from regulation as hazardous wastes under Subtitle C of the Resource Conservation and Recovery Act (RCRA), including produced water, drill cuttings, and drilling fluids (EPA 2002, p.10). Reams Construction, located in Naturita, Colorado provides field drilling services including produced water and drilling fluid waste disposal; all drilling fluids, not reused, would be transported to their facility for treatment and recycling. This is about 62 miles from Dove Creek, less from the Project Area.

### 3.3.14 Water Resources

According to the Colorado Department of Public Health and Environment (Colbert 2012), the Project Area is not within any surface or ground water Source Water Assessment Areas or Protection Areas.

#### 3.3.14.1 Surface Water

The Project Area is adjacent to the Dolores Canyon area of the Dolores River, which is east of the proposed drill sites. The river is 2,300 feet below proposed Drill Site 5, the closest drill site location to the river, over a horizontal distance of 1.4 miles. The nearest USGS Gaging Station is USGS 09168730 Dolores River near Slick Rock, Colorado, which is approximately four miles north-northeast (downriver) of proposed Drill Site 1. The station is below the confluence of the Dolores River and Disappointment Creek, and has operated since May 1, 1997. However USGS has only calculated mean annual discharge for 2000, 2009, and 2010 (161.5 cubic feet per second [cfs], 120.2 cfs, and

120.4 cfs, respectively). Records for the station show many gaps in the data, notably between 2003 and 2008 and over several winters. For the period of record (which is intermittent), the minimum recorded discharge was 1 cfs (June 11, 2002); the maximum recorded discharge was 3,660 cfs (May 7, 1998); and the mean discharge was 184.8 cfs.

**Figure 6** and **Table 3-7** show the HUC 6 watersheds in which the proposed drill sites are located. Only the Dolores River is perennial within these watersheds; all of the other streams are described as intermittent in the USGS National Hydrographic Dataset (2012). Named creeks include Bell Creek (tributary to Bush Canyon, tributary to the Dolores River); Bishop Canyon and Summit Canyon (tributary to the Dolores River); Morrison, Blue, and Bell canyons (tributary to the Dolores River); and Chico Creek (tributary to Coal Creek Canyon). **Table 3-8** shows springs, by the HUC watershed, in the analysis area (i.e., the six HUCs in **Table 3-8**; **Figure 8** in Chapter 4).

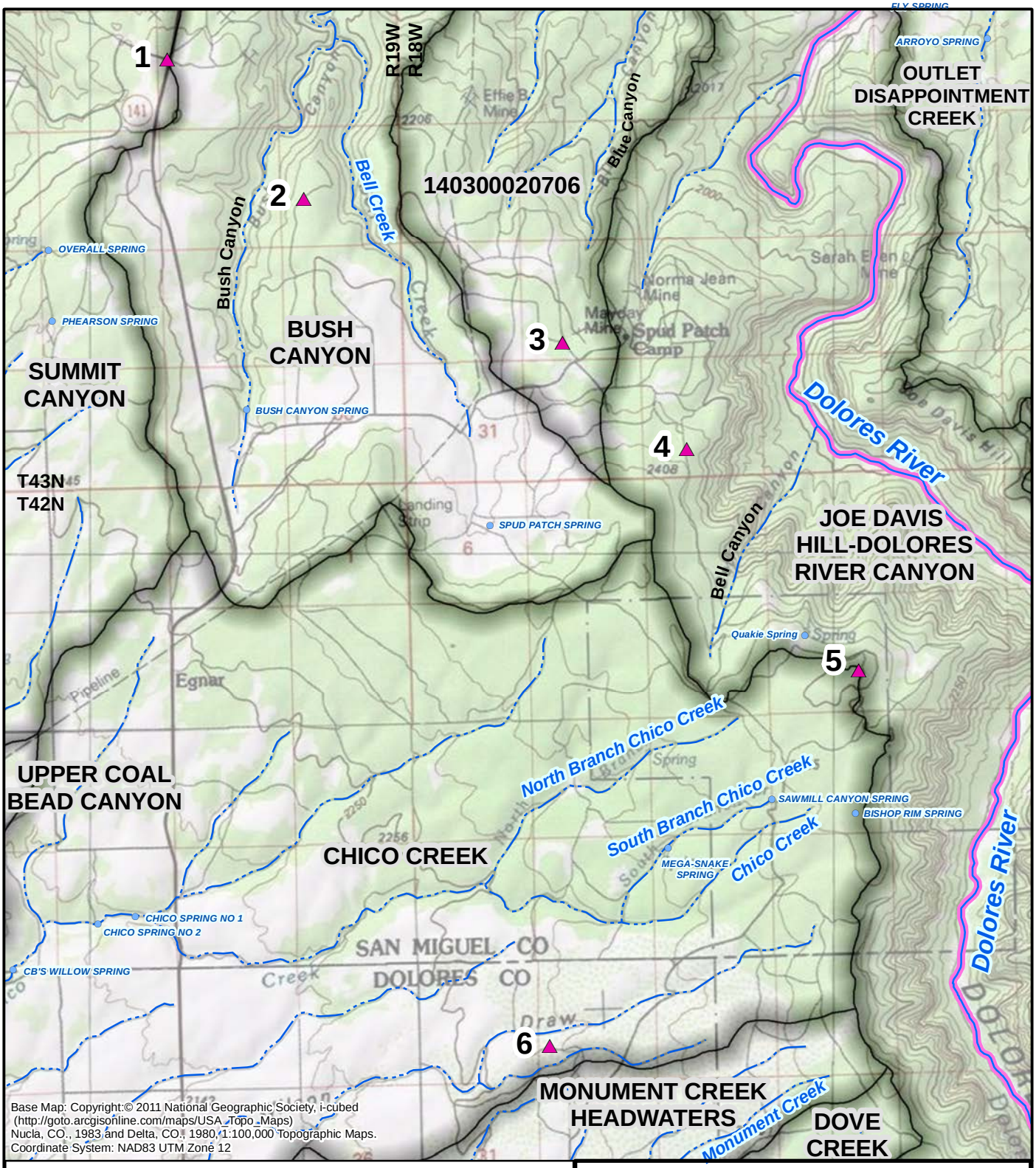
**Table 3-7 HUC 6 Watersheds**

| Drill Site # | HUC 6 Number | HUC 6 Name |
|---|---|---|
| 1 | 140300020702 | Summit Canyon |
| 2 | 140300020701 | Bush Canyon |
| 3 | 140300020706 | 140300020706 |
| 4 | 140300020605 | Joe Davis Hill-Dolores River Canyon |
| 5 | 140300020605 | Joe Davis Hill-Dolores River Canyon |
| 6 | 140802030201 | Chico Creek |

**Table 3-8 Springs in the analysis area by HUC**

| HUC 6 Name | Springs |
|---|---|
| Summit Canyon | Secret, Overall, Phearson, Reynolds, Strawberry, Bishop Canyon, Unnamed |
| Bush Canyon | Unnamed, Spud Patch |
| 140300020706 | Unnamed |
| Joe Davis Hill-Dolores River Canyon | Quakie, Tommy, Sawmill Canyon, Bishop Rim |
| Chico Creek | Mega-Snake, Chico #1, Chico #2, CB's Willow |

Dolores County is currently developing a source water protection program under the Colorado Department of Public Health and the Environment.




**Legend**

- Proposed RM Potash Drill Hole Locations
- Spring Location
- Intermittent Stream
- 303(d) Listed River
- HUC-6 Watershed Boundary
- 303(d) Listed Impaired Waters

N

0 2 Miles

RM POTASH
POTASH EXPLORATION PROJECT

FIGURE 6
HUC-6 WATERSHED, 303(d) Streams

JBR

| DRAWN BY | DATE DRAWN |
|---|---|
| CP | 6/7/2012 |
| SCALE | |
| 1:75,000 | |

Path: E:\drawings\Colorado Potash Exporation EA RM Potash\EA\Fig6 HUC-6 Watershed, 303(d) Streams.mxd

The Dolores River is meeting its designated use for agriculture, public water supply, and recreation, but is impaired for cold water aquatic life due to excessive iron content (CDPHE 2010), and is on the State 303(d) list for impaired waters. This designation covers 62.8 miles of river near the Montezuma/Dolores County line and the Little Gypsum Valley Bridge at the San Miguel/Montrose County Line. No other water bodies in the analysis area are in the Colorado Integrated 305(b) and 303(d) 2010 Report (CDPHE 2010).

Water quality in the Dolores River gets progressively more saline as the stream travels through the Mancos shale and other surface formations of marine origin (BLM 1984). Disappointment Creek, which joins the river downstream, runs through the Mancos shale and adds a substantial salinity to the river. The only available water quality data for the Slick Rock gaging station is for specific conductance, which is often used as a surrogate for salinity, which increases ionic strength. Thirty-eight readings were taken between 1997 and 2003; readings were between 264 microsiemens per centimeter (µS/cm) and 960 µS/cm, with a mean of 491 µS/cm. Although there are no regulatory standards for specific conductance in Colorado, typical values are as follows (CWT 2004):

- Distilled water ranges from 0.5 to 3.0 µS/cm
- Melted snow ranges from 2-42 µS/cm
- Potable water (U.S.) ranges from 30-0500 µS/cm
- Ocean water is typically 50,000 to 56,000 µS/cm

Drill Site 6 is in the Chico Creek Watershed, which drains to Coal Bed Canyon in Utah, before reaching Montezuma Creek. No water quality data is available for Chico Creek, which is intermittent.

#### 3.3.14.2 Groundwater

There are four major, regional aquifers in the planning area (Uinta-Animas, Mesa Verde, Dakota-Glen Canyon, and Fruitland-Pictured Cliffs), in addition to more local aquifers (Coconino-DeChelly, Florida Mesa, and major alluvial aquifers). Of these, the Mineral Report for the current Project (BLM 2010) shows only the Dakota Formation as exposed at the surface of the mineral leases, in addition to alluvial aquifers.

The Groundwater Atlas of Colorado (Topper et al. 2003) describes two major hydrogeologic units in the Paradox Basin as 1) a Mesozoic sandstone aquifer composed of a stacked sequence of about 10 sandstone and shale geologic units with varying water quality and quantity, and 2) a lower Paleozoic carbonate (primarily limestone) aquifer with saline water. The two aquifers are separated by a thick sequence of confining salt beds, as shown in **Figure 7**.

**Figure 7 Hydrogeologic Units of the Paradox Basin**

| Era | System | Stratigraphic Unit | Unit Thickness (feet) | Physical Characteristics | Hydrogeologic Unit | Hydrologic Characteristics |
|---|---|---|---|---|---|---|
| Cenozoic | Quaternary | Alluvium | 0–100 | Alluvial sands and gravels, loess, colluvium, windblown sands | Alluvium | Yields large quanities for domestic, stock, and municipal |
| Mesozoic | Upper Cretaceous | Mancos Shale | 1,000–5,000 | Shales interbedded with minor sandstone | Cretaceous confining beds | Confining unit; none |
| | Lower Cretaceous | Dakota Sandstone | 0–200 | Fine-to coarse-grained cross-bedded sandstone | Mesozoic sandstone aquifer | Yields some water, stock and domestic |
| | | Burro Canyon Fm | 0–250 | Conglomerate, sandstone and shale | | Yields water to springs |
| | Upper Jurassic | Morrison Formation: Brushy Basin Member | 400–500 | Shales interbedded with minor sandstone | | None |
| | | Morrison Formation: Saltwash Member | 300 | Medium-grained sandstone interbedded with red shale | | Yields small quantities, stock and domestic |
| | Upper and Middle Jurassic | Summerville Fm | 0–120 | Shales interbedded with minor sandstone | | None |
| | | Entrada Sandstone | 15–170 | Buff to grayish-white cross-bedded sandstones | | Yields water |
| | | Carmel Formation | 0–40 | Siltstone and mudstone interbedded with fine-grained sandstone | | None |
| | | Navajo Sandstone | 0–125 | Fine-grained, cross-bedded quartz sandstone | | Small to moderate amounts from fractures, stock and domestic |
| | | Kayenta Formation | 0–200 | Sandstone interbedded with siltstone and thin-bedded shale | | Yields little to no water |
| | Upper Triassic | Wingate Sandstone | 0–400 | Medium grained, poorly cemented, cross-bedded sandstone | | Yields water to numerous springs |
| | | Dolores Formation | 150–230 | Pink to red mudstone and fine-grained sandstone. Not present in all areas | Mesozoic-Upper Paleozoic confining beds | Not water bearing |
| | | Chinle Formation | 0–500 | Shale, siltstones, interbedded with minor fine-grained sandstone | | Yields small quantities where fractured, stock and domestic |
| | Lower Triassic | Moenkopi Formation | 0–480 | Mudstone interbedded with minor sandstone | | Yields small quantities, stock and domestic |
| Paleozoic | Permian | Cutler Formation | 0–3,500 | Fine grained sandstone interbedded with minor conglomerate and mudstone | | Yields small quantities where fractured, stock and domestic |
| | Pennsylvanian | Hermosa Formation | 0–3,900 | Shales, limestones, salt and gypsum; includes the Paradox Member | Confining salt beds | None |
| | Mississippian | Leadville Limestone | 20–100 | Massive to thinly laminated, gray buff and yellow limestone | Lower Paleozoic carbonate aquifer | Transmits saltwater through fractures |
| | Devonian and Cambrian | Ouray, Elbert, and Ignacio Formations | 0–150 | Limestone, shale, dolomite; Ignacio is a quartzite | | |

Source: Topper et al. 2003

The average well depth in the Paradox Basin is 180 feet below ground surface (bgs), with at least 90 percent of the wells of record completed to depths less than 350 feet bgs (Topper et al. 2003). Well yields are typically low, with 90 percent yielding less than the average yield of 20 gallons per minute (gpm); the most productive wells are typically found in the Navajo Sandstone (Topper et al. 2003); however, most wells in the Project Area are likely in the Dakota- Burro Canyon aquifer, given the well depths. No known groundwater wells are developed in the lower Paleozoic aquifer due to both its depth and salinity (Topper et al. 2003). Groundwater quality is highly variable with the best quality water found in the shallower and/or more highly productive units (i.e., alluvium and the Navajo Sandstone), with concentrations of total dissolved solids, chloride, and sulfate all increasing generally with depth (Topper et al. 2003).

### 3.3.15 Wildlife

The three main vegetation communities (**Section 3.3.12**) in the Project Area include Inter-Mountain Basins Big Sagebrush Shrubland (sagebrush shrubland), Colorado Plateau Pinyon-Juniper Woodland (pinyon-juniper woodland), and Rocky Mountain Gambel Oak-Mixed Montane Shrubland (Mountain shrubland/oak).

Sagebrush shrublands are an extremely important vegetation type for many wildlife species. Many of the birds that occur in this habitat are sagebrush obligate species that exhibit sensitivity to habitat edges and fragmentation, such as sage sparrow (*Amphispiza belli*), Brewer's sparrow (*Spizella breweri*), and Gunnison sage-grouse (*Centrocercus minimus*). Many of these species also nest on, or near, the ground beneath the shrubs, and are, therefore, vulnerable to effects. Sagebrush shrublands also support many of the same small mammal species as mountain shrublands and pinyon-juniper woodlands. Some jackrabbit (*Lepus californicus*) and cottontail (*Sylvilagus audubonii*) species may reach high population densities in this habitat type. As with mountain shrublands, sagebrush shrublands can support a high diversity of reptile species, especially when interspersed with semi-desert shrublands, rock/cliff habitat, and other dry habitat types. However, amphibians are generally absent, except where water sources are present (BLM and USFS 2007 p.3-148).

Pinyon-juniper woodlands are essential to avian species, and support the largest assemblage of nesting bird species of any upland vegetation type in the western United States (BLM and USFS 2007 p.3-148). Typical bird species that utilize local pinyon-juniper habitats include the bushtit (*Psaltriparus minimus*), pinyon jay (*Gymnorhinus cyanocephalus*), and mountain chickadee (*Poecile gambeli*). Pinyon-juniper habitats are utilized by many big game species, at least on a seasonal basis, and may provide year-round habitat for mule deer (*Odocoileus hemionus*) and elk (*Cervus canadensis*) when food and water resources are available. Pinyon-juniper habitats are also frequently associated with desert bighorn sheep (*Ovis canadensis*) when in proximity to the cliff/rock/talus habitat type. Numerous small mammal species may occupy pinyon-juniper, including deer mouse (*Peromyscus maniculatus*), bushy-tailed woodrat (*Neotoma cinerea*), white-footed mouse (*Peromyscus leucopus*), and white-tailed jackrabbit (*Lepus townsendii*). Large carnivores such as cougars (*Puma concolor*) may also frequent pinyon-juniper, especially when prey species are available. The diversity of reptile

species within these woodlands is high and includes species such as the western rattlesnake (*Crotalus viridis helleri*). Pinyon-juniper habitats also support the highest diversity of bat species in Colorado; this is especially valuable where wetlands and riparian habitats occur. Bat species such as the fringed myotis (*Myotis thysanodes*) and Yuma myotis (*Myotis yumanensis*) are also known to utilize pinyon-juniper trees (and the associated cliff and rock habitat) as roosting areas. In general, amphibian species are scarce in pinyon-juniper woodlands, except where water is available.

Mountain shrublands/oak habitat provides valuable food and cover for many wildlife species, and some species, such as black bears (*Ursus americanus*) depend heavily upon the mast crops (BLM and USFS 2007 p.3-147). Fewer small rodent species utilize mountain shrubland habitats in Colorado; however, some small mammals, such as Nuttall's cottontail (*Sylvilagus nuttallii*), may reach high densities in this habitat type. At least 24 bird species in Colorado utilize mountain shrublands. Local bird species that are closely associated with this habitat type include the green-tailed towhee (*Pipilo chlorurus*), spotted towhee (*Pipilo maculatus*), Virginia's warbler (*Oreothlypis virginiae*), and wild turkey (*Meleagris gall*).

Based on GIS data provided by the Colorado Division of Wildlife, Natural Diversity Information Source (CDOW NDIS 2011), the Project Area is located near (within 1 - 4 miles) bighorn sheep winter range. The middle and southern portions of the Project Area provide winter, summer, and production habitat for elk and the entire Project Area is identified as winter range for mule deer.

No mammals were observed during the survey (JBR 2011a); however, the following mammal sign was recorded: elk, mule deer, cougar, cottontail rabbit, jack rabbit, and coyote (*Canis latrans*). A complete list of bird species observed is provided in **Table 3-3** (**Section 3.3.5**).

### 3.3.16 Air Quality and Climate Change

There is broad scientific consensus that humans are changing the chemical composition of our atmosphere. Activities such as fossil fuel combustion, deforestation, and other changes in land use are resulting in the accumulation of trace greenhouse gasses (GHGs) such as carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), water vapor, and several industrial gases in our atmosphere. An increase in GHG emissions is said to result in an increase in the earth's average surface temperature, primarily by trapping and decreasing the amount of heat energy radiated by the earth back into space. The phenomenon is commonly referred to as global warming. Global warming is expected, in turn, to affect weather patterns, average sea level, ocean acidification, chemical reaction rates, precipitation rates, etc., which is commonly referred to as climate change. The Intergovernmental Panel on Climate Change (IPCC) has predicted that the average global temperature rise between 1990 and 2100 could be as great as 5.8°C (10.4°F), which could have massive deleterious effects on the natural and human environments. Although GHG levels have varied for millennia (along with corresponding variations in climatic conditions), industrialization and burning of fossil carbon sources have caused GHG concentrations to increase measurably, from approximately 280 ppm in 1750 to 396 ppm

in 2012 (as of June). The rate of change has also been increasing as more industrialization and population growth is occurring around the globe. This fact is demonstrated by data from the Mauna Loa CO2 monitor in Hawaii that documents atmospheric concentrations of CO2 going back to 1960, at which point the average annual CO2 concentration was recorded at approximately 317 ppm. The record shows that approximately 70 percent of the increases in atmospheric CO2 concentration, or build up, since pre-industrial times has occurred within the last 50 years. In the coming decades climate change may lead to changes in the Mountain West and Great Plains, such as increased drought and wild land fire potential.

# 4.0 ENVIRONMENTAL EFFECTS

## 4.1 Introduction

This section describes the potential environmental effects of the Proposed Action and No Action Alternatives on the physical, biological, and other resources in the Project Area described above in **Chapter 3**. In consideration of environmental protection and design criteria included in the Proposed Action, the remaining environmental consequences described below may be unavoidable.

## 4.2 Direct/Indirect Effects

### 4.2.1 Alternative A – Proposed Action

#### 4.2.1.1 Cultural Resources

There would be No Effects to Historic Properties under the Proposed Action (**Table 4-1**). Two newly recorded sites, 5SM7095 and 5SM7096, are at the Drill Site 1 Project Area. Neither is recommended eligible for the NRHP. Site 5SM7095, the lithic scatter, is located away from the proposed drilling location, so would not be impacted by drilling activity. Site 5SM7096 is in the area of proposed exploration drilling activities; however, since the site is ineligible for the NRHP, avoidance is not necessary. Site 5SM7097, a trash dump within the Drill Site 3 Project Area, is recommended as not eligible for the NRHP. It is located northwest of the proposed exploration drilling site and would not be impacted by the Project. Site 5SM1410 was not relocated; however, the plotted location is northwest of the drill pad at Drill Site 3 and would not be impacted. The original Drill Site 5 was moved south to avoid impacting site 5SM4822; therefore the site would not be affected. Site 5SM4936 is officially not eligible for the NRHP; however, this site would not be impacted by the proposed exploration activities at Drill Site 4 as the drill location is southwest of the site area.

**Table 4-1 Summary of Sites and Recommendations**

| Site Number | Site Type | Affiliation | NRHP Evaluation | Project Recommendation |
|---|---|---|---|---|
| 5SM1410 | Lithic Scatter | Prehistoric | Not Eligible | None |
| 5SM4822 | Lithic Scatter | Prehistoric | Needs Data | Avoid |
| 5SM4936 | Artifact Scatter | Prehistoric | Not Eligible | None |
| 5SM7095 | Lithic Scatter | Prehistoric | Not Eligible | None |
| 5SM7096 | Trash Dump | Historic | Not Eligible | None |
| 5SM7097 | Debris Scatter | Historic | Not Eligible | None |

#### 4.2.1.2 Geology and Minerals

Exploration activities would not be expected to impact geological conditions or mineral resources. RM Potash would comply with all state and federal requirements, and with the permit stipulations. In addition to complying with permit stipulations, RM Potash would implement EPMs and BMPs to mitigate potential adverse effects of the Project (**Section 2.2.8**). RM Potash would coordinate with the DOE as appropriate to avoid conflicts with ongoing activities on the uranium lease tracts, which remain open to mineral leasing under the 1920 leasing act.

While there are mining claims in the area, there are no mining operation plans or notices-level activities that would be interfered with, and none have been proposed at the time this EA was written. Much of the area has been leased for oil and gas production, and hydrocarbon bearing strata are expected to be encountered. Core holes would be drilled, cased, cemented, and abandoned in such a way that they would not infringe on or diminish other mineral resources – including oil and gas. No subsidence or induced seismicity would result from core drilling. Blow out prevention, gas flares, and hydrogen sulfide contingency plans would eliminate risks due to well control issues, so effects to geology and mineral resources would be negligible. These plans would be prepared using the Oil and Gas Applications for Permits to Drill as a template and as specifically laid out in BLM Onshore Orders 1, 2, and 6;these would be a required as a condition of approval.

#### 4.2.1.3 Land Use and Realty

Segments of roads identified in **Figure 2** and **Tables 2.2** and **2.3** totaling 10.2 acres would need to be improved (i.e. blading, gravelling or widening). Disturbance width for roads was estimated at 20 feet, thought it is likely to be less in many areas. These improvements may be left in place upon the concurrence of the land owner (if on private) or of the county (if a county road), and would result in a better road surface than currently is in place. The roads would be seeded back to the original road width as required. If warranted, roads would be reclaimed back to their original condition, resulting in no net disturbance in either case. The effect would be a short-term, negligible impact until reclamation vegetation is successfully re-established in 3-4 years.

The Proposed Action would require a Conditional Use Permit in both San Miguel and Dolores Counties and RM Potash would be responsible for obtaining these permits. Land use surrounding the Project Area would not be affected.

RM Potash would coordinate with the San Miguel and Dolores County Road Departments. The Counties may identify additional segments of County roads as well as specify the type and degree of additional improvements they might require. The proposed Project would not affect any existing ROWs. There would be no conflicts with other land use authorizations.

#### 4.2.1.4 Livestock Grazing

The Proposed Action would involve the short-term loss of vegetation of up to 1.4 acre per drill location. Maximum drill pad disturbance if all six drill locations were drilled would be approximately 8.6 acres. In addition, some existing roads would need improvement for an additional maximum disturbance of 10.2 acres. **Table 4-2** provides the potential acres of disturbance within each grazing allotment and the estimate of AUMs that would be temporarily lost.

**Table 4-2 Impacts to Grazing Allotments**

| Allotment Name | Acres | AUMs | Associated Drill Site | Drill Pad Disturbance (acres) | Access Road Disturbance (acres) | AUMS Lost |
|---|---|---|---|---|---|---|
| Bush Canyon | 4,677 | 76 | 2 | 1.4 | 4.8 | <1 |
| Slick Rock | 53,572 | 2,492 | 1 | 1.4 | 0 | <1 |
| Spud Patch | 11,880 | 878 | 3, 4, 6 | 4.2 | 5.4 | <1 |
| Sandrock | 6,276 | 590 | 5 | 1.4 | 0 | <1 |

Upgraded existing roads to the drill locations might aid stockmen's access to the allotments. Effects related to drill pad construction and operation would be short term. Less than one AUM would be impacted in each of the four allotments. The disturbed areas would be reclaimed with the goal of providing rangeland vegetation and forage again. Drill pad areas would be fenced off during reclamation until revegetation is successful. The small size of the disturbances relative to undisturbed lands would make these disturbances negligible.

Use of design features, BMPs, and EPMs, as outlined in **Section 2.2.8**, would minimize effects to livestock grazing and associated range improvements.

#### 4.2.1.5 Migratory Birds

Up to a maximum of approximately 18.8 acres of habitat for migratory bird (passerine) nesting and raptor foraging would be lost short-term due to exploration drilling pad construction and access road improvement. The disturbance to migratory bird habitat would be minimal. Although some individuals may be displaced during pad construction and nesting habitat may be removed, these disturbances should not affect the regional populations of migratory birds. Vegetation would be cleared from a drill pad site in a 250 by 250 foot area. Adjacent undisturbed habitat would be available for migratory bird nesting and foraging during exploration activities.

Though unlikely, there may be some direct disturbance to passerine bird nests from vehicles and construction equipment. Active nests are most likely to be present between April 1 and July 31 and may be impacted if activity occurs during this time and the nests were undetected. If vegetation at each site is cleared prior to the nesting season, direct effects to migratory bird nests would be avoided. If Project activities were to take place

between April 1 and July 31, additional surveys would be required immediately prior to drill pad construction and/or drilling to identify any active nests.

Noise effects from construction activities would be temporary and could affect raptors nesting within 0.5 mile of the Project Areas. Effects to nesting migratory birds would be short-term (1-5 years) because birds could nest elsewhere in the same or following season if interrupted. If a passerine nest is found within the disturbance area, or if a raptor nest is found within 0.5 miles of the planned activities, activities would need to be delayed until birds have fledged from the nest. Therefore, only nests that are undetected may be adversely affected by noise or human presence.

#### 4.2.1.6 Noise

Noise effects would be short-term and minor. There would be a short-term increase in noise level both in intensity of the noise and the frequency of events in a remote area. This could change the recreation experience of those seeking a remote type of recreation. Increased traffic on county roads would increase noise at nearby residences and ranches, but would be sporadic and limited. Only occasional motorists use the county roads, and residents and recreationists would be sufficiently distant from the work areas that any increase in noise would have attenuated to very low levels. Any displaced wildlife would be expected to return to the area once drilling is completed. Once drilling activities were completed and reclamation successful, noise levels would return to previous levels.

Specific noise stipulations for Gunnison sage grouse are presented in **Section 4.2.1.10**.

#### 4.2.1.7 Recreation

There are no BLM-developed recreation areas/facilities in the Project Area; however, scattered recreation may take place on these lands. Construction of the Project would not be expected to have any detrimental effects on recreation. Drilling activity during the fall months may affect the quality of hunting within approximately a 0.5 mile radius of the active drill site, depending on topography.

Local residents could continue to access the BLM-administered lands using the existing access roads as the Project would not impact access. Recreation users in close proximity to the Project would see and hear Project activities; however, this would be a short-term and minor impact. Recreation opportunities on BLM-administered lands adjacent to and/or accessed via the Project Area would not be affected. Drilling activities would not be visible or audible from within the Dolores River Canyon, and therefore would not have any effect on boaters or other recreational users in the canyon bottom.

#### 4.2.1.8 Socioeconomics

The Proposed Action would increase traffic through rural areas with a few adjacent residences. This would be a short-term and minor impact. There would not likely be any direct effects to San Miguel or Dolores County, other than the benefits to the local economy that would be provided during the exploration drilling in the form of services and goods provided to Project personnel in the communities along Highway 141.

#### 4.2.1.9 Soils

The Proposed Action would result in 8.6 acres of soil disturbance from drill pad construction and drilling, and 10.2 acres of improved existing access road disturbance. All Project disturbances would be temporary. Surface disturbance (i.e. core drilling) would result in direct effects within the Project Area. Direct physical effects to soil resources include compaction and crushing of the soil and soil crust by equipment during Project activities at the 250 by 250 foot drill pads and improved access roads. Vegetation would only be cleared to the extent necessary, minimizing effects to soil resources. Although clearing of vegetation would be kept to a minimum, there would be increased susceptibility of soils to wind and water erosion, until reclamation occurs. Implementation of EPMs, as identified in **Section 2.2.8**, would minimize loss of soil from erosion due to wind and water. Reclamation would include recontouring drill pad locations and reseeding. Temporary or permanent erosion control structures would be installed as needed. The effects to the disturbed areas would be site-specific, short-term, and negligible.

#### 4.2.1.10 Threatened, Endangered, Candidate, and Sensitive Species

Implementation of the Proposed Action **May Effect, but Not Likely to Adversely Affect** Mexican spotted owl. The only BLM sensitive species that the Proposed Action **may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing** is Gunnison sage-grouse. All other BLM sensitive species were a **no effec**t determination. A combined Biological Assessment/Biological Evaluation (BA/BE) prepared for this Project (JBR 2011b) is included in the Project Record and provides additional details and descriptions for the impact analysis for those species having the potential to occur within the Project Area (see Figure F1, and Table F1 of **Appendix F**).

The proposed activities associated with Drill Sites 4 and 5 could affect Mexican spotted owls based on the proximately of these sites to the Dolores River canyon rim. The Dolores River canyon has been identified as potential Mexican spotted owl habitat by USFWS. Any activities within 0.5 mile of the canyon rim during March 1 – Aug 31 have been determined to potentially affect this species (see Figure F1, and Table F1 of **Appendix F**).

The proposed pad construction activities at Drill Site 6 and improvement of the associated existing access road would directly remove up to 4.1 acres of occupied sage-grouse (a BLM Sensitive Species) habitat within a mapped Gunnison sage-grouse (GUSG) production area. This action would affect acreage of production area habitat, but is expected to have a minimal impact to the overall utility of this habitat long term, if disturbance is reclaimed. In addition, by applying the construction timing restrictions (March 15 - June 15) that would allow for activities to occur outside of the nesting and fledging periods, functional habitat affects to this production area could be short-term and may not affect reproduction of GUSG. There are detrimental effects to GUSG when noise levels are high. Noise dB restrictions would apply if activities occur in the production area. If GUSG are in the area during drilling, noise and human presence could cause individuals to alter their normal movement patterns and the amount of habitat

not available could be larger than the actual disturbance footprint. In general, GUSG displaced by such activities would probably return to the area after the disturbance, unless birds in the vicinity were nesting, in which case nesting activities could be disrupted and adverse reproductive effects could occur.

Construction vehicles may transport invasive plant seeds to the disturbance areas and lead to increases in these undesirable species. Invasive species do not provide the same level of nutritious forage as sagebrush plants, and invasive grasses facilitate fire, after which sagebrush plants that rely on seed to reestablish are out-competed by the abundance of invasive grass seeds in the soil. EPMs designed to minimize the establishment of invasive species would minimize this potential impact (**Section 2.2.8** and **Appendix C**).

EPMs identified for the Proposed Action include noise stipulations for GUSG. The Gunnison Sage Grouse Rangewide Conservation Plan (GUSG RCP 2005) recommends that continuous sources of noise be limited to 10 dBA above ambient in all seasonal GUSG habitats. Consistent with this recommendation, CDOW has suggested that a Controlled Surface Use (CSU) lease stipulation be implemented to muffle or otherwise control noise from well sites, roads, and compressors, so that drilling and operational noise will not exceed 49 dBA measured at 30 feet from the source in areas between 0.6-4.0 miles from a lek year round (CDOW 2010). CDOW's recommendation to limit drilling and operational noise to 49 dBA measured at 30 feet from the source is based on a calculation of the noise limits necessary to achieve less than 10 dBA above ambient at a lek from a distance of 0.6 mile (the edge of the No Surface Occupancy (NSO) Buffer recommended in the GUSG RCP). CDOW's 49 dBA at 30 feet recommendation assumes that the NSO buffer is enforced such that no facilities are placed within 0.6 mile of a lek site.

#### 4.2.1.11 Transportation

If all six drill sites were to be drilled sequentially, exploration activities could take up to approximately 2 years (24 months) to complete, although it is most likely that only between 1-3 drill sites would be drilled in a single drilling season (approximately March – October). The following general assumptions about travel patterns were used to determine effects:

Drilling activities would occur 24 hours per day, 7 days per week. Site preparation and reclamation activities would be done during daylight hours. Between six and eight vehicle trips per day would be made to each drill site, with only one drill site being drilled at any given time. Because of a lack of amenities available in communities in the north (i.e. Egnar or Slickrock), it is likely personnel would be located in either Dove Creek, Monticello, or Cortez and therefore would access the Project Area from the south.

The Proposed Action would increase the AADT on Highway 141 by about 3 percent on the least frequented section north of Egnar when accessing drill sites 1 through 4. This AADT increase would be less (1.3 percent) on the section of Highway 141 south of Egnar. The increase in traffic on US Route 491 would be negligible. The increase in traffic on the county access roads (**Table 3-6**) would likely be noticeable to local

residents, but would not impede traffic flow. Effects to transportation would be short-term and negligible to minor.

Once drilling activities were completed and reclamation successful, traffic levels would return to previous levels.

#### 4.2.1.12 Vegetation

There would be approximately 18.8 acres of vegetation disturbed by the Proposed Action, assuming all six drill sites were drilled. About 8.6 acres of vegetation would be disturbed by drilling activities as well as some vegetation on either side of the existing access roads to be improved. Effects to vegetation would be minor and short-term.

Use of design features, BMPs, and EPMs, as outlined in **Sections 2.2.7** and **2.2.8**, would minimize effects to vegetation and reduce the potential to spread noxious and non-native, invasive weeds.

#### 4.2.1.13 Waste - Hazardous, Fluid, and Solid

Waste products that would be generated during exploration drilling would include municipal solid waste, workforce sewage, used oil, non-hazardous hydrocarbon and antifreeze waste, and drilling waste (i.e., water-based and diesel mud and drill cuttings).

Drill cuttings created during the water-based mud drilling would be dried in a cuttings area. Cuttings that meet or exceed the specifications in COGCC 900 series rules (Table 910-1: 500 mg/kg total petroleum hydrocarbons and other organic compounds and metals) may be buried on site (see **Section 2.2.3)**.

Quantities of municipal solid waste (i.e., office/lunch room waste), wood, paper, and plastic debris would be generated during exploration activities, mostly from used packaging and empty containers, as well as other sources. This would be contained on-site in bins and transported off site to a permitted landfill for disposal and/or recycling, as appropriate. During exploration drilling activities, the on-site workers would use portable sanitary facilities for collection of sewage that would be collected by contractors and shipped off site for treatment and disposal. Sanitary sewage managed in this way would cause short-term, negligible effects to resources in the Project Area.

A drill rig and other equipment and vehicles would be used at each exploration drill site. The equipment would be maintained and fueled on-site as would some of the trucks. This would require installation of temporary tanks and containers for storage of diesel fuel, gasoline, lubricating oil, grease, and antifreeze. These tanks and containers would be designed and maintained to be leak free, but would also be installed within secondary containment systems. SPCC requirements would be complied with for these installations to minimize the potential for spills. Used oil, antifreeze, and grease would also be managed in containers for recycling or disposal in permitted facilities (such as Safety Kleen).

Hazardous materials would be required during exploration drilling activities as oil-based mud would be used for drilling the core hole section between approximately 5,500 to 6,000 feet in each hole. However, drilling muds are exempt from regulation as hazardous wastes under Subtitle C of the RCRA (EPA 2002, p.10). Reams Construction (or an equivalent), located in Naturita, Colorado would be used for drilling fluid waste disposal; drilling fluids would be transported to their facility for treatment and recycling.

In addition, diesel fuel and gasoline would be used for on-site vehicles and generators. All hazardous materials would be handled in compliance with applicable federal, state, and local requirements. Liquid hazardous materials would be stored on-site within secondary containment systems to prevent releases of such materials to the environment in the event of a spill. Spills would be contained and promptly cleaned up and the spill residues would be packaged for disposal off site at permitted facilities. Hazardous materials managed this way, in full compliance with applicable regulations and manufacturers' recommendations, would cause short-term, negligible effects to environmental resources in the Project area or during transport.

Further, because of the existence of uranium deposits and other NORMS that may be encountered during drilling activities, the Project would conform to the *Joint Agency Guidelines for Uranium Exploration Drilling Reclamation* (USFS et al. 2007), as well as the COGCC 900 series rules. Hazardous waste effects would be short-term and negligible. Potassium 40 is a naturally occurring NORM that makes up approximately ~0.012 percent of all potassium, and is naturally taken up as a nutrient with other potassium isotopes. Because closed loop drilling would be used, and diesel bearing mud (used to drill the potash) would be disposed of in a licensed land farm, and core would be hauled off for study, no potassium 40 would be left at the surface.

#### 4.2.1.14 Water Resources

As described in **Section 1.7**, the Project would be compliant with all applicable laws, regulations and executive orders, including EO11988 (Floodplain Management), EO11990 (Protection of Wetlands), the Municipal Water/Drinking Water Source Protection Area regulations, and the Clean Water Act.

##### 4.2.1.14.1 Surface water

Two issues were identified as potential risks to surface water (**Section 1.8.14**). They are sedimentation from soil disturbance and erosion, and spill releases. EPMs described in **Section 2.2.7** and **2.2.8**, such as expedient reclamation and using a closed-loop system, would reduce the potential effects to short duration and negligible amounts. Soil disturbance would be limited in time to the drilling period (approximately 60 days) after which reclamation procedures would be initiated to re-vegetate the sites. Drill cuttings would be dried and temporarily stored within a bermed, lined cuttings pad. In addition, water bars would be used to minimize erosion from roads. Most of the proposed drill holes are located away from surface water features. The only perennial stream in the general Project Area is the Dolores River, which is a substantial distance away. The two drill hole locations closest to surface water features are Drill Site 6, which would be

approximately 600 feet from Wilson Draw, and Drill Site 2, which is more than 1,900 feet from an un-named intermittent stream.

All process fluids would be stored in tanks with secondary containment capable of containing at least 150 percent of the full contents of the tank. Implementation of SWPPP and SPCC plans would be implemented to prevent and/or minimize any potential effects to surface water (**Section 2.2.8**).

4.2.1.14.2 Groundwater

The issue identified as the potential risk to groundwater resources (**Section 1.8.14**) concerns possible degradation of groundwater and associated aquifers through introduction of fluids such as drilling mud or cross-contamination of aquifers with either one another or with hydrocarbon reservoirs facilitated by the annular space outside the drill casing. Several precautions would be taken to prevent this from occurring, including the use of appropriate casing and cementing design criteria, and plugging holes by means of cementing from the bottom to the surface (**Sections 2.2.3** and **2.2.8**).

The uppermost section of the drill hole would be 10 inches in diameter and lined with a permanent 9-5/8 inch surface steel casing string and a continuous column of cement behind this string (**Figure 4**). The surface casing section would be set at approximately 1,000 and 1,500 feet deep, below the water-bearing Navajo and Wingate Sandstones and at least 50 feet below the top of the relatively fine-grained rocks of the Chinle Formation (**Table 4-4**). This shallow casing and cement program would prevent cross-communication between and isolation of all potentially useable aquifers above the Chinle Formation (i.e. above the surface casing shoe).

The next drill hole section down would be 8 inches in diameter and lined with a 7 inch intermediate steel casing. The intermediate casing string would extend from ground level down to the depth at which coring would take place at approximately 5,500 feet bgs. The bottom of this second string would be cemented from the base of the pipe to at least 150 feet above the intermediate casing shoe. Such a design would protect the formations in the annual space behind the intermediate string from contamination by oil-based muds used to drill the deepest portion of the well, or by brines which could potentially flow from salt-laden formations when drilling the final core hole interval. In addition, the presence of weighted water-based drilling mud in the annulus behind the 7 inch casing would effectively prevent cross-communication of fluid-bearing intervals within the intermediate hole section.

The deepest section of the well would be a 6-inch diameter drill hole from which a 3-inch diameter core would be extracted using an oil-based mud to prevent water from dissolving any potassium salts, rendering the cores useless. Formation water at these depths is extremely saline and, as previously explained, will not be in communication with any potentially useable water aquifers shallower in the hole. Furthermore, the drilling fluids used in the project would only be pumped into the bore hole at pressures sufficient for cooling and lubrication of the well and at rates sufficient to lift drill cuttings to the surface. Hydraulic fracturing or “fracing”, a practice used to induce artificial

fractures in the surrounding rock in order to stimulate production in oil and gas wells, would not be employed.

After coring and any downhole testing is done, all oil-based mud would be pumped out of the well and the borehole would be cleaned of any residual oil-based mud. Both the oil-based drilling fluids and contaminated cleaning solutions would be circulated out of the well and then collected and reused, recycled, or disposed of in a licensed facility. The intermediate casing string would be cut above the casing shoe and removed, and the entire hole would be cemented from bottom to top. Water-bearing aquifers and/or hydrocarbon-bearing reservoirs in the intermediate and deep hole sections might be exposed during these abandonment activities once the intermediate casing is removed, but the potential for cross-communication would be short–term and negligible based on the brief duration of such operations.

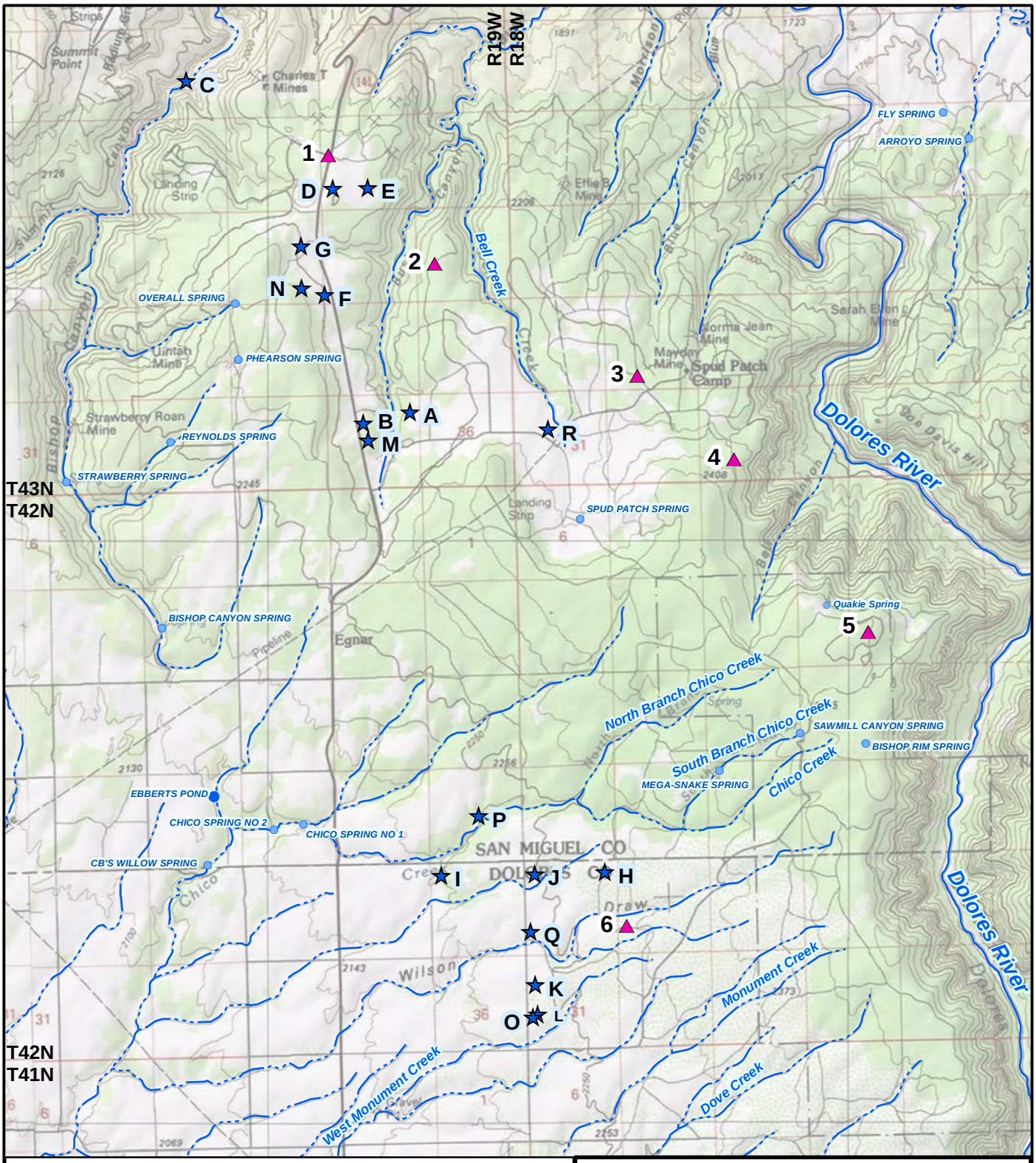
**Table 4-3** shows all water wells within 2 miles of the proposed drill sites and **Table 4-4** shows four oil and gas wells close to the proposed drill sites. See **Figure 8** for their locations. The tables give an indication of the distances between the aquifers being used for water wells and those that would likely be encountered during drilling. More information about the water-bearing characteristics of the formations is in **Figure 7**. The tables show that the saline aquifers and the target formation of the exploratory wells are several thousand feet below any freshwater aquifers.

There is no groundwater quality data available for the wells in **Table 4-3** or any others in the local area. Consequently, one of the EPMs (**Section 2.2.8**) would be to obtain water samples from at least one of the wells near each drill-hole that would be used. From these samples baseline water quality would be determined for future reference. Since there are no wells within two miles of Drill Site 5, water samples would be taken from either Quakie Spring or Sawmill Spring for representative groundwater quality analysis.

**Table 4-3 Water Wells Permitted Within Two Miles of a Proposed Drill Site[1]**

| Location (Figure 8) | Depth (feet bgs) | Depth to Water (feet bgs) | Pumping Rate (gpm) | Uses | Nearest Drill Site |
|---|---|---|---|---|---|
| A | 200 | 100 | 4 | Domestic | 2 |
| B[2] | 220 | | | Stock | 2 |
| C | 200 | | 5 | Stock | 1 |
| D | | | | Irrigation | 1 |
| E | | | | Irrigation | 1 |
| F | | | | Domestic, Stock | 2 |
| G | | | | Domestic, Stock | 1 |
| H | | | | Stock | 6 |
| I | 70 | 64 | 35 | Domestic, Stock | 6 |
| J | 110 | | | Domestic | 6 |
| K | 250 | | 5 | Domestic | 6 |
| L[3] | 140 | 65 | 4 | Domestic | 6 |
| M | 125 | 44 | 3 | Domestic, Stock | 2 |
| N | 200 | 63 | 4 | Stock | 2 |
| O | 150 | 40 | 2 | Domestic | 6 |
| P | 53 | 30 | | Other | 6 |
| Q | 203 | 90 | 2 | Domestic | 6 |
| R | | | | Domestic | 3 |

[1] Blank means no data- well may or may not have been drilled
[2] Burro Canyon Formation – All others listed as "unnamed aquifer"
[3] Abandoned
Source: Colorado Division of Water Resources Well Permit Database (2011)




Base Map: Copyright:© 2011 National Geographic Society, i-cubed
(http://goto.arcgisonline.com/maps/USA_Topo_Maps)
Nucla, CO., 1983 and Delta, CO., 1980, 1:100,000 Topographic Maps.
Coordinate System: NAD83 UTM Zone 12

**Legend**

- Proposed RM Potash Drill Hole Locations
- Water Well
- Spring Location
- Intermittent Stream
- River

N

0 2 Miles

RM POTASH
POTASH EXPLORATION PROJECT

FIGURE 8
PROPOSED DRILL HOLES, WELLS, AND NATURAL SPRINGS

JBR

| DRAWN BY | DATE DRAWN |
|---|---|
| CP | 6/7/2012 |

SCALE 1:96,000

Path: E:\drawings\Colorado Potash Exporation EA RM Potash\EA\Fig8 Water Wells and Springs.mxd

**Table 4-4 Selected Oil and Gas Wells In or Near the Project Area**

| Formation | 6-H-18 Mc Intyre Canyon (T44N R19W Sec. 16) | Egnar #1 (T43N R19W Sec. 14) | 1X Shenandoh-Pinto (T42N R18W Sec. 34) | 1 Dolores Unit (T41N R18W Sec. 16) |
|---|---|---|---|---|
| **Top of Formation in Feet bgs** | | | | |
| Alluvium* | | | | |
| Dakota Sandstone* | | | | 0 |
| Burro Canyon* | | | | |
| Saltwash* | | 0 | | 490 |
| Summerville | | 288 | | 915 |
| Entrada* | | 359 | 1,045 | 957 |
| Carmel | 806 | 489 | 1,142 | 994 |
| Navajo Sandstone* | | 562 | 1,168 | 1,057 |
| Kayenta | | | 1,295 | |
| Wingate* | | 706 | 1,468 | |
| Chinle | 1,290 | 958 | 1,700 | 1,677 |
| Shinarump | | 1,445 | 2,370 | |
| Moenkopi | 1,721 | 1,491 | 2,410 | |
| Cutler | 1,850 | 1,615 | 2,470 | 2,395 |
| Hermosa | | 3,650 | 4,148 | |
| Paradox, Ismay, Desert Creek, Salt | | 4,700 | 5,639 | 5,600 |
| Leadville Limestone** | 8,398 | | | |
| Ouray, Elbert, Ignacio** | 8,450 | | | |

*Yields water
**Yields saltwater
Sources: Colorado Oil & Gas Conservation Commission Information System

Water use for the Project is estimated at approximately 5,000 gallons per day (gpd) during drilling and an additional unknown amount for possible dust suppression. RM Potash would obtain water from a private source. It is estimated that each drill hole would take approximately 60 days to complete. This works out to 300,000 gallons or 0.92 acre feet per well. **Table 4-5** shows the water rights for the four townships in which there are wells within two miles of a proposed drill hole. Under Colorado water law, most, if not all, of the water wells in **Table 4-3** above are not required to have water rights. In other words, the water wells in the previous section are likely not represented among the water rights in **Table 4-5**. As noted in **Figure 7**, the Burro Canyon Formation and the Wingate Sandstone are known to yield water through springs. The table shows that the 0.92 acre feet of water use per well would have a negligible impact on local water supplies.

**Table 4-5 Water Rights in the Four Townships Encompassing the Project Area**

| Water Right Name | Section | Township | Range | Uses | Structure Type | Rate[1] (cfs) |
|---|---|---|---|---|---|---|
| San Miguel PMPG PLT | 10 | 43N | 18W | irrigation, commercial, industrial, domestic, other | ditch, pipeline | 5.000 |
| Bush Canyon Spring | 35 | 43N | 19W | domestic, stock | spring | 0.022 |
| Overall Spring | 22 | 43N | 19W | stock | spring | 0.050 |
| Phearson Spring | 27 | 43N | 19W | stock | spring | 0.050 |
| Reynolds Spring | 33 | 43N | 19W | stock | spring | 0.050 |
| Smitty Well | 35 | 43N | 19W | domestic, stock | well | 0.050 |
| Strawberry Spring | 32 | 43N | 19W | storage, domestic, stock | spring | 0.001 |
| Strawberry Spring | 32 | 43N | 19W | storage, domestic, stock | spring | 0.001 |
| Bishop Rim Spring | 15 | 42N | 18W | storage, stock | reservoir | 0.010 |
| Spud Patch Spring | 6 | 42N | 18W | stock, wildlife | spring | 0.0006 |
| Bishop Canyon Spring | 9 | 42N | 19W | domestic, stock | spring, pipeline | 0.011 |

[1] 1.0 cfs = 448.8 gallons per minute = 1.983 acre feet per day

Source: Colorado Decision Support Systems and Colorado Division of Water Resources Hydrobase database (2011)

Oil-based drilling mud is sometimes used in oil and gas operations, where fresh water-based muds could potentially react with and/or degrade sensitive geologic formations such as shale-rich (clayey) or evaporitic (salty) intervals that may be penetrated in the proposed drill site. A closed loop system would be employed to ensure that the drilling mud would not contact either aquifers or the environment outside the drill hole. First, only water-based mud would be used down to the target formation at approximately 5,500 feet bgs. Second, the well would be sealed from the bottom of the intermediate casing with a 150 foot cement plug to ensure that no oil-based mud or other contaminants could reach any intermediate aquifers above the base of the intermediate casing shoe. Finally, the oil-based drilling mud would be kept in a closed system when it is pumped into and out of the drill hole, it would not go to any open cuttings pit, and would be fully contained in a closed system throughout the Project.

EPMs identified for the Proposed Action includes re-sampling wells and springs previously sampled for baseline data after drilling (**Section 2.2.8**).

#### 4.2.1.15 Wildlife

Overall effects to non-listed wildlife would be negligible to minor and short-term. Up to 18.8 acres of habitat would be temporarily impacted from drilling activities under the Proposed Action. The 8.6 acres of disturbance at the drill locations (6 x 1.43 acres) would be reclaimed and re-seeded after drilling and thus would be a short-term loss. Suitable habitat is abundant and available adjacent to the Project Area. Minimal indirect effects to some small, less mobile individuals would likely occur as they could be forced to disperse from the area or may be killed or injured during construction activities. Wildlife in the area would likely be displaced temporarily during active drilling activities into adjacent undisturbed habitat. Populations on the whole would not be affected.

To further reduce potential effects to big game using the Project Area during drilling activities, applicable wildlife timing stipulations would be implemented as part of the Proposed Action (**Section 2.2.8)**. These time restrictions would apply, for any drill holes located within Big Game Production Areas, Big Game Winter Range, Big Game Critical/Severe Winter Range for elk and deer, and potential Mexican spotted owl breeding and nesting habitat.

#### 4.2.1.16 Air Quality and Climate Change

Greenhouse gas emissions were calculated using a factor of 1.16 lb./hp-hr (EPA table 3.2-1 $CO_2$ emissions, AP-42). The proposed drill rig is rated at 760 horsepower (hp). Each drill hole is estimated to take approximately 75 days to drill and plug (760hp * 1800hrs * 1.16)/2000 = 800 tons of $CO_2$ generated by the drill rig for each core hole drilled). Three passenger/support vehicles (pickup trucks) would need to drive to the drill site from Dove Creek each day in 2 shifts for a total of 6 vehicle trips per day. Each vehicle is assumed to burn 5 gallons of gasoline for each trip. This yields a total of 30 gallons of gasoline consumed each day. Each hole would take approximately 75 days to drill and abandon. Combustion of a gallon of gasoline creates 19.8 lbs of $CO_2$ (http://www.epa.gov/cleanenergy/energy-resources/calculator.html). So (30 gallons * 75 days *19.8lbs/gallon)/2000 = 22.3 tons of $CO_2$ released for each drill hole for travel to

and from the drill sites. This is approximately 3 percent the amount of fuel consumed by the drill rig. Other service vehicles, water trucks, bulldozers/excavators for site preparation, etc., would consume a similarly small proportion of gasoline or diesel as compared to the drill rig. Only negligible amounts of methane or $CO_2$ are expected to be released from underground due to the drilling methods, blowout protection, and abandonment methods to be employed. The total amount of $CO_2$ released from this Project as compared to the amount released nationally from all fossil fuels consumption is negligible, and the effect the release of this amount would have is poorly constrained.

#### 4.2.1.17 Mitigation, Monitoring, and/or Compliance

No mitigation or monitoring needs have been identified for this action, other than inspection and enforcement by BLM staff to ensure that the EPMs (**Section 2.2.8**) and any items adopted as conditions of approval described in the Proposed Action are followed. The EPMs described in the Proposed Action would be sufficient because they would avoid and/or minimize potential effects to a negligible level. BLM would monitor sites after drilling to ensure that reclamation is successful. No other recommended mitigation measures resulted from evaluation of the environmental consequences of the Proposed Action.

#### 4.2.1.18 Residual Effects

There would be no adverse residual effects as a result of the Proposed Action.

### 4.2.2 Alternative B – No Action

Under the No Action Alternative, the proposal would be rejected; the BLM would not authorize exploration drilling. None of the previously described environmental consequences associated with the proposed activity would occur. The current land uses such as grazing, oil and gas exploration/development, uranium exploration, recreation, rural residential development, and agriculture would continue. Oil and gas development would continue to drill exploration and production wells. Uranium leases under the jurisdiction of the Department of Energy would continue to be enjoined until the PEIS is completed and a ROD describing approved activities is published. Effects to soils, vegetation, wildlife species (including special status species), cultural resources, livestock grazing, and water would continue to be subject to the existing conditions and trends associated with existing land uses.

Selection of the No Action Alternative would likely prompt the Proponent to find other locations for potash exploration or to abandon the exploration Project altogether.

The No Action Alternative would limit the data gathering and resource analysis that could lead to development of potash resources in the Paradox Basin. The potential to define commercial quantities of potash resources that would occur as a result of the Proposed Action would be deferred or foregone under the No Action Alternative.

## 4.3 Cumulative Effects Analysis

"Cumulative effects" are those effects resulting from the incremental effect of an action when added to other past, present, or reasonably foreseeable actions regardless of what agency or person undertakes such other actions. Cumulative effects could only occur for those resources that are 1) affected by the Proposed Action and 2) affected by other actions whose effects occur within the same area and timeframe.

### 4.3.1 Cumulative Effects Areas

The resources analyzed in **Chapter 4** that have the potential to be adversely impacted by the Proposed Action include migratory birds; soils; threatened, endangered, candidate or special status animal species; water resources/quality (drinking/surface/ground); vegetation; and wildlife resources. The cumulative effects area (CEA) is typically a resource-based area. For this EA, CEAs are defined as follows:

The CEA for migratory birds; threatened, endangered, candidate or special status animal species; and wildlife is defined as 15 miles in all directions generally surrounding the Proposed Action.

The CEA for soils, vegetation, and for water resources/quality (drinking/surface/ground) is defined as the two HUC 8 watersheds that cover all of the proposed drill holes and access roads. Drill Sites 1-5 occur within the HUC 8 - Upper Dolores watershed (HUC 14030002) and encompass approximately 1,394,078 acres. Drill Site 6 occurs within the HUC 8 - Montezuma watershed (HUC 14030002) and encompasses approximately 749,772 acres.

The purpose of this cumulative effects analysis is to describe the interaction among the effects of the Proposed Action and the various past, present, and reasonable foreseeable future actions.

### 4.3.2 Past and Present Actions

The portion of Dolores and San Miguel counties where the Project Area is located is very rural and undeveloped or under agricultural use. Past or ongoing actions that affect the same components of the environment as the Proposed Action are:

- **Livestock Grazing.** Currently and historically, livestock grazing has been a primary land use on public lands in the Project Area.
- **Recreation including Camping, All-Terrain Vehicle (ATV) Use, and Hunting.** Though dispersed, these past and present activities use the existing roads and travel ways, as well as off-road travel.
- **Oil and Gas Exploration.** Oil and gas leases, units, and drilling permit applications are present in the Project Area (**Figure 5**) and are currently held by Bill Barrett Corporation. In addition, there are existing gas wells operated by Patara. Some of these wells are producing while others are plugged and abandoned.

- **Uranium Exploration and Mining.** The Project Area is part of the Uravan Belt, an area that was heavily explored and mined for uranium and vanadium from the 1940's through the 1980's with some exploration and mining activity continuing to the present day. There are inactive DOE lease tracts and DOE lease tracts under review in the Project Area (**Figure 5**).
- **Private Land Actions.** There has been some development of private lands in the CEAs. Rural residences, associated infrastructure, and roads have been constructed. According to US Census Bureau data (2011), few building permits have been issued recently.
- **Habitat Improvement.** Various beneficial big game winter range habitat improvement projects have modified habitat within the Project Area.

### 4.3.3 Reasonably Foreseeable Action Scenario (RFAS)

BLM provides a list of proposed actions by posting Project information on the TRFO NEPA Register. RFAS include potential activities on public and private lands within the CIAs. The following list of RFAS identifies reasonably foreseeable future actions that would cumulatively affect the same resources in the cumulative impact areas as the Proposed Action.

- **Livestock Grazing.** Livestock grazing would continue to occur on public and private lands. BLM would continue to preclude or mitigate potential effects to grazing allotments through analysis of allotments, such as the Lower Disappointment Grazing Allotment Analysis.
- **Recreation including Camping, All-Terrain Vehicle (ATV) Use, and Hunting.** Dispersed recreation activities would continue and likely increase as nearby populations increase.
- **Continued Oil and Gas Exploration and Development.** It is reasonable to assume that Bill Barrett Corporation and/or other companies would continue to build upon its oil and gas exploration program by either performing additional evaluations on previously drilled holes and by drilling new holes within their lease areas and/or acquiring 2D or 3D seismic data. In general, direct effects from these projects would be similar to those already predicted for the planned Project. These activities could result in additional gas wells. Additional NEPA analyses would be required and could include mitigation measures to reduce projected effects. A Supplemental Draft EIS for a RMP Amendment for oil and gas development in the Gothic Shale member of the Paradox formation is currently in progress. If approved, and it is foreseeable that there could be dozens or hundreds of wells drilled for gas in the same area as is proposed for potash development, as well as in areas outside the area currently proposed for potash development. Thus, continued oil and gas development could potentially constrain the location and or timing of potash resource development, or vice versa.

- **Continued Potash Exploration.** It is reasonable to assume that RM Potash and/or other companies would continue to build upon its potash exploration program by either performing other evaluations on holes that are currently planned to be drilled, by drilling other holes within the respective prospecting permit application areas, or by exploring the surrounding prospecting permit application areas wherein no drilling is currently permitted. In general, direct effects from these projects would be similar to those already predicted for the Proposed Action. Additional NEPA analyses would be required and could include mitigation measures to reduce projected effects. It is estimated that up to a total of 20 or so core holes could be needed to prove up the potash deposit presently covered by prospecting permit applications to the point where a mine plan could be designed. Disturbance associated with each permit and associated drill hole could reasonably be expected to be similar to those analyzed for the six permits under consideration for this project. Additional geophysical prospecting methods, such as seismic may also be needed.
- **Potash Development.** It is possible that the above-mentioned exploration activities would result in a full-scale potash production. Such a development would entail facility construction, operation, and maintenance activities, including new or upgraded roads, power lines, and pipelines. Water consumption and visual changes are among the types of effects that might occur. It is possible that potash development could affect hydrocarbon recovery positively or negatively. Results of exploration would be needed to generate a proposed action for potash development, and without them, potential potash development scenarios would be speculative. A project-specific NEPA analysis would be required prior to any leasing or development of the potash resource, and mitigation may be required to reduce effects.
- **Uranium/Vanadium Mining and Exploration.** Uranium mining claims and uranium lease tracts occur within the area. It is likely that exploration activities would continue intermittently in the area. It is possible in the future that some of these claims or lease tracts may progress to active mining activity at some time in the future at the same time as potash development is taking place. It is extremely unlikely that all of these claims and lease tracts would be developed, let alone developed at the same time. Increased uranium/vanadium exploration and mining would be more likely if a proposed uranium mill in Paradox Valley, about 50 miles to the north, is ever constructed.
- **Habitat Improvement.** Additional various beneficial big game winter range habitat improvement projects would continue to modify habitat within the Project Area.
- **Private Land Actions.** There are private lands in the CIAs which could be modified or developed. At this time, neither Dolores County nor San Miguel County officials are in receipt of any sizeable development proposals on private lands.

### 4.3.4 Cumulative Effects

**Migratory Birds**

Cumulative effects to migratory birds would be possible if substantial uranium, oil and gas, potash or other development activity were approved and ongoing concurrently in the area. This could lead to substantial direct and indirect habitat losses for these species that would be long term.

**Soils**

At least some of the other past, present, and reasonably foreseeable future actions (such as livestock grazing, ATV use, uranium mining, oil and gas exploration, and gas development) have the potential to cause soil erosion. However, with planned and successful BMPs, cumulative effects should be reduced.

**Threatened, Endangered, Candidate or Special Status Animal Species**

Only the Mexican spotted-owl has the potential to be within the Project Area, and with the timing stipulations put in place, there would be no cumulative effects to these species. Cumulative effects to BLM sensitive species, especially the Gunnison sage-grouse, would be possible if substantial additional uranium, oil and gas, potash or other development activity were approved and ongoing concurrently in the area. This could lead to direct and indirect habitat losses for these species that would be long term.

**Water Resources/Quality (drinking/surface/ground)**

Some of the other past, present, and reasonably foreseeable future actions (such as irrigation, recreational use, mineral development, and population growth) have the potential to affect surface water supplies and quality, as well as groundwater supplies and quantities. However, with prudent development and well-instituted BMPs, cumulative effects should be minimal.

**Vegetation**

If uncontrolled, noxious and non-native, invasive plant species could continue their spread and establishment in the area. Projects under federal oversight would be required to monitor and treat any project-related occurrences/spread of invasive plant species.

**Wildlife**

Cumulative effects to non-listed wildlife, especially big game species such as mule deer and elk, would be possible if substantial uranium, oil and gas, potash or other development activity were approved and ongoing concurrently in the area.

**Summary**

Cumulative effects from the project would be negligible and minor when added to the potential effects of all past, present and reasonably foreseeable actions. The effects would include a maximum of 18.8 acres of disturbance. Mechanized/drilling activities would last less than 1 year, and reclamation vegetation would be established in three to four years, though it may take decades for some species of shrubs and trees to grow to maturity.

# 5.0 CONSULTATION AND COORDINATION

## 5.1 Introduction

The issue identification section of **Chapter 1** identifies those issues analyzed in detail in **Chapter 4**. The issues were identified through the public and agency involvement process described in **Sections 5.2** and **5.3** below.

## 5.2 Persons, Groups, and Agencies Consulted

**Table 5-1 List of all Persons, Agencies and Organizations Consulted**

| Name | Purpose & Authorities for Consultation or Coordination | Findings & Conclusions |
|---|---|---|
| U.S. Fish & Wildlife Service (USFWS) | Information on Consultation, under Section 7 of the Endangered Species Act (16 USC 1531) | Provided an email response for direction on obtaining a federally protected species list for counties within the Project Area. |
| Colorado State Office of Archaeology and Historic Preservation (OAHP) | Consultation for undertakings, as required by the National Historic Preservation Act (NHPA) (16 USC 470) | Concurrence was received on the cultural resources report. |
| Native American Indian Tribes | Consultation as required by the American Indian Religious Freedom Act o f 1978 (42 USC 1531) and NHPA (16 USC 1531) | No responses have been received to date. |
| Division of Reclamation, Mining, and Safety | Exploration Plan Approval and Reclamation Bonding | Provided review of Exploration Plan and Reclamation Bond Estimate |

## 5.3 Summary of Public Participation

A Notice of Scoping was posted on the BLM Newsroom web page on June 28, 2011. In addition, a public scoping letter was mailed to 74 addresses on June 24, 2011. The scoping mailing list is provided in the RM Potash Exploration Project Scoping Report (BLM 2011a). A public scoping meeting was held at the Dove Creek High School Commons in Dove Creek, Colorado on July 12, 2011. During the scoping meeting, 16 people registered their attendance. Written scoping comments were accepted via mail, e-mail, the website, and fax resulting in a total of 15 scoping responders. Resource issues for the Proposed Action were identified through public and internal scoping.

## 5.4 List of Preparers

The following two tables list the BLM and non-BLM preparers of the EA.

**Table 5-2 Tres Rios Field Office Personnel**

| Name | Title |
|---|---|
| James Blair | Geologist, Project Manager |
| Connie Clementson | Field Office Manager |
| Deborah Kill | NEPA Coordinator |
| Pam Leschak | Petroleum Geologist |
| Ivan Messinger | Wildlife Biologist |
| John Pecor | Petroleum Engineer |
| Joni Vanderbilt | Hydrologist |
| Cara MacMillan | Ecology/Plants |
| Mike Jensen | Range and Weeds |
| Tina Transtrom Kincaid | NEPA Coordinator |
| Amy Wise | Archaeologist |

**Table 5-3 Non-BLM Preparers**

| Name | Title | Responsible for the Following Section(s) of this Document |
|---|---|---|
| Greg Brown | JBR Project Manager, Biologist | Project Management, Overall Quality Assurance |
| Jon Schulman | JBR Hydrologist | Water Resources |
| Connie Pixton | JBR GIS Specialist | GIS, Maps, Acreages |
| Jenni Prince-Mahoney | JBR Senior NEPA Specialist, Archaeologist | Cultural Resources, Geology & Minerals, Land Use & Realty, Noise, Range Mgmt., Recreation, Socio, Soils, Transportation, Waste, Cumulative Effects |
| Eric Holt | JBR Wildlife Biologist | Wildlife Resources, Vegetation, TEC & Special Status Species, Migratory Birds |
| Ron Rood | JBR Archaeologist | Cultural Resources |
| Seth Topham | JBR Biologist | GIS, Wildlife Resources |
| Jon Thorson, RM Potash | Geologist, Proponent Project Manager | Proposed Action/Project details |

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## 6.2 List of Acronyms Used in this EA

| | |
|---|---|
| **AADT** | Annual Average Daily Traffic |
| **APD** | Application for Permit to Drill |
| **ATV** | All Terrain Vehicle |
| **AUM** | Animal Unit Month |
| **BBC** | Bill Barrett Corporation |
| **BGS** | Below Ground Surface |
| **BLM** | Bureau of Land Management |
| **BMPs** | Best Management Practices |
| **CEQ** | Council on Environmental Quality |
| **CFR** | Code of Federal Regulations |
| **CIA** | Cumulative Impact Area |
| **DCMP** | Dolores County Master Plan |
| **DEIS** | Draft Environmental Effects Statement |
| **DOE** | Department of Energy |
| **DR** | Decision Record |
| **EA** | Environmental Assessment |
| **EIS** | Environmental Impact Statement |
| **ESA** | Endangered Species Act |
| **FLPMA** | Federal Land Policy and Management Act |
| **FONSI** | Finding of No Significant Impact |
| **FSM** | Forest Service Manual |
| **GPD** | Gallons Per Day |
| **GPM** | Gallons Per Minute |
| **IDT** | Interdisciplinary Team |
| **JBR** | JBR Environmental Consultants, Inc. |
| **KCl** | Sylvite |
| **KMgCL3 6H20** | Carnalite |
| **MBTA** | Migratory Bird Treaty Act |
| **NHPA** | National Historical Preservation Act |
| **MLA** | Mineral Leasing Act |
| **NEPA** | National Environmental Policy Act |
| **NORMs** | Naturally Occurring Radioactive Materials |
| **NPDES** | National Pollutant Discharge Elimination System |
| **NRHP** | National Register of Historic Places |
| **NSO** | No Surface Occupancy |
| **RFAS** | Reasonably Foreseeable Action Scenarios |
| **RMP** | Resource Management Plan |
| **ROD** | Record of Decision |
| **ROW** | Right of Way |
| **SOPA** | Schedule of Proposed Actions |

| | |
|---|---|
| **SPCC** | Spill Prevention, Control, and Countermeasure |
| **SWPPP** | Stormwater Pollution Prevention Plan |
| **TEC** | Threatened, Endangered, and Candidate |
| **TRFO** | Tres Rios Field Office |
| **USC** | United States Code |
| **USDI** | U.S. Department of the Interior |
| **USFWS** | U.S. Fish and Wildlife Service |
| **USFS** | U.S. Forest Service |
| **USGS** | U.S. Geological Survey |
| **WRCC** | Western Regional Climate Center |
| **4WD** | Four-Wheel Drive |

## 6.3 Glossary

**Adverse Effect**: An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register of Historic Places in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

**Affected Environment**: A physical, biological, social, and economic environment within which human activity is proposed. The natural, physical and human-related environment that is sensitive to changes from the alternatives.

**Air Quality**: Refers to standards for various classes of land as designated by the Clean Air Act (PL 88-206: Jan. 1978.).

**Allotment**: A unit of public (and sometimes including private) land suitable and available for livestock grazing that is managed as one grazing unit.

**Alternatives**: A choice of two or more things. For NEPA purposes, alternatives to the Proposed Action must be examined in the planning process. The discussion of alternatives must define the issues and provide a clear basis for choice by the decision maker and the public (40 CFR 1502.14).

**Animal Unit Month**: Amount of forage required by a cow/calf pair (or five sheep or one horse) for 1 month.

**Applicant Committed Environmental Protection Measures**: Measures that are part of the proposed project and would be implemented by the Proponent to avoid or minimize effects to resources.

**Application**: A formal, written request.

**Aquifer**: A body of rock that is sufficiently permeable to conduct groundwater and to yield economically significant quantities of water to wells and springs.

**Bedrock**: Any solid rock exposed at the surface or overlain by unconsolidated material.

**Best Management Practices (BMPs)**: Methods, measures or practices to prevent or reduce water pollution including, but not limited to, structural and non-structural controls, operation and maintenance procedures, other requirements, scheduling and distribution of activities. Usually, BMPs are selected on the basis of site-specific conditions that reflect natural background conditions and political, economic, and technical feasibility.

**Big Game**: Those species of large mammals normally managed as a sport hunting resource. Generally includes; elk, moose, white-tailed deer, mule deer, mountain goat, bighorn sheep, black bear & mountain lion.

**BLM special-status species**: Species designated as federally endangered, threatened, proposed, or candidate under the ESA, those designated by the Colorado Division of Wildlife as state endangered or threatened, and BLM Sensitive Species which are species under status review by the USFWS, species with numbers declining so rapidly that federal listing may become necessary, species with typically small and widely dispersed populations, or species inhabiting ecological refugia or other specialized or unique habitats.

**Blowout**: An uncontrolled flow of gas, oil, or other well fluids into the atmosphere or into an underground formation. A blowout, or gusher, can occur when formation pressure exceeds the pressure applied to it by the column of drilling fluid.

**Clean Water Act, as amended in 1977**: Legislation enacted by the U.S. Congress in 1977 to maintain and restore the chemical, physical, and biological integrity of the waters of the United States. This act was formerly known as the Federal Water Pollution Control Act (33 USC 1344).

**Critical Habitat**: An area occupied by a threatened or endangered species "on which are found those physical and biological features: 1) essential to the conservation of the species, and 2) which may require special management considerations or protection."

**Crucial Winter Range**: That part of the overall range where 90 percent of the individuals are located during the average five winters out of ten from the first heavy snowfall to spring green-up, or during a site-specific period of winter as defined for each Colorado Division of Wildlife Data analysis unit.

**Cultural Resource**: Any prehistoric site, as well as historic site, which is more than 50 years old. The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs, etc.) having scientific, prehistoric, or social values.

**Cumulative Impact**: Impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

**Cumulative Effects Area**: The cumulative effects area is the geographic area that may be affected by the project's contribution to cumulative effects on a particular resource. The project study area for cumulative effects analysis generally will be larger than what is traditionally defined as the area under study for direct effects. It is generally not necessary to conduct the same level of detailed analysis throughout the entire cumulative effects study area as is done for the direct effects study area.

**Direct Effects (Direct Effects)**: Effects that are caused by the action and occur at the same time and place.

**Dispersed Recreation**: Outdoor recreation in which visitors are diffused over relatively large areas. Where facilities or developments are provided, they are more for access and protection of the environment than for the comfort or convenience of the people.

**Discharge**: The volume of water flowing past a point per unit time, commonly expressed as cubic feet per second, gallons per minute, or million gallons per day.

**Disturbance**: A discrete event, either natural or human-induced, that causes a change in the existing condition of an ecosystem.

**Disturbed Area**: An area where natural vegetation has been removed.

**Drainage**: The natural channel through which water flows some time of the year; natural and artificial means for affecting discharge of water as by a system of surface and subsurface passages

**Drawdown**: The lowering of the water level in a well as a result of withdrawal; the reduction in groundwater level at a point caused by the withdrawal of water from an aquifer.

**Drilling Mud**: A specially compounded liquid circulated through the wellbore during rotary drilling operations. In addition to its function of bringing cuttings to the surface, drilling mud cools and lubricates the bit and drill stem, protects against blowouts by holding back subsurface pressures, and deposits a mud cake on the wall of the borehole to prevent loss of fluids to the formation.

**Effects**: "Effect" and "impact" are synonymous as used in this document. Environmental consequences (the scientific and analytical basis for comparison of alternatives). Effects may be either direct, which are caused by the action and occur at the same time and place, or indirect, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable, or cumulative.

**Endangered Species**: Any species in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act.

**Environment**: The physical conditions that exist within the area that will be affected by a proposed project, including land, water, minerals, flora, fauna, and objects of historical or aesthetic significance. The area involved is the area in which significant effects would occur either directly or indirectly as a result of the project. The "environment" includes both natural and human-made conditions.

**Environmental Analysis**: An analysis of alternative actions and their predictable environmental effects, including physical, biological, economic, and social consequences and their interactions; short- and long-term effects; direct, indirect, and cumulative effects.

**Erosion**: The wearing away of soil and rock by weathering, mass wasting, and the action of streams, glaciers, waves, wind, and groundwater.

**Exploration Plan**: Detailed plan to search for oil and gas, or other minerals, including aerial and geophysical surveys, geological studies, core testing, and core drilling.

**Fugitive Dust**: Dust particles suspended randomly in the air from various sources including road travel, excavation, and rock loading operations.

**Geochemistry**: The study of the distribution and amounts of the chemical elements in minerals, ores, rocks, soils, water, and the atmosphere, and their circulation in nature on the basis of the properties of their atoms and ions.

**Ground Cover**: The percentage of biotic and abiotic material (other than bare soil) covering the ground surface including litter, mosses, lichens, vegetation basal area, and rock fragments. Ground cover plus bare soil equals 100 percent.

**Groundwater Table**: The surface between the zone of saturation and the zone of aeration; that surface of a body of unconfined groundwater at which the pressure is equal to that of the atmosphere.

**Growth Media**: Natural soils or soil-like materials that are capable of sustaining plant growth when placed in a layer over disturbed land surfaces.

**Habitat**: A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.

**Hazardous Materials**: CERCLA term identifying those substances designated pursuant to section 1321(b)(2)(A) of Title 33, or 42 USC 9602, or listed in 40 CFR 302 or 355.

**Hazardous Materials Release**: Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles containing any hazardous substance or pollutant or contaminant).

**Hazardous Waste**: Refers to a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may pose a substantial threat to human health and the environment.

**Impact**: A modification in the status of the environment brought about by the proposed action or an alternative.

**Indirect Impact**: Effects that are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable (40 Code of Federal Regulations 1508.8); synonymous with indirect effects.
**Lease**: A temporary property right that authorizes public lands for developing deposits of coal, petroleum, natural gas and other hydrocarbons, in addition to phosphates, sodium, sulphur, and potassium.

**Mineral**: Any naturally formed inorganic material, solid or fluid inorganic substance that can be extracted from the earth, any of various naturally occurring homogeneous substances (as stone, coal, salt, sulfur, sand, petroleum, water, or natural gas) obtained for man's use, usually from the ground. Under federal laws, considered as locatable (subject to the general mining laws), leasable (subject to the Mineral Leasing Act of 1920), and salable (subject to the Materials Act of 1947).

**Mitigate, Mitigation**: To cause to become less severe or harmful; actions to avoid, minimize, rectify, reduce or eliminate, and compensate for effects to environmental resources.

**Mitigation Measure**: Actions taken to reduce or eliminate effects (effects) from management actions, including: 1) avoiding the impact altogether by not taking certain action or parts of an action; 2) minimizing effects by limiting the degree or magnitude of the action and its implementation; 3) rectifying the effects by repairing, rehabilitating or restoring the affected environment; 4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and 5) compensating for the impact by replacing or providing substitute resources or environments (40 CFR 1508.20).

**Monitor**: To systematically and repeatedly watch, observe, or measure environmental conditions in order to track changes.

**National Environmental Policy Act**: The National Environmental Policy Act (NEPA) of 1969 established the national policy charter for protecting the environment. NEPA established the Council on Environmental Quality (CEQ), and provides the process for the preparation of an environmental analysis (EA) or an environmental impact statement (EIS). The CEQ regulations in 40 CFR 1500-1508 implement NEPA and provide rules for the preparation of EAs and EISs.

**National Historic Preservation Act of 1966, as amended**: Act directing federal agencies to consider the effects of their programs and projects on properties listed on or eligible for the National Register of Historic Places. If a proposed action might impact any archaeological, historical, or architectural resource, this act mandates consultation with the proper agencies.

**National Pollution Discharge Elimination System**: A part of the Clean Water Act that requires point source dischargers to obtain permits. These permits are referred to as National Pollution Discharge Elimination System permits and are administered by the U.S. Environmental Protection Agency.

**National Register of Historic Places**: A register maintained by the National Park Service that lists districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, engineering and culture that meet criteria set forth in 36 Code of Federal Regulations 60.

**Noxious Weeds**: Plants designated as noxious by the Secretary of Agriculture or by the responsible state official. They are usually an invasive species. They generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of serious insects or disease, non-native, new, or not common to the United States. According to the Federal Noxious Weed Act (PL 93-639), a noxious weed is one that causes disease or has other adverse effects on people or their environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.

**Potash**: Various mined and manufactured salts that contain potassium in water-soluble form. Potash is used primarily as an agricultural fertilizer (plant nutrient) because it is a source of soluble potassium.

**Prospect Permit**: Permit to explore for leasable mineral deposits on lands where BLM has determined that prospecting is needed to determine the existence of a valuable deposit.

**Reclamation**: The recontouring and revegetation of a site after exploration activity is completed.

**Reclamation**: Returning disturbed land to a form and productivity that will be ecologically balanced and in conformity with a predetermined land management plan.

**Revegetation**: The reestablishment and development of a plant cover. This may take place naturally through the reproductive processes of the existing flora, or artificially through the direct action of reforestation or reseeding.

**Runoff**: That part of precipitation that appears in surface streams; precipitation that is not retained on the site where it falls and is not absorbed by the soil.

**Special-Status Species**: Refers to federally listed threatened or endangered species, federal candidate species, species recognized as requiring special protection by State agencies, and species managed as sensitive species by the USFS and/or by the BLM.

**Species**: A group of individuals of common ancestry that closely resemble each other structurally and physiologically, and in nature interbreed producing fertile offspring.

**Summer Range**: A range, usually at higher elevation, used by deer and elk during the summer; a summer range is usually much more extensive than a winter range.

**Threatened Species**: Any species of plant or animal that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as threatened in accordance with the 1973 Endangered Species Act.

**Visual Resource**: The composite of basic terrain, geologic features, water features, vegetation patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for viewers.

**Visual Resource Management Classes**: A classification of landscapes according to the kinds of structures and changes that are acceptable to meet established visual goals (BLM).

**Water Quality**: The biological, physical, and chemical properties of water that make it suitable for specific uses.

**Watershed**: The entire land area that contributes water to a particular drainage system or stream.

**Water Table**: The level in the saturated zone at which the pressure is equal to the atmospheric pressure.

**Winter Range**: A range, usually at lower elevation, used by migratory deer and elk during the winter months; usually better defined and smaller than summer ranges.

# Appendix A

## Interdisciplinary Team Checklist

# INTERDISCIPLINARY TEAM CHECKLIST

**Project Title**: RM Potash Exploration Project

**NEPA Log Number**: DOI-BLM-CO-S010-2009-0076

**File/Serial Number**: COC73567. Et al

**Project Leader**: James Blair

**DETERMINATION OF STAFF:** ***(Choose one of the following abbreviated options for the left column)***

NP = not present in the area impacted by the proposed or alternative actions
NI = present, but not affected to a degree that detailed analysis is required
PI = present with potential for relevant impact that need to be analyzed in detail in the EA
NC = (DNAs only) actions and impacts not changed from those disclosed in the existing NEPA documents cited in Section D of the DNA form. The Rationale column may include NI and NP discussions.

| Determi-nation | Resource | Rationale for Determination* | Signature | Date |
|---|---|---|---|---|
| **RESOURCES AND ISSUES CONSIDERED (INCLUDES SUPPLEMENTAL AUTHORITIES APPENDIX 1 H-1790-1)** | | | | |
| NI | Air Quality | Mitigation & design features would prevent substantial impacts | James J. Blair | 7/23/12 |
| NP | Areas of Critical Environmental Concern | There are no ACECs present | James J. Blair | 7/23/12 |
| NP | BLM Natural Areas** | NP | [illegible] | 7/30/12 |
| NI | Cultural Resources | No Historic Resources will be impacted | James Blair (FOR ANY WISE) | 7/19/12 |
| NI ~~NP~~ | Greenhouse Gas Emissions** | Calculated in EA | James J. Blair | 7/23/12 |
| NI | Environmental Justice | VERY FEW INHABITANT. EFFECT WOULD BE NEGLIGABLE. SEE CALCULATIONS IN EA | James J. Blair | 7/23/12 |
| NP | Farmlands (Prime or Unique) | | James J. Blair | 7/23 |
| PI | Fish and Wildlife Excluding USFW Designated Species | Gunnison Sage Grouse May affect | Ivan Merz | 7/31/12 |
| NP | Floodplains | Site inspection indicates no floodplains | [illegible] | 7/23/12 |
| NI | Fuels/Fire Management | Mitigation measures in EA | James Blair | 7/23/12 |
| ~~NP~~ PI | Geology / Mineral Resources/Energy Production | Mitigation & design features would prevent impacts | James J Blair | 7/23/12 |
| NI | Hydrologic Conditions** | Mitigation and design features would prevent any impacts. | [illegible] | 7/23/12 |
| NI | Invasive Species/Noxious Weeds | Mitigation measures for Noxious Weeds in EA. | [illegible] | 7/25/12 |
| NI | Lands/Access | No substantive issues | H. [illegible] | 7/23/12 |
| NI | Livestock Grazing | Mitigation measures included in document. | [illegible] | 7/26/12 |

| Determi-nation | Resource | Rationale for Determination* | Signature | Date |
|---|---|---|---|---|
| PI | Migratory Birds. | addressed MBTA compliance and migratory bird mitigation. | [signature] | 7/31/12 |
| NI | Native American Religious Concerns | RELIGIOUS CONCERNS MAY BE PRESENT ANWHERE HOWEVER, NO SPECIFIC CONCERNS ID'D IN Proposed ACTION AREA | James B[signature] FOR JULIE BELL | 9/25/12 |
| NP/NI | Paleontology | No paleo resources found in surveys. If resources uncovered, BLM will be notified | James B[signature] | 7/23/12 |
| NI | Rangeland Health Standards | Activity will not have significant impact to RHS. | [signature] | 7/26/12 |
| NI | Recreation | Mitigation measures will minimize effects | James B[signature] | 7/23/12 |
| NI | Socio-Economics | ~~Mitigation measures will minimize~~ UAD No large scale effects from exploration-level activity | James B[signature] | 7/23/12 |
| NI | Soils | Mitigation and design features would prevent any impacts. | [signature] | 7/23/12 |
| NI | Threatened, Endangered or Candidate Plant Species | Mitigation measures in EA. | [signature] | 7/30/12 |
| PI | Threatened, Endangered or Candidate Animal Species | Mexican Spotted owl has a may affect not likely to adversely effect | [signature] | 7/31/12 |
| NI | Wastes (hazardous or solid) | Mitigation & design features would prevent impacts | James J. B[signature] | 7/23/12 |
| NI | Water Resources/Quality (drinking/surface/ground) | Mitigation and design features would prevent any impacts. | [signature] | 7/23/12 |
| NP | Wetlands/Riparian Zones | Site inspection indicates no wetlands/riparian | [signature] | 7/23/12 |
| NP | Wild and Scenic Rivers | ~~James J. B[signature]~~ Not present | James B[signature] | 7/23/12 |
| NP | Wilderness/WSA | Not present. confirmed | James J. B[signature] | 7/23/12 |
| NP | Woodland / Forestry | No timber resources. | [signature] | 7/23/12 |
| NI | Vegetation Excluding USFW Designated Species | mitigation measured in EA. | [signature] | 7/30/12 |
| NI | Visual Resources | Not visible from canyon Bottom @ effect from rim | James B[signature] | 7/23/12 |
| NP | Wild Horses and Burros | NONE Present | James B[signature] | 7/23/12 |
| NI | Areas with Wilderness Characteristics** | Canyon is citizen proposed wilderness, but coreholes will not affect long term ability to be considered & are outside proposed wilderness | James J. B[signature] | 7/23/12 |

**FINAL REVIEW:**

| Reviewer Title | Signature | Date | Comments |
|---|---|---|---|
| Environmental Coordinator | /S/Tina Kiukaid | 8/8/12 | J. Blair for T.K. via verbal confirmation (JJB) |
| Authorized Officer | [illegible] | 8.16.12 | design features are used as part of. |

note) the proposed action
Mitigation req'd
as a result of
effects analysis

# Appendix B

# Photos of Drill Sites

**Drill Site 1 – Stake with Pink Flagging Marks Drill Site**

**Drill Site 2 – Stake with Pink Flagging Marks Drill Site**

**Drill Site 3 – Stake with Pink Flagging Marks Drill Site**

**Drill Site 4 – Stake with Pink Flagging Marks Drill Site**

**Drill Site 5 – Stake with Pink Flagging Marks Drill Site**

**Drill Site 6 – Stake with Pink Flagging Marks Drill Site**

# Appendix C

# Noxious Weed Management Plan

# RM POTASH EXPLORATION PROJECT
# NOXIOUS WEED MANAGEMENT PLAN

## 1.0 Introduction

RM Potash has submitted six prospecting permit applications and an associated exploration plan for up to six drill holes to the Bureau of Land Management (BLM), Tres Rios Field Office. The project area is located northwest of Dove Creek, Colorado. This Noxious Weed Management Plan is being developed in order to help control noxious weed species from becoming established in areas disturbed by this project.

Noxious weeds within Colorado are defined in the Colorado Noxious Weed Act, §§ 35-5.5-101 through 119, C.R.S. (CDOA 2003). A noxious weed is any species of plant which is, or is likely to be, detrimental or destructive and difficult to control or eradicate. The following laws, regulations, policies, and agreements apply to the management of noxious weeds:

- BLM Manuals 9011, 9014, and 9015;
- BLM 1991 Environmental Impact Statement, Vegetation Treatment on BLM Lands in Thirteen Western States;
- Executive Order 13112, Invasive Species;
- Federal Noxious and Invasive Weed Laws; and
- Colorado Noxious Weed Act, §§ 35-5.5-101 through 119, C.R.S.

The Colorado Department of Agriculture maintains a list of noxious weeds in the state. There are 71 species on the Colorado noxious and non-native invasive weed list (CDOA 2011). These species are classified into one of three categories.

**List A species**
List A weed species in Colorado that are designated by the Commissioner for eradication.

**List B species**
List B weed species are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, develops and implements state noxious weed management plans designed to stop the continued spread of these species.

**List C species**
List C weed species are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, will develop and implement state noxious weed management plans designed to support the efforts of local governing bodies to facilitate more effective integrated weed

management on private and public lands. The goal of such plans will not be to stop the continued spread of these species but to provide additional education, research, and biological control resources to jurisdictions that choose to require management of List C species.

## 2.0 Noxious Weed Management Plan

In order to minimize the establishment of noxious weeds within the project area, RM Potash would use the following environmental protection measures for their project:

**Noxious Weed Control**

- Noxious weed infestation would be reported to the BLM upon discovery. The extent of the infestation would be documented on a map;

- RM Potash would treat any noxious weed infestations with BLM-approved herbicides. Application would be coordinated with the BLM and Pesticide Application Records would be turned into the BLM after every application.

**Equipment and Vehicles**

- RM Potash would restrict vehicle traffic to existing roads and the authorized ROW to reduce potential mechanical transport of noxious weed seeds; and

- RM Potash would wash all vehicles that are within areas of established noxious weed populations prior to leaving the site.

**Reclamation**

- RM Potash would reclaim and seed surface disturbance with a seed mix composed of quick-growing species to provide a quick vegetative cover;

- Equipment would be cleaned of all mud, plant parts, and seed prior to entering BLM lands.

- The seed mix would be certified pure live seed and weed free; and

- Reclaimed areas would be monitored to ensure successful vegetative growth efforts and to deter noxious weed establishment.

## 3.0 References

Colorado Department of Agriculture (CDOA). 2011. Colorado Noxious Weed List. Available online at http://www.colorado.gov/cs/Satellite/Agriculture-Main/CDAG/1174084048733. Accessed October 24, 2011.

# Appendix D

# COGCC Rules 900 Series and Joint Agency Guidelines for Uranium Exploration Drilling Reclamation

## E&P WASTE MANAGEMENT

### 901. INTRODUCTION

a. **General.** The rules and regulations of this series establish the permitting, construction, operating and closure requirements for pits, methods of E&P waste management, procedures for spill/release response and reporting, and sampling and analysis for remediation activities. The 900 Series rules are applicable only to E&P waste, as defined in § 34-60-103(4.5), C.R.S., or other solid waste where the Colorado Department Of Public Health And Environment has allowed remediation and oversight by the Commission.

b. **COGCC reporting forms.** The reporting required by the rules and regulations of this series shall be made on forms provided by the Director. Alternate forms may be used where equivalent information is supplied and the format has been approved by the Director.

c. **Additional requirements.** Whenever the Director has reasonable cause to believe that an operator, in the conduct of any oil or gas operation, is performing any act or practice which threatens to cause or causes a violation of Table 910-1 and with consideration of water quality standards or classifications established by the Water Quality Control Commission ("WQCC" ) for waters of the state, the Director may impose additional requirements, including but not limited to, sensitive area determination, sampling and analysis, remediation, monitoring, permitting and the establishment of points of compliance. Any action taken pursuant to this Rule shall comply with the provisions of Rules 324A. through D. and the 500 Series rules.

d. **Alternative compliance methods.** Operators may propose for prior approval by the Director alternative methods for determining the extent of contamination, sampling and analysis, or alternative cleanup goals using points of compliance.

e. **Sensitive area determination.** When the operator or Director has data that indicate an impact or threat of impact to ground water or surface water, the Director may require the operator to make a sensitive area determination and that determination shall be subject to the Director's approval. The sensitive area determination shall be made using appropriate geologic and hydrogeologic data to evaluate the potential for impact to ground water and surface water, such as appropriate percolation tests that demonstrate that seepage will not reach underlying ground water or waters of the State and impact current or future uses of these waters. Operators shall submit data evaluated and analysis used in the determination to the Director.

f. **Sensitive area operations.** Operations in sensitive areas shall incorporate adequate measures and controls to prevent significant adverse environmental impacts and ensure compliance with the concentration levels in Table 910-1, with consideration to WQCC standards and classifications.

### 902. PITS - GENERAL AND SPECIAL RULES

a. Pits used for exploration and production of oil and gas shall be constructed and operated to protect public health, safety, and welfare and the environment, including soil, waters of the state, and wildlife, from significant adverse environmental, public health, or welfare impacts from E&P waste, except as permitted by applicable laws and regulations.

b. Pits shall be constructed, monitored, and operated to provide for a minimum of two (2) feet of freeboard at all times between the top of the pit wall at its point of lowest elevation and

the fluid level of the pit. A method of monitoring and maintaining freeboard shall be employed. Any unauthorized release of fluids from a pit shall be subject to the reporting requirements of Rule 906.

c. Any accumulation of oil or condensate in a pit shall be removed within twenty-four (24) hours of discovery. Operators shall use skimming, steam cleaning of exposed liners, or other safe and legal methods as necessary to maintain pits in clean condition and to control hydrocarbon odors. Only de minimis amounts of hydrocarbons may be present unless the pit is specifically permitted for oil or condensate recovery or disposal use. A Form 15 pit permit may be revoked by the Director and the Director may require that the pit be closed if an operator repeatedly allows more than de minimis amounts of oil or condensate to accumulate in a pit. This requirement is not applicable to properly permitted and properly fenced, lined, and netted skim pits that are designed, constructed, and operated to prevent impacts to wildlife, including migratory birds.

d. Where necessary to protect public health, safety and welfare or to prevent significant adverse environmental impacts resulting from access to a pit by wildlife, migratory birds, domestic animals, or members of the general public, operators shall install appropriate netting or fencing.

e. Pits used for a period of no more than three (3) years, or more than three (3) years if the Director has issued a variance, for storage, recycling, reuse, treatment, or disposal of E&P waste or fresh water, as applicable, may be permitted in accordance with Rule 903 to service multiple wells, subject to Director approval.

f. Unlined pits shall not be constructed on fill material.

g. Except as allowed under Rule 904.a, unlined pits shall not be constructed in areas where pathways for communication with ground water or surface water are likely to exist.

h. Produced water shall be treated in accordance with Rule 907 before being placed in a production pit.

i. Operators shall utilize appropriate biocide treatments to control bacterial growth and related odors as needed.

**903. PIT PERMITTING/REPORTING REQUIREMENTS**

a. An Earthen Pit Report/Permit, Form 15, shall be submitted to the Director for prior approval for the following pits:

(1) All production pits.

(2) Special purpose pits except those reported under Rule 903.b.(1) or Rule 903.b.(2).

(3) Drilling pits designed for use with fluids containing hydrocarbon concentrations exceeding 10,000 ppm TPH or chloride concentrations at total well depth exceeding 15,000 ppm.

(4) Multi-well pits containing produced water, drilling fluids, or completion fluids that will be recycled or reused, except where reuse consists only of moving drilling fluids from one (1) oil and gas location to another such location for reuse there.

b. An Earthen Pit Report/Permit, Form 15, shall be submitted within thirty (30) calendar days after construction for the following:

(1) Special purpose pits used in the initial phase of emergency response.

(2) Flare pits where there is no risk of condensate accumulation.

c. An Earthen Pit Report/Permit, Form 15, shall not be required for drilling pits using water-based bentonitic drilling fluids with concentrations of TPH and chloride below those referenced in Rule 903.a.(3).

d. An Earthen Pit Report/Permit, Form 15, shall be completed in accordance with the instructions in Appendix I. Failure to complete the form in full may result in delay of approval or return of form.

e. The Director shall endeavor to review any properly completed Earthen Pit Report/Permit, Form 15, within thirty (30) calendar days after receipt. In order to allow adequate time for pit permit review and approval, operators shall submit an Earthen Pit Report/Permit, Form 15, at the same time as the Application for Permit to Drill, Form 2, is submitted. The Director may condition permit approval upon compliance with additional terms, provisions, or requirements necessary to protect the waters of the state, public health, or the environment.

**904. PIT LINING REQUIREMENTS AND SPECIFICATIONS**

a. Pits that were constructed before May 1, 2009 on federal land, or before April 1, 2009 on other land, shall comply with the rules in effect at the time of their construction. The following pits shall be lined if they are constructed on or after May 1, 2009 on federal land, or on or after April 1, 2009 on other land:

(1) Drilling pits designed for use with fluids containing hydrocarbon concentrations exceeding 10,000 ppm TPH or chloride concentrations at total well depth exceeding 15,000 ppm.

(2) Production pits, other than skim pits, unless the operator demonstrates to the Director's satisfaction that the quality of the produced water is equivalent to or better than that of the underlying groundwater or the operator can clearly demonstrate by substantial evidence, such as by appropriate percolation tests, that seepage will not reach the underlying aquifer or waters of the state at contamination levels in excess of applicable standards. Subject to Rule 901.c, this requirement shall not apply to such pits in Huerfano or Las Animas Counties constructed before May 1, 2011, or to such pits in Washington, Yuma, Logan, or Morgan counties constructed before May 1, 2013.

(3) Special purpose pits, except emergency pits constructed during initial emergency response to spills/releases, or flare pits where there is no risk of condensate accumulation.

(4) Skim pits.

(5) Multi-well pits used to contain produced water, drilling fluids, or completion fluids that will be recycled or reused, except where reuse consists only of moving drilling fluids from one oil and gas location to another such location for reuse there. Subject to Rule 901.c, this requirement shall not apply to multi-well pits used to contain produced water in Huerfano or Las Animas Counties constructed before May 1, 2011, or to multi-well

pits used to contain produced water in Washington, Yuma, Logan, or Morgan counties constructed before May 1, 2013.

(6) Pits at centralized E&P waste management facilities and UIC facilities.

b. The following specifications shall apply to all pits that are required to be lined:

(1) Materials used in lining pits shall be of a synthetic material that is impervious, has high puncture and tear strength, has adequate elongation, and is resistant to deterioration by ultraviolet light, weathering, hydrocarbons, aqueous acids, alkali, fungi or other substances in the produced water.

(2) All pit lining systems shall be designed, constructed, installed, and maintained in accordance with the manufacturers' specifications and good engineering practices.

(3) Field seams must be installed and tested in accordance with manufacturer specifications and good engineering practices. Testing results must be maintained by the operator and provided to the Director upon request.

c. The following specifications shall also apply to pits that are required to be lined, except those at centralized E&P waste management facilities, unless an oil and gas operator demonstrates to the satisfaction of the Director that a liner system offering equivalent protection to public health, safety, and welfare, including the environment and wildlife resources, will be used:

(1) Liners shall have a minimum thickness of twenty-four (24) mils. The synthetic or fabricated liner shall cover the bottom and interior sides of the pit with the edges secured with at least a twelve (12) inch deep anchor trench around the pit perimeter. The anchor trench shall be designed to secure, and prevent slippage or destruction of, the liner materials.

(2) The foundation for the liner shall be constructed with soil having a minimum thickness of twelve (12) inches after compaction covering the entire bottom and interior sides of the pit, and shall be constructed so that the hydraulic conductivity shall not exceed $1.0 \times 10^{-7}$ cm/sec after testing and compaction. Compaction and permeability test results measured in the laboratory and field must be maintained by the operator and provided to the Director upon request.

(3) As an alternative to the soil foundation described in Rule 904.c.(2), the foundation may be constructed with bedding material that exceeds a hydraulic conductivity of $1.0 \times 10^{-7}$ cm/sec, if a double synthetic liner system is used; however, the bottom and sides of the pit shall be padded with soil or synthetic matting type material and shall be free of sharp rocks or other material that are capable of puncturing the liner. Each synthetic liner shall have a minimum thickness of twenty-four (24) mils.

d. The following specifications shall also apply to pits used at centralized E&P waste management facilities, unless an oil and gas operator demonstrates to the satisfaction of the Director that a liner system offering equivalent protection to public health, safety, and welfare, including the environment and wildlife resources, will be used:

(1) Liners shall have a minimum thickness of sixty (60) mils. The synthetic or fabricated liner shall cover the bottom and interior sides of the pit with the edges secured with at least a twelve (12) inch deep anchor trench around the pit perimeter. The

anchor trench shall be designed to secure, and prevent slippage or destruction of, the liner materials.

(2) The foundation for the liner shall be constructed with soil having a minimum thickness of twenty-four (24) inches after compaction covering the entire bottom and interior sides of the pit, and shall be constructed so that the hydraulic conductivity shall not exceed $1.0 \times 10^{-7}$ cm/sec after testing and compaction. Compaction and permeability test results measured in the laboratory and field must be maintained by the operator and provided to the Director upon request.

(3) As an alternative to the soil foundation described in Rule 904.d.(2), a secondary liner consisting of a geosynthetic clay liner, which is a manufactured hydraulic barrier typically consisting of bentonite clay or other very low permeability material, supported by geotextiles or geomembranes, which are held together by needling, stitching, or chemical adhesives, may be used.

e. In Sensitive Areas, the Director may require a leak detection system for the pit or other equivalent protective measures, including but not limited to, increased record-keeping requirements, monitoring systems, and underlying gravel fill sumps and lateral systems. In making such determination, the Director shall consider the surface and subsurface geology, the use and quality of potentially-affected ground water, the quality of the produced water, the hydraulic conductivity of the surrounding soils, the depth to ground water, the distance to surface water and water wells, and the type of liner.

**905. CLOSURE OF PITS, AND BURIED OR PARTIALLY BURIED PRODUCED WATER VESSELS.**

a. Drilling pits shall be closed in accordance with the 1000-Series Rules.

b. Pits not used exclusively for drilling operations, buried or partially buried produced water vessels, and emergency pits shall be closed in accordance with an approved Site Investigation and Remediation Workplan, Form 27. The workplan shall be submitted for prior Director approval and shall include a description of the proposed investigation and remediation activities in accordance with Rule 909. Emergency pits shall be closed and remediated as soon as the initial phase of emergency response operations are complete or process upset conditions are controlled.

(1) Operators shall ensure that soils and ground water meet the concentration levels of Table 910-1.

(2) **Pit evacuation.** Prior to backfilling and site reclamation, E&P waste shall be treated or disposed in accordance with Rule 907.

(3) Liners shall be disposed as follows:

A. **Synthetic liner disposal.** Liner material shall be removed and disposed in accordance with applicable legal requirements for solid waste disposal.

B. **Constructed soil liners.** Constructed soil liner material may be removed for treatment or disposal, or, where left in place, the material shall be ripped and mixed with native soils in a manner to alleviate compaction and prevent an impermeable barrier to infiltration and ground water flow and shall meet soil standards listed in Table 910-1.

(4) Soil beneath the low point of the pit must be sampled to verify no leakage of the managed fluids. Soil left in place shall meet the standards listed in Table 910-1.

c. **Discovery of a spill/release during closure.** When a spill/release is discovered during closure operations, operators shall report the spill/release on the Spill/Release Report, Form 19, in accordance with Rule 906. Leaking pits and buried or partially buried produced water vessels shall be closed and remediated in accordance with Rules 909. and 910.

d. **Unlined drilling pits.** Unlined drilling pits shall be closed and reclaimed in accordance with the 1000 Series rules and operators shall ensure that soils and ground water meet the concentration levels in Table 910-1.

**906. SPILLS AND RELEASES**

a. **General.** Spills/releases of E&P waste, including produced fluids, shall be controlled and contained immediately upon discovery to protect the environment, public health, safety, and welfare, and wildlife resources. Impacts resulting from spills/releases shall be investigated and cleaned up as soon as practicable. The Director may require additional activities to prevent or mitigate threatened or actual significant adverse environmental impacts on any air, water, soil or biological resource, or to the extent necessary to ensure compliance with the concentration levels in Table 910-1, with consideration to WQCC ground water standards and classifications.

b. **Reportable spills and reporting requirements for spills/releases.**

(1) Spills/releases of E&P waste or produced fluid exceeding five (5) barrels, including those contained within lined or unlined berms, shall be reported on COGCC Spill/Release Report, Form 19.

(2) Spills/releases which exceed twenty (20) barrels of an E&P waste shall be reported on COGCC Spill/Release Report, Form 19, and shall also be verbally reported to the Director as soon as practicable, but not more than twenty-four (24) hours after discovery.

(3) Spills/releases of any size which impact or threaten to impact any waters of the state, residence or occupied structure, livestock, or public byway shall be reported on COGCC Spill/Release Report, Form 19, and shall also be verbally reported to the Director as soon as practicable, but not more than twenty-four (24) hours, after discovery.

(4) Spills/releases of any size which impact or threaten to impact any surface water supply area shall be reported to the Director and to the Environmental Release/Incident Report Hotline (1-877-518-5608). Spills and releases that impact or threaten a surface water intake shall be verbally reported to the emergency contact for that facility immediately after discovery.

(5) For all reportable spills, operators shall submit a Spill/Release Report, Form 19, within ten (10) days after discovery. An 8 1/2 x 11 inch topographic map showing the governmental section and location of the spill shall be included. Such report shall also include information relating to initial mitigation, site investigation, and remediation. The Director may require additional information.

(6) Chemical spills and releases shall be reported in accordance with applicable state and federal laws, including the Emergency Planning and Community Right-to-Know Act, the Comprehensive Environmental Response, Compensation, and Liability Act, the Oil Pollution Act, and the Clean Water Act, as applicable.

c. **Surface owner notification and consultation.** The operator shall notify the affected surface owner or the surface owner's appointed tenant of reportable spills as soon as practicable, but not more than twenty-four (24) hours, after discovery. The operator also shall make good faith efforts to notify and consult with the affected surface owner, or the surface owner's appointed tenant, prior to commencing operations to remediate E&P waste from a spill/release in an area not being utilized for oil and gas operations.

d. **Remediation of spills/releases.** When threatened or actual significant adverse environmental impacts on any air, water, soil or other environmental resource from a spill/release exists or when necessary to ensure compliance with the concentration levels in Table 910-1, with consideration to WQCC ground water standards and classifications, the Director may require operators to submit a Site Investigation and Remediation Workplan, Form 27. Such spills/releases shall be remediated in accordance with Rules 909. and 910.

e. **Spill/release prevention.**

(1) **Secondary containment.** Secondary containment that was constructed before May 1, 2009 on federal land, or before April 1, 2009 on other land, shall comply with the rules in effect at the time of construction. Secondary containment constructed on or after May 1, 2009 on federal land, or on or after April 1, 2009 on other land shall be constructed or installed around all tanks containing oil, condensate, or produced water with greater than 3,500 milligrams per liter (mg/l) total dissolved solids (TDS) and shall be sufficient to contain the contents of the largest single tank and sufficient freeboard to contain precipitation. Secondary containment structures shall be sufficiently impervious to contain discharged material. Operators are also subject to tank and containment requirements under Rules 603. and 604. This requirement shall not apply to water tanks with a capacity of fifty (50) barrels or less.

(2) **Spill/release evaluation.** Operators shall determine the cause of a spill/release, and, to the extent practicable, shall implement measures to prevent spills/releases due to similar causes in the future. For reportable spills, operators shall submit this information to the Director on the Spill/Release Report, Form 19, within ten (10) days after discovery of the spill/release.

**907. MANAGEMENT OF E&P WASTE**

a. **General requirements.**

(1) **Operator obligations.** Operators shall ensure that E&P waste is properly stored, handled, transported, treated, recycled, or disposed to prevent threatened or actual significant adverse environmental impacts to air, water, soil or biological resources or to the extent necessary to ensure compliance with the concentration levels in Table 910-1, with consideration to WQCC ground water standards and classifications.

(2) E&P waste management activities shall be conducted, and facilities constructed and operated, to protect the waters of the state from significant adverse environmental impacts from E&P waste, except as permitted by applicable laws and regulations.

(3) **Reuse and recycling.** To encourage and promote waste minimization, operators may propose plans for managing E&P waste through beneficial use, reuse, and recycling by submitting a written management plan to the Director for approval on a Sundry Notice, Form 4, if applicable. Such plans shall describe, at a minimum, the type(s) of waste, the proposed use of the waste, method of waste treatment, product quality assurance, and shall include a copy of any certification or authorization that may be required by other laws and regulations. The Director may require additional information.

b. **Waste transportation.**

(1) E&P waste, when transported off-site within Colorado for treatment or disposal, shall be transported to facilities authorized by the Director or waste disposal facilities approved to receive E&P waste by the Colorado Department of Public Health and Environment. When transported to facilities outside of Colorado for treatment or disposal, E&P waste shall be transported to facilities authorized and permitted by the appropriate regulatory agency in the receiving state.

(2) **Waste generator requirements.** Generators of E&P waste that is transported off-site shall maintain, for not less than five (5) years, copies of each invoice, bill, or ticket and such other records as necessary to document the following requirements A through F:

A. The date of the transport;

B. The identity of the waste generator;

C. The identity of the waste transporter;

D. The location of the waste pickup site;

E. The type and volume of waste; and

F. The name and location of the treatment or disposal site.

Such records shall be signed by the transporter, made available for inspection by the Director during normal business hours, and copies thereof shall be furnished to the Director upon request.

c. **Produced water.**

(1) **Treatment of produced water.** Produced water shall be treated prior to placement in a production pit to prevent crude oil and condensate from entering the pit.

(2) **Produced water disposal.** Produced water may be disposed as follows:

A. Injection into a Class II well, permitted in accordance with Rule 325.;

B. Evaporation/percolation in a properly permitted pit;

C. Disposal at permitted commercial facilities;

D. Disposal by roadspreading on lease roads outside sensitive areas for produced waters with less than 3,500 mg/l TDS when authorized by the surface owner. Roadspreading of produced waters shall not impact

waters of the state, shall not result in pooling or runoff, and the adjacent soils shall meet the concentration levels in Table 910-1. Flowback fluids shall not be used for dust suppression.

E. Discharging into state waters, in accordance with the Water Quality Control Act and the rules and regulations promulgated thereunder.

i. Operators shall provide the Colorado discharge permit number, latitude and longitude coordinates, in accordance with Rule 215.f, of the discharge outfall, and sources of produced water on a Source of Produced Water for Disposal, Form 26, and shall include a U.S.G.S. topographic map showing the location of the discharge outfall.

ii. Produced water discharged pursuant to this subsection (2).E. may be put to beneficial use in accordance with applicable state statutes and regulations governing the use and administration of water.

F. Evaporation in a properly lined pit at a centralized E&P waste management facility permitted in accordance with Rule 908.

(3) **Produced water reuse and recycling.** Produced water may be reused for enhanced recovery, drilling, and other approved uses in a manner consistent with existing water rights and in consideration of water quality standards and classifications established by the WQCC for waters of the state, or any point of compliance established by the Director pursuant to Rule 324D.

(4) **Mitigation.** Water produced during operation of an oil or gas well may be used to provide an alternative domestic water supply to surface owners within the oil or gas field, in accordance with all applicable laws, including, but not limited to, obtaining the necessary approvals from the WQCD for constructing a new "waterworks," as defined by Section 25-1-107(1)(X)(II)(A), C.R.S. Any produced water not so used shall be disposed of in accordance with subsection (2) or (3). Providing produced water for domestic use within the meaning of this subsection (4) shall not constitute an admission by the operator that the well is dewatering or impacting any existing water well. The water produced shall be to the benefit of the surface owner within the oil and gas field and may not be sold for profit or traded.

d. **Drilling fluids.**

(1) **Recycling and reuse.** Drilling pit contents may be recycled to another drilling pit for reuse consistent with Rule 903.

(2) **Treatment and disposal.** Drilling fluids may be treated or disposed as follows:

A. Injection into a Class II well permitted in accordance with Rule 325;

B. Disposal at a commercial solid waste disposal facility; or

C. Land treatment or land application at a centralized E&P waste management facility permitted in accordance with Rule 908.

(3) **Additional authorized disposal of water-based bentonitic drilling fluids.** Water-based bentonitic drilling fluids may be disposed as follows:

A. Drying and burial in pits on non-crop land. The resulting concentrations shall not exceed the concentration levels in Table 910-1, below; or

B. Land application as follows:

i. **Applicability.** Acceptable methods of land application include, but are not limited to, production facility construction and maintenance, and lease road maintenance.

ii. **Land application requirements.** The average thickness of water-based bentonitic drilling fluid waste applied shall be no more than three (3) inches prior to incorporation. The waste shall be applied to prevent ponding or erosion and shall be incorporated as a beneficial amendment into the native soils within ten (10) days of application. The resulting concentrations shall not exceed those in Table 910-1.

iii. **Surface owner approval.** Operators shall obtain written authorization from the surface owner prior to land application of water-based bentonitic drilling fluids.

iv. **Operator obligations.** Operators shall maintain a record of the source, the volume, and the location where the land application of the water-based bentonitic drilling fluid occurred. Upon the Director's written request, this information shall be provided within five (5) business days, in a format readily reviewable by the Director. Operators with control and authority over the wells from which the water-based bentonitic drilling fluid wastes are obtained retain responsibility for the land application operation, and shall diligently cooperate with the Director in responding to complaints regarding land application of water-based bentonitic drilling fluids.

v. **Approval.** Prior Director approval is not required for reuse of water-based bentonitic drilling fluids for land application as a soil amendment.

e. **Oily waste.** Oily waste includes those materials containing crude oil, condensate or other E&P waste, such as soil, frac sand, drilling fluids, and pit sludge that contain hydrocarbons.

(1) Oily waste may be treated or disposed as follows:

A. Disposal at a commercial solid waste disposal facility;

B. Land treatment onsite; or

C. Land treatment at a centralized E&P waste management facility permitted in accordance with Rule 908.

(2) Land treatment requirements:

A. Free oil shall be removed from the oily waste prior to land treatment.

B. Oily waste shall be spread evenly to prevent pooling, ponding, or runoff.

C. Contamination of stormwater runoff, ground water, or surface water shall be prevented.

D. Biodegradation shall be enhanced by disking, tilling, aerating, or addition of nutrients, microbes, water or other amendments, as appropriate.

E. Land-treated oily waste incorporated in place or beneficially reused shall not exceed the concentrations in Table 910-1.

F. When a threatened or significant adverse environmental impact from onsite land treatment exists, operators shall submit a Site Investigation and Remediation Workplan, Form 27, for approval by the Director. Treatment shall thereafter be completed in accordance with the workplan and Rules 909. and 910.

G. When land treatment occurs in an area not being utilized for oil and gas operations, operators shall obtain prior written surface owner approval.

f. **Other E&P Waste.** Other E&P waste such as workover fluids, tank bottoms, pigging wastes from gathering and flow lines, and natural gas gathering, processing, and storage wastes may be treated or disposed of as follows:

(1) Disposal at a commercial solid waste disposal facility;

(2) Treatment at a centralized E&P waste management facility permitted in accordance with Rule 908;

(3) Injection into a Class II injection well permitted in accordance with Rule 325; or

(4) An alternative method proposed in a waste management plan in accordance with rule 907.a.(3) and approved by the Director.

**907A. MANAGEMENT OF NON-E&P WASTE**

a. Certain wastes generated by oil and gas-related activities are non-E&P wastes and are not exempt from regulation as solid or hazardous wastes. These wastes need to be properly identified and disposed of in accordance with state and federal regulations.

b. Certain wastes generated by oil and gas-related activities can either be E&P wastes or non-E&P wastes depending on the circumstances of their generation.

c. The hazardous waste regulations require that a hazardous waste determination be made for any non-E&P solid waste. Hazardous wastes require storage, treatment, and disposal practices in accordance with 6 C.C.R. 1007-3. All non-hazardous/non-E&P wastes are considered solid waste which require storage, treatment, and disposal in accordance with 6 C.C.R. 1007-2.

**908. CENTRALIZED E&P WASTE MANAGEMENT FACILITIES**

a. **Applicability.** Operators may establish non-commercial, centralized E&P waste management facilities for the treatment, disposal, recycling or beneficial reuse of E&P waste. This rule applies only to non-commercial facilities, which means the operator does not represent itself as providing E&P waste management services to third parties, except as part of a unitized area or joint operating agreement or in response to an emergency. Centralized

facilities may include components such as land treatment or land application sites, pits, and recycling equipment.

b. **Permit requirements.** Before any person shall commence construction of a centralized E&P waste management facility, such person shall file with the Director an application on Form 28 and pay a filing and service fee established by the Commission (see Appendix III), and obtain the Director's approval. The application shall contain the following:

(1) The name, address, phone and fax number of the operator, and a designated contact person.

(2) The name, address, and phone number of the surface owner of the site, if not the operator, and the written authorization of such surface owner.

(3) The legal description of the site.

(4) A general topographic, geologic, and hydrologic description of the site, including immediately adjacent land uses, a topographic map of a scale no less than 1:24,000 showing the location, and the average annual precipitation and evaporation rates at the site.

(5) **Centralized facility siting requirements.**

A. A site plan showing drainage patterns and any diversion or containment structures, and facilities such as roads, fencing, tanks, pits, buildings, and other construction details.

B. Scaled drawings of entire sections containing the proposed facility. The field measured distances from the nearer north or south and nearer east or west section lines shall be measured at ninety (90) degrees from said section lines to facility boundaries and referenced on the drawing. A survey shall be provided including a complete description of established monuments or collateral evidence found and all aliquot corners.

C. The facility shall be designed to control public access, prevent unauthorized vehicular traffic, provide for site security both during and after operating hours, and prevent illegal dumping of wastes. Appropriate measures shall also be implemented to prevent access to the centralized facility by wildlife or domestic animals.

D. Centralized facilities shall have a fire lane of at least ten (10) feet in width around the active treatment areas and within the perimeter fence. In addition, a buffer zone of at least ten (10) feet shall be maintained within the perimeter fire lane.

E. Surface water diversion structures, including, but not limited to, berms and ditches, shall be constructed to accommodate a one hundred (100) year, twenty four (24) hour event. The facility shall be designed and constructed with a run-on control system to prevent flow onto the facility during peak discharge and a run-off control system to contain the water volume from a twenty-five (25) year, twenty-four (24) hour storm.

(6) **Waste profile.** For each type of waste, the amounts to be received and managed by the facility shall be estimated on a monthly average basis. For each waste type to be treated, a characteristic waste profile shall be completed.

(7) **Facility design and engineering.** Facility design and engineering data, including plans and elevations, design basis, calculations, and process description.

A. Geologic data, including, but not limited to:

i. Type and thickness of unconsolidated soils;

ii. Type and thickness of consolidated bedrock, if applicable;

iii. Local and regional geologic structures; and

iv. Any geologic hazards that may affect the design and operation of the facility.

B. Hydrologic data, including, but not limited to:

i. Surface water features within two (2) miles;

ii. Depth to shallow ground water and major aquifers;

iii. Water wells within one (1) mile of the site boundary and well depth, depth to water, screened intervals, yields, and aquifer name;

iv. Hydrologic properties of shallow ground water and major aquifers including flow direction, flow rate, and potentiometric surface;

v. Site location in relation to the floodplain of nearby surface water features;

vi. Existing quality of shallow ground water; and

vii. An evaluation of the potential for impacts to nearby surface water and ground water.

C. Engineering data, including, but not limited to:

i. Type and quantity of material required for use as a liner, including design components;

ii. Location and depth of cut for liners;

iii. Location, dimensions, and grades of all surface water diversion structures;

iv. Location and dimensions of all surface water containment structures; and

v. Location of all proposed facility structures and access roads.

(8) **Operating plan.** An operating plan, including, but not limited to:

A. A detailed description of the method of treatment, loading rates, and application of nutrients and soil amendments;

B. Dust and moisture control;

C. Sampling;

D. Inspection and maintenance;

E. Emergency response;

F. Record-keeping;

G. Site security;

H. Hours of operation;

I. Noise and odor mitigation; and

J. Final disposition of waste. Where treated waste will be beneficially reused, a description of reuse and method of product quality assurance shall be included.

(9) **Ground water monitoring.**

A. **Water Wells.**

Water samples shall be collected from water wells known to the operator or registered with the Colorado State Engineer within a one (1) mile radius of the proposed facility and shall be analyzed to establish baseline water quality. Analytical parameters shall be selected based upon the proposed waste stream and shall include, at a minimum, all major cations and anions, total dissolved solids, iron and manganese, nutrients (nitrates, nitrites, selenium), benzene, toluene, ethylbenzene, xylenes, pH, and specific conductance. Operators shall use reasonable good faith efforts to identify and obtain access to such water wells for the purpose of collecting water samples. If access cannot be obtained, then the operator shall notify the Director of the wells for which access was not obtained and sampling of such wells by the operator shall not be required. Not conducting sampling because access to water wells cannot be obtained shall not be grounds for denial of the proposed facility.

Copies of all test results described above shall be provided to the Director and the water well owner within three (3) months of collecting the samples. Laboratory results shall also be submitted to the Director in an electronic data deliverable format.

B. **Site-specific monitoring wells.**

i. Where applicable, the Director shall require ground water monitoring to ensure compliance with the concentration levels in Table 910-1 and WQCC standards and classifications by establishing points of compliance, unless an oil and gas operator demonstrates to the satisfaction of the Director that an alternative method offering equivalent protection of public health, safety, and welfare, including the environment and wildlife resources, can be employed and provided the operator employs a dual liner with a leak detection system that provides for immediate leak detection from the uppermost liner. All monitoring well construction must be completed in accordance with the

State Engineer's regulations on well construction, "Water Well Construction Rules" (2 C.C.R. 402-2).

ii. Where monitoring is required, the direction of flow, ground water gradient and quality of water shall be established by the installation of a minimum of three (3) monitor wells, including an up-gradient well and two (2) down-gradient wells that will serve as points of compliance, or other methods authorized by the Director.

(10) **Surface water monitoring.** Where applicable, the Director shall require baseline and periodic surface water monitoring to ensure compliance with WQCC surface water standards and classifications. Operators shall use reasonable good faith efforts to obtain access to such surface water for the purpose of collecting water samples. If access cannot be obtained, then the operator shall notify the Director of the surface water for which access was not obtained and sampling of such surface water by the operator shall not be required. Not conducting sampling because access to surface water cannot be obtained shall not be grounds for denial of the proposed facility.

(11) **Contingency plan.** A contingency plan that describes the emergency response operations for the facility, 24-hour contact information for the person who has authority to initiate emergency response actions, and an outline of responsibilities under the joint operating agreement regarding maintenance, closure, and monitoring of the facility.

c. **Permit approval.** The Director shall endeavor to approve or deny the properly completed permit within thirty (30) days after receipt and may condition permit approval as necessary to prevent any threatened or actual significant adverse environmental impact on air, water, soil or biological resources or to the extent necessary to ensure compliance with the concentration levels in Table 910-1, with consideration to WQCC ground water standards and classifications.

d. **Financial assurance.** The operator of a centralized E&P waste management facility shall submit for the Director's approval such financial assurance as required by Rule 704. prior to issuance of the operating permit.

e. **Facility modifications.** Throughout the life of the facility the operator shall submit proposed modifications to the facility design, operating plan, permit data, or permit conditions to the Director for prior approval.

f. **Annual permit review.** To ensure compliance with permit conditions and the 900 Series rules, the facility permit shall be subject to an annual review by the Director. To facilitate this review, the operator shall submit an annual report summarizing operations, including the types and volumes of waste actually handled at the facility. The Director may require additional information.

g. **Closure.**

(1) **Preliminary closure plan.** A general preliminary plan for closure shall be submitted with the centralized E&P waste management facility permit, Form 28. The preliminary closure plan shall include, but not be limited to:

A. A general plan for closure and reclamation of the entire facility, including a description of the activities required to decommission and remove all

equipment, close and reclaim pits, dispose of or treat residual waste, collect samples as needed to verify compliance with soil and ground water standards, implement post-closure monitoring, and complete other remediation, as required.

B. An estimate of the cost to close and reclaim the entire facility and to conduct post-closure monitoring. Cost estimates shall be subject to review by the Director.

(2) **Final closure plan.** A detailed Site Investigation and Remediation Workplan, Form 27, shall be submitted at least sixty (60) days prior to closure for approval by the Director. The workplan shall include, but not be limited to, a description of the activities required to decommission and remove all equipment, close and reclaim pits, dispose of or treat residual waste, collect samples as needed to verify compliance with soil and ground water standards, implement post-closure monitoring, and complete other remediation, as required.

h. Operators may be subject to local requirements for zoning and construction of facilities and shall provide copies of any approval notices, permits, or other similar types of notifications for the facility from local governments or other agencies to the Director for review prior to issuance of the operating permit.

## 909. SITE INVESTIGATION, REMEDIATION, AND CLOSURE

a. **Applicability.** This section applies to the closure and remediation of pits other than drilling pits constructed pursuant to Rule 903.a.(3); investigation, reporting and remediation of spills/releases; permitted waste management facilities including treatment facilities; plugged and abandoned wellsites; sites impacted by E&P waste management practices; or other sites as designated by the Director.

b. **General site investigation and remediation requirements.**

(1) **Sensitive Area Determination.** Operators shall complete a sensitive area determination in accordance with Rule 901.e.

(2) **Sampling and analyses.** Sampling and analysis of soil and ground water shall be conducted in accordance with Rule 910. to determine the horizontal and vertical extent of any contamination in excess of the concentrations in Table 910-1.

(3) **Management of E&P waste.** E&P waste shall be managed in accordance with Rule 907.

(4) **Pit evacuation.** Prior to backfilling and site reclamation, E&P waste shall be treated or disposed in accordance with Rule 907. and the 1000 Series rules.

(5) **Remediation.** Remediation shall be performed in a manner to mitigate, remove, or reduce contamination that exceeds the concentrations in Table 910-1 in order to ensure protection of public health, safety, and welfare, and to prevent and mitigate significant adverse environmental impacts. Soil that does not meet concentrations in Table 910-1 shall be remediated. Ground water that does not meet concentrations in Table 910-1 shall be remediated in accordance with a Site Investigation and Remediation Workplan, Form 27.

(6) **Reclamation.** Remediation sites shall be reclaimed in accordance with the 1000 Series rules for reclamation.

c. **Site Investigation And Remediation Workplan, Form 27.** Operators shall prepare and submit for prior Director approval a Site Investigation and Remediation Workplan, Form 27, for the following operations and remediation activities:

(1) Unlined pit closure when required by Rule 905.

(2) Remediation of spills/releases in accordance with Rule 906.

(3) Land treatment of oily waste in accordance with Rule 907.e.(2).F.

(4) Closure of centralized E&P waste management facilities in accordance with Rule 908.g.

(5) Remediation of impacted ground water in accordance with Rule 910.b.(4).

d. **Multiple sites.** Remediation of multiple sites may be submitted on a single workplan with prior Director approval.

e. **Closure.**

(1) Remediation and reclamation shall be complete upon compliance with the concentrations in Table 910-1, or upon compliance with an approved workplan.

(2) **Notification of completion.** Within thirty (30) days after conclusion of site remediation and reclamation activities operators shall provide the following notification of completion:

A. Operators conducting remediation operations in accordance with Rule 909.b. shall submit to the Director a Site Investigation and Remediation Workplan, Form 27, containing information sufficient to demonstrate compliance with these rules.

B. Operators conducting remediation under an approved workplan shall submit to the Director, by adding or attaching to the original workplan, information sufficient to demonstrate compliance with the workplan.

f. **Release of financial assurance.** Financial assurance required by Rule 706. may be held by the Director until the required remediation of soil and/or ground water impacts is completed in accordance with the approved workplan, or until cleanup goals are met.

**910. CONCENTRATIONS AND SAMPLING FOR SOIL AND GROUND WATER**

a. **Soil and groundwater concentrations.** The concentrations for soil and ground water are in Table 910-1. Ground water standards and analytical methods are derived from the ground water standards and classifications established by WQCC.

b. **Sampling and analysis.**

(1) **Existing workplans.** Sampling and analysis for sites subject to an approved workplan shall be conducted in accordance with the workplan and the sampling and analysis requirements described in this rule.

(2) **Methods for sampling and analysis.** Sampling and analysis for site investigation or confirmation of successful remediation shall be conducted to determine the

nature and extent of impact and confirm compliance with appropriate concentration levels in Table 910-1.

A. **Field analysis.** Field measurements and field tests shall be conducted using appropriate equipment, calibrated and operated according to manufacturer specifications, by personnel trained and familiar with the equipment.

B. **Sample collection.** Samples shall be collected, preserved, documented, and shipped using standard environmental sampling procedures in a manner to ensure accurate representation of site conditions.

C. **Laboratory analytical methods.** Laboratories shall analyze samples using standard methods (such as EPA SW-846 or API RP-45) appropriate for detecting the target analyte. The method selected shall have detection limits less than or equal to the concentrations in Table 910-1.

D. **Background sampling.** Samples of comparable, nearby, non-impacted, native soil, ground water or other medium may be required by the Director for establishing background conditions.

(3) **Soil sampling and analysis.**

A. **Applicability.** If soil contamination is suspected or known to exist as a result of spills/releases or E&P waste management, representative samples of soil shall be collected and analyzed in accordance with this rule.

B. **Sample collection.** Samples shall be collected from areas most likely to have been impacted, and the horizontal and vertical extent of contamination shall be determined. The number and location of samples shall be appropriate to the impact.

C. **Sample analysis.** Soil samples shall be analyzed for contaminants listed in Table 910-1 as appropriate to assess the impact or confirm remediation. The analytical parameters shall be selected based on site-specific conditions and process knowledge and shall be agreed to and approved by the Director.

D. **Reporting.** Soil Analysis Report, Form 24, shall be used when the Director requires results of soil analyses.

E. **Soil impacted by produced water.** For impacts to soil due to produced water, samples from comparable, nearby non-impacted native soil shall be collected and analyzed for purposes of establishing background soil conditions including pH and electrical conductivity (EC). Where EC of the impacted soil exceeds the level in Table 910-1, the sodium adsorption ratio (SAR) shall also be determined.

F. **Soil impacted by hydrocarbons.** For impacts to soil due to hydrocarbons, samples shall be analyzed for TPH.

(4) **Ground water sampling and analysis.**

A. **Applicability.** Operators shall collect and analyze representative samples of ground water in accordance with these rules under the following circumstances:

(i) Where ground water contamination is suspected or known to exceed the concentrations in Table 910-1;

(ii) Where impacted soils are in contact with ground water; or

(iii) Where impacts to soils extend down to the high water table.

B. **Sample collection.** Samples shall be collected from areas most likely to have been impacted, downgradient or in the middle of excavated areas. The number and location of samples shall be appropriate to determine the horizontal and vertical extent of the impact. If the concentrations in Table 910-1 are exceeded, the direction of flow and a ground water gradient shall be established, unless the extent of the contamination and migration can otherwise be adequately determined.

C. **Sample analysis.** Ground water samples shall be analyzed for benzene, toluene, ethylbenzene, xylene, and API RP-45 constituents, or other parameters appropriate for evaluating the impact. The analytical parameters shall be selected based on site-specific conditions and process knowledge and shall be agreed to and approved by the Director.

D. **Reporting.** Water Analysis Report, Form 25, shall be used when the Director requires results of water analyses.

E. **Impacted ground water.** Where ground water contaminants exceed the concentrations listed in Table 910-1, operators shall notify the Director and submit to the Director for prior approval a Site Investigation and Remediation Workplan, Form 27, for the investigation, remediation, or monitoring of ground water to meet the required concentrations in Table 910-1.

## 911. PIT, BURIED OR PARTIALLY BURIED PRODUCED WATER VESSEL, BLOWDOWN PIT, AND BASIC SEDIMENT/TANK BOTTOM PIT MANAGEMENT REQUIREMENTS PRIOR TO DECEMBER 30, 1997.

a. **Applicability.** This rule applies to the management, operation, closure and remediation of drilling, production and special purpose pits, buried or partially buried produced water vessels, blowdown pits, and basic sediment/tank bottom pits put into service prior to December 30, 1997 and unlined skim pits put into service prior to July 1, 1995. For pits constructed after December 30, 1997 and skim pits constructed after July 1, 1995, operators shall comply with the requirements contained in Rules 901. through 910.

b. **Inventory.** Operators were required to submit to the Director no later than December 31, 1995, an inventory identifying production pits, buried or partially buried produced water vessels, blowdown pits, and basic sediment/tank bottom pits that existed on June 30, 1995. The inventory required operators to provide the facility name, a description of the location, type, capacity and use of pit/vessel, whether netted or fenced, lined or unlined, and where available, water quality data. Operators who have failed to submit the required inventory are in continuing violation of this rule.

c. **Sensitive area determination.**

(1) For unlined production and special purpose pits constructed prior to July 1, 1995 and not closed by December 30, 1997, operators were required to determine whether the pit was located within a sensitive area in accordance with the Sensitive Area Determination Decision Tree, Figure 901-1 (now Rule 901.e.) and submit data evaluated and analysis used in the determination to the Director on a Sundry Notice, Form 4. In December 2008, Figure 901-1 was deleted from the 900-Series Rules.

(2) For steel, fiberglass, concrete, or other similar produced water vessels that were buried or partially buried and located in sensitive areas prior to December 30, 1997, operators were required to test such vessels for integrity, unless a monitoring or leak detection system was put in place.

d. The following permitting/reporting requirements applied to pits constructed prior to December 30, 1997:

(1) A Sundry Notice, Form 4, including the name, address, and phone number of the primary contact person operating the production pit for the operator, the facility name, a description of the location, type, capacity and use of pit, engineering design, installation features and water quality data, if available, was required for the following:

A. Lined production pits and lined special purpose pits constructed after July 1, 1995.

B. Unlined production pits constructed prior to July 1, 1995 which are lined in accordance with Rule 905. by December 30, 1997.

(2) An Application For Permit For Unlined Pit, Form 15 was required for the following:

A. Unlined production pits and special purpose pits in sensitive areas constructed prior to July 1, 1995, and not closed by December 30, 1997.

B. Unlined production pits outside sensitive areas constructed after July 1, 1995 and not closed by December 30, 1997.

(3) An Application For Permit For Unlined Pit, Form 15 and a variance under Rule 904.e.(1). (repealed, now Rule 502.b.) was required for unlined production pits and unlined special purpose pits in sensitive areas constructed after July 1, 1995.

(4) A Sundry Notice, Form 4 was required for unlined production pits outside sensitive areas receiving produced water at an average daily rate of five (5) or less barrels per day calculated on a monthly basis for each month of operation constructed prior to December 30, 1997.

e. The Director may have established points of compliance for unlined production pits and special purpose pits and for lined production pits in sensitive areas constructed after July 1, 1995.

f. **Closure requirements.**

(1) Operators of production or special purpose pits existing on July 1, 1995 which were closed before December 30, 1997, were required to submit a Sundry Notice,

Form 4, within thirty (30) days of December 30, 1997. The Sundry Notice, Form 4 shall include a copy of the existing pit permit, if a permit was obtained, and a description of the closure process.

(2) Pits closed prior to December 30, 1997 were required to be reclaimed in accordance with the 1000 Series rules. Pits closed after December 30, 1997 shall be closed in accordance with the 900 Series rules and reclaimed in accordance with the 1000 Series rules.

(3) Operators of steel, fiberglass, concrete or other similar produced water vessels buried or partially buried and located in sensitive areas were required to repair or replace vessels and tanks found to be leaking. Operators shall repair or replace vessels and tanks found to be leaking. Operators shall submit to the Director a Sundry Notice, Form 4, describing the integrity testing results and action taken within thirty (30) days of December 30, 1997.

(4) Closure of pits and steel, fiberglass, concrete or other similar produced water vessels, and associated remediation operations conducted prior to December 30, 1997 are not subject to Rules 905., 906., 907., 909. and 910.

## 912. VENTING OR FLARING NATURAL GAS

a. The unnecessary or excessive venting or flaring of natural gas produced from a well is prohibited.

b. Except for gas flared or vented during an upset condition, well maintenance, well stimulation flowback, purging operations, or a productivity test, gas from a well shall be flared or vented only after notice has been given and approval obtained from the Director on a Sundry Notice, Form 4, stating the estimated volume and content of the gas. The notice shall indicate whether the gas contains more than one (1) ppm of hydrogen sulfide. If necessary to protect the public health, safety or welfare, the Director may require the flaring of gas.

c. Gas flared, vented or used on the lease shall be estimated based on a gas-oil ratio test or other equivalent test approved by the Director, and reported on Operator's Monthly Production Report, Form 7.

d. Flared gas that is subject to Sundry Notice, Form 4, shall be directed to a controlled flare in accordance with Rule 903.b.(2) or other combustion device operated as efficiently as possible to provide maximum reduction of air contaminants where practicable and without endangering the safety of the well site personnel and the public.

e. Operators shall notify the local emergency dispatch or the local governmental designee of any natural gas flaring. Notice shall be given prior to flaring when flaring can be reasonably anticipated, or as soon as possible, but in no event more than two (2) hours after the flaring occurs.

**Table 910-1**
**CONCENTRATION LEVELS[1]**

| Contaminant of Concern | Concentrations |
|---|---|
| | |
| **Organic Compounds in Soil** | |
| **TPH (total volatile and extractable petroleum hydrocarbons)** | **500 mg/kg** |
| **Benzene** | **0.17 mg/kg[2]** |

| | |
|---|---|
| **Toluene** | **85 mg/kg[2]** |
| **Ethylbenzene** | **100 mg/kg[2]** |
| **Xylenes (total** | **175 mg/kg[2]** |
| **Acenaphthene** | **1,000 mg/kg[2]** |
| **Anthracene** | **1,000 mg/kg[2]** |
| **Benzo(A)anthracene** | **0.22 mg/kg[2]** |
| **Benzo(B)fluoranthene** | **0.22 mg/kg[2]** |
| **Benzo(K)fluoranthene** | **2.2 mg/kg[2]** |
| **Benzo(A)pyrene** | **0.022 mg/kg[2]** |
| **Chrysene** | **22 mg/kg[2]** |
| **Dibenzo(A,H)anthracene** | **0.022 mg/kg[2]** |
| **Fluoranthene** | **1,000 mg/kg[2]** |
| **Fluorene** | **1,000 mg/kg[2]** |
| **Indeno(1,2,3,C,D)pyrene** | **0.22 mg/kg[2]** |
| **Napthalene** | **23 mg/kg[2]** |
| **Pyrene** | **1,000 mg/kg[2]** |
| **Organic Compounds in Ground Water** | |
| **Benzene** | **5 μg/l[3]** |
| **Toluene** | **560 to 1,000 μg/l[3]** |
| **Ethylbenzene** | **700 μg/l[3]** |
| **Xylenes (Total)** | **1,400 to 10,000 μg/l[3,4]** |
| **Inorganics in Soils** | |
| **Electrical Conductivity (EC)** | **<4 mmhos/cm or 2x background** |
| **Sodium Adsorption Ratio (SAR)** | **<12[5]** |
| **pH** | **6-9** |
| **Inorganics in Ground Water** | |
| **Total Dissolved Solids (TDS)** | **<1.25 x background[3]** |
| **Chlorides** | **<1.25 x background[3]** |
| **Sulfates** | **<1.25 x background[3]** |
| **Metals in Soils** | |
| **Arsenic** | **0.39 mg/kg[2]** |
| **Barium (LDNR True Total Barium)** | **15,000 mg/kg[2]** |
| **Boron (Hot Water Soluble)** | **2 mg/l[3]** |
| **Cadmium** | **70 mg/kg[3,6]** |
| **Chromium (III)** | **120,000 mg/kg[2]** |
| **Chromium (VI)** | **23 mg/kg[2,6]** |
| **Copper** | **3,100 mg/kg[2]** |
| **Lead (inorganic)** | **400 mg/kg[2]** |
| **Mercury** | **23 mg/kg[2]** |
| **Nickel (soluble salts)** | **1,600 mg/kg[2,6]** |
| **Selenium** | **390 mg/kg[2,6]** |
| **Silver** | **390 mg/kg[2]** |
| **Zinc** | **23,000 mg/kg[2,6]** |
| **Liquid Hydrocarbons in Soils and Ground Water** | |
| **Liquid hydrocarbons including condensate and oil** | **Below detection level** |

COGCC recommends that the latest version of EPA SW 846 analytical methods be used where possible and that analyses of samples be performed by laboratories that maintain state or national accreditation programs.

[1] Consideration shall be given to background levels in native soils and ground water.
[2] Concentrations taken from CDPHE-HMWMD Table 1 Colorado Soil Evaluation Values (December 2007).
[3] Concentrations taken from CDPHE-WQCC Regulation 41 - The Basic Standards for Ground Water.
[4] For this range of standards, the first number in the range is a strictly health-based value, based on the WQCC's established methodology for human health-based standards. The second number in the range is a maximum contaminant level (MCL), established under the Federal Safe Drinking Water Act which has been

determined to be an acceptable level of this chemical in public water supplies, taking treatability and laboratory detection limits into account. The WQCC intends that control requirements for this chemical be implemented to attain a level of ambient water quality that is at least equal to the first number in the range except as follows: 1) where ground water quality exceeds the first number in the range due to a release of contaminants that occurred prior to September 14, 2004 (regardless of the date of discovery or subsequent migration of such contaminants) clean-up levels for the entire contaminant plume shall be no more restrictive than the second number in the range or the ground water quality resulting from such release, whichever is more protective, and 2) whenever the WQCC has adopted alternative, site-specific standards for the chemical, the site-specific standards shall apply instead of these statewide standards.

[5] Analysis by USDA Agricultural Handbook 60 method (20B) with soluble cations determined by method (2). Method (20B) = estimation of exchangeable sodium percentage and exchangeable potassium percentage from soluble cations. Method (2) = saturated paste method (note: each analysis requires a unique sample of at least 500 grams). If soils are saturated, USDA Agricultural Handbook 60 with soluble cations determined by method (3A) saturation extraction method.

[6] The table value for these inorganic constituents is taken from the CDPHE-HMWMD Table 1 Colorado Soil Evaluation Values (December 2007). However, because these values are high, it is possible that site-specific geochemical conditions may exist that could allow these constituents to migrate into ground water at levels exceeding ground water standards even though the concentrations are below the table values. Therefore, when these constituents are present as contaminants, a secondary evaluation of their leachability must be performed to ensure ground water protection.

Updated June 26, 2007

# Joint Agency Guidelines for Uranium Exploration Drilling Reclamation

Forest Service
Bureau of land Management
NM Mining and Minerals Division

## Background Radiation Readings

Prior to any exploration disturbance, the operator and the affected agency will verify background radiation at each proposed drill hole site. These readings will be considered "background". This data will be used as a reclamation standard for radiation cleanup for the site. Gamma ray emissions will be used as the basis for establishing the background standard. Readings should be taken 1 meter above the ground at the staked drill hole location and at any proposed pit locations. The readings should be taken unshielded, with a Ludlum microR or similar gamma radiation measuring device. The purpose of the background readings is to provide a standard which will be the goal for final reclamation, at the same site. For example, if the background reading in the area averages 20uR/hour, then the clean-up standard would be the same.

Radiation Exposure is measured with gamma rays.
Relationship between milliRoetgens and microRoentgens: 1 milli R (mR) = 1000 micro R (uR)

0.02mR/hr. = 20uR/hr

All measuring devices should be calibrated annually.

## Drill Hole Abandonment

Dry Holes

For holes which don't encounter water, the operator shall backfill with cuttings, clean native fill, or other approved materials, then install a non-metallic plug 10 feet below the ground surface and backfilled with concrete to within 1 foot of the surface. The remaining hole shall be backfilled with native soil.

Wet Holes

For holes that encounter groundwater, within 30 days of encountering the water stratum, they need to be filled from the bottom upwards to the ground surface using a tremie or similar pipe. The well shall be plugged with neat cement slurry, bentonite based material, or other sealing material approved by the State Engineer as required pursuant to

the State Engineer's Office's Rules and Regulations Governing Well Driller Licensing, Construction, Repair, and Plugging of Wells, 19.27.4 NMAC (see 19.27.4.36, Requirements for Mine Drill Holes that Encounter Water).

**Drill Cuttings Disposal**

All drill cores and cuttings that show radioactive readings in excess of background readings shall be buried and covered with no less than 3 feet of earthen material to bring radiation readings back to background levels. In some cases where it is impractical to dig a pit for cuttings use such as when bedrock is at the surface, the cuttings are to be removed to another approved site where they can be buried and covered with 3 feet of soil. .

**Radiation Reclamation**

The goal of radiation reclamation is for all exploration drill hole locations to be abandoned with radiation levels that are no more than the level that was measured for the background readings. To verify this, following drill hole abandonment, the operator and affected agency (s) shall obtain radiological data at each drill hole location and reclaimed pit as described above in the Background Radiation Readings section.

> In the event that background radiation levels can not be replicated by using a 3 foot cover, for good cause, the agencies may consider an alternative closeout, radiation level, which shall not be less stringent than established by guidelines/standards such as those established by the Nuclear Regulatory Commission (NRC ) or the Environmental Protection Agency (EPA).

**Overall Reclamation**

Finally, the entire site that has been disturbed is to be regraded, ripped, or scarified, then reseeded with native grasses approved by the land management agency.

Here's the stip discussed at the meeting today. This was applied to a drilling program approved in 2007.

**Stipulation:** The surface of the backfilled mud pits will not exceed the following limits:

1. The concentration of radium-226 or radium-228 in soil may not exceed the background level by more than 5 picocuries per gram (pCi/g) or 0.185 becquerels per gram (Bq/g), averaged over the first 15 centimeters (cm) of soil below the surface; and
2. The concentration of natural uranium in soil, with no radioactive decay products present may not exceed the background level by more than 30 pCi/g or 1.11 Bq/g, averaged over the top 15 cm of soil below the surface; and 150 pCi/g or 5.55 Bq/g, average concentration at depths greater than 15 cm below the surface, so that no individual member of the public will receive an effective dose equivalent in excess of 100 mrem per year or 1 millisievert (mSv) per year.

# Appendix E

# Soils Descriptions

Mapped soils (NRCS 2011a, Survey Area Data Version 7, May 3, 2011) at Drill site 1 include the Gladel-Bond-Rock outcrop complex, Monticello-Witt loams (1-3 percent slope), and Monticello-Witt loams (3-6 percent slope). Gladel-Bond-Rock outcrop occurs generally between 6,800 to 7,400 feet above mean sea level (amsl) on ridges and mesas. It occurs on slopes 3 to 25 percent and is well-drained. The soils are sandy loam over unweathered sandstone. Monticello-Witt loams (both the 1-3 percent slope and the 3-6 percent slope) is found at 6,800 to 7,400 feet amsl on ridges. It is a well-drained loam.

Mapped soils at Drill site 2 are comprised entirely of Gurley-Skein loams (3-20 percent slope). The Gurley-Skein loam occurs generally between 6,800 to 7,400 feet above mean sea level (amsl) on ridges and terraces. It occurs on slopes of 3 to 20 percent and is well-drained. Soils consist of loam and gravelly loam over unweathered bedrock.

Mapped soils at Drill site 3 is entirely Gurley-Skein loams. It is the same as described under Drill Site 2.

Mapped soils at Drill site 4 is comprised almost entirely of Nortez-Fivepine loam with a small area of Borolls-Rock outcrop (NRCS 2011; Survey Area Data: Version 7, May 3, 2011). The Nortez-Fivepine loam occurs at elevations between 7,400 to 8,500 feet amsl on mesas and structural benches. The soils consist of loam, clay loam, clay or loam, on unweathered bedrock. It occurs on slopes ranging from 1 to 12 percent and is well-drained. The Borolls-Rock outcrop series is located at elevations between 6,600 and 9,200 feet amsl on mesa and canyons. Borolls includes very stony loam, very stony sandy clay loam, very cobbly clay, and very stony clay, while the Rock outcrop is just unweathered bedrock. Slopes range from 40 to 90 percent and the Borolls is well-drained.

Mapped soils at Drill site 5 include Nortez-Granath and Ormiston-Fivepine loam (NRCS 2010, Survey Area Data: Version 7, Aug 2, 2010). The Nortez-Granath soils generally occur at 7,400 to 8,500 feet and on sideslopes of hills and mesas. The soils consist of loams and clays loams over unweathered bedrock. It occurs on slopes ranging from 1 to 12 percent and is well-drained. The Omiston-Fivepine loam occurs between 7,100 to 8,500 feet amsl on the sideslopes of hills and mesas. Soils include loam, flaggy loam, flaggy clay loam, and stony clay loam, over unweathered bedrock. It occurs on slopes ranging from 0 to 15 percent and is well-drained.

Mapped soils at Drill site 6 is entirely Nortez-Granath complex (0-6 percent slopes) (NRCS 2011c, Survey Area Data: Version 5, Jan 31, 2008). It is the same as described under Drill Site 5.

# Appendix F

# Wildlife Timing and Controlled Surface Use Requirements

## Table F1: Noise and Timing Requirements for Wildlife Protection Based on Figure F1

| | Gunnison Sage Grouse (NSO) | Gunnison Sage Grouse (CSU3/11-6/30, Noise Stipulation | Mule Deer Critical Winter Range (TL 12/1-4/30) | Mule Deer Severe Winter Range (TL 12/1-4/30) | Elk Production Area (TL 4/15-6/30) | Elk Severe Winter Range (TL 12/1-4/30) | Mexican Spotted Owl (TL within 1/2 mile from Dolores Canyon Rim 3/15-8/31) | Annual Migratory Bird Nesting Survey - 4/1-7/31) | Dates when activity may occur without timing restrictions, pending results of migratory bird survey. |
|---|---|---|---|---|---|---|---|---|---|
| Site 1 | N | N | N | N | N | N | N | TBD | JAN 1 - DEC 31 |
| Site 1 Access Improvement | na | na | na | na | na | na | na | TBD | na |
| Site 2 | N | N | N | N | N | N | N | na | JAN 1 - DEC 31 |
| Site 2 Access Improvement | N | N | **Y** | N | N | N | N | TBD | MAY 1 - NOV 30 |
| Site 3 | N | N | **Y** | N | N | N | N | TBD | MAY 1 - NOV 30 |
| Site 3 Access Improvement | na | na | na | na | na | na | na | na | na |
| Site 4 | N | **Y** | **Y** | N | N | N | **Y** | TBD | SEP 1 - NOV 30 |
| Site 4 Access Improvement | N | **Y** | **Y** | **Y** | N | N | **Y** | TBD | SEP 1 - NOV 30 |
| Site 5 | N | **Y** | N | N | **Y** | N | **Y** | TBD | SEP 1 - NOV 30 |
| Site 5 Access Improvement | na | na | na | na | na | na | na | na | na |
| Site 6 | **Y** | **Y** | N | N | N | N | N | TBD | JUL 1 – APR 28* |
| Site 6 Access Improvement | **Y** | **Y** | N | N | N | **Y** | N | TBD | NOT AVAILABLE |

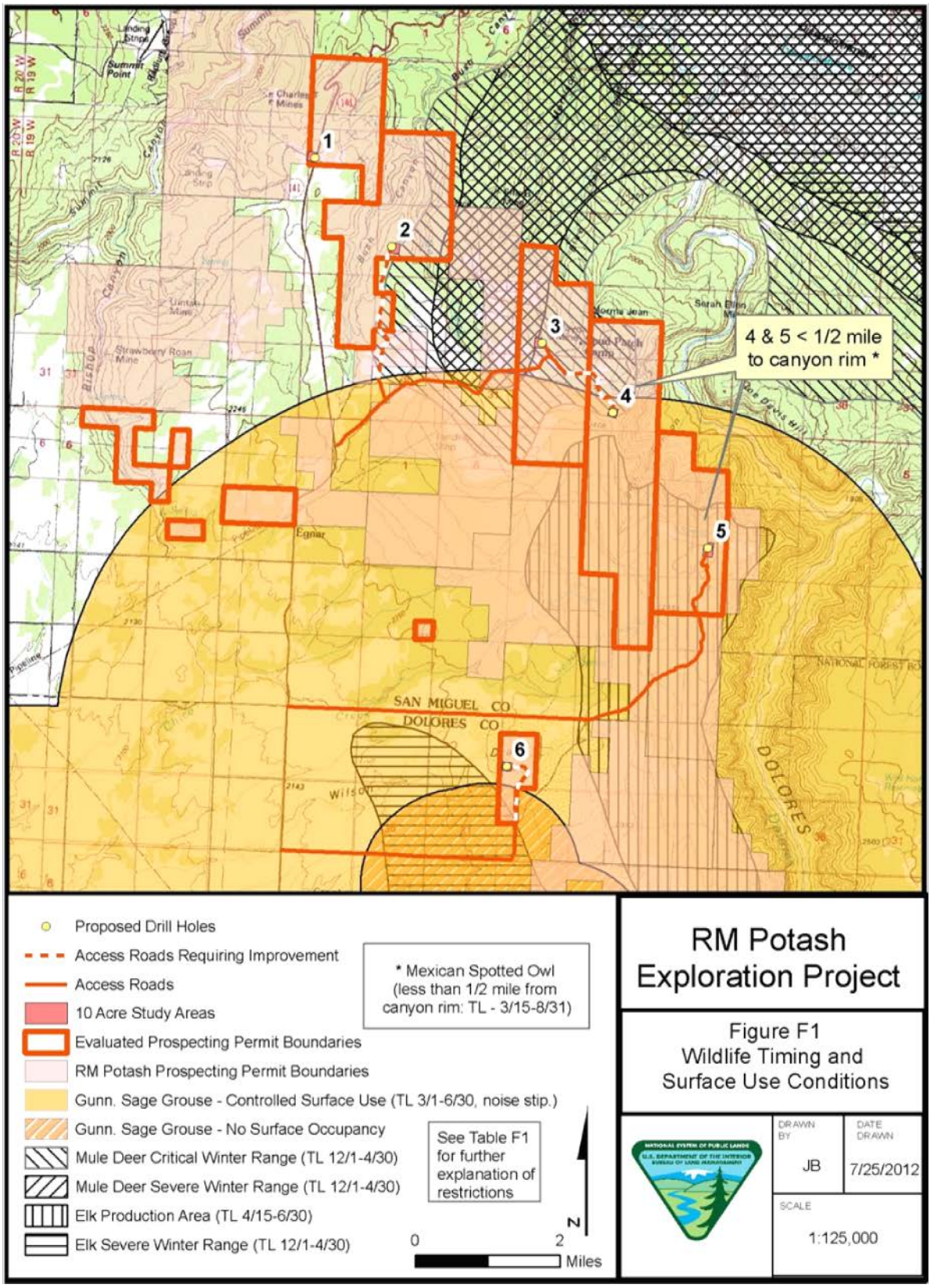
Y = Impact, N = No Impact, na = Not Applicable, TBD = To Be Determined

1.) **NSO** (No Surface Occupancy) Stipulation: NSO stipulation within 0.6 mile radius of a Gunnison sage grouse lek complex.

2.) **CSU** (Controlled Surface Use) Stipulation: CSU stipulation for project occupation, noise and operational time limits (operations will occur from 10AM to 6PM) will be applied within 4 mile radius of mapped Gunnison sage grouse production area, if occurring during March 1- June 30.

3.) **Timing Limitation Stipulation**: Timing limitation to protect big game (deer/elk) crucial winter range *December 1 to April 30*. Timing Limitation for Elk Production April 15 to June 30. Timing limitation to protect Gunnison sage grouse nesting habitat from *March 1 to June 30* within the 4 mile radius of mapped Gunnison sage grouse production area. Timing limitation to protect Mexican Spotted Owl (in the absence of a negative survey) March 1 to August 31.

*Note: While drill site 6 is outside of the Sage Grouse No Surface Occupancy Area (NSO), it cannot be accessed without ground disturbance inside the Sage Grouse NSO area.


1
2
3
4
5
6
4 & 5 < 1/2 mile to canyon rim *
SAN MIGUEL CO
DOLORES CO
Egnar
Wilson
DOLORES
Proposed Drill Holes
Access Roads Requiring Improvement
Access Roads
10 Acre Study Areas
Evaluated Prospecting Permit Boundaries
RM Potash Prospecting Permit Boundaries
Gunn. Sage Grouse - Controlled Surface Use (TL 3/1-6/30, noise stip.)
Gunn. Sage Grouse - No Surface Occupancy
Mule Deer Critical Winter Range (TL 12/1-4/30)
Mule Deer Severe Winter Range (TL 12/1-4/30)
Elk Production Area (TL 4/15-6/30)
Elk Severe Winter Range (TL 12/1-4/30)
* Mexican Spotted Owl (less than 1/2 mile from canyon rim: TL - 3/15-8/31)
See Table F1 for further explanation of restrictions
N
0
2
Miles
RM Potash Exploration Project
Figure F1
Wildlife Timing and Surface Use Conditions
DRAWN BY
JB
DATE DRAWN
7/25/2012
SCALE
1:125,000