# U.S. Department of the Interior
# Bureau of Land Management

**Environmental Assessment UT- 080 – 06 – 280**
**April 2007**

## OIL SHALE RESEARCH, DEVELOPMENT AND DEMONSTRATION PROJECT WHITE RIVER MINE, UINTAH COUNTY, UTAH

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BLM

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## FIGURES



## APPENDICES

## ACRONYMS AND DEFINED TERMS USED

| | |
|---|---|
| ACEC | Area of Critical Environmental Concern |
| ATP | Alberta Taciuk Process |
| BLM | Bureau of Land Management |
| BTU | British Thermal Unit |
| CEQ | Presidents Council on Environmental Quality |
| CFR | Code of Federal Regulations |
| DAQ | Division of Air Quality, Utah Department of Environmental Quality |
| DOGM | Division of Oil, Gas and Mining, Utah Department of Natural Resources |
| DR | Decision Record |
| DWQ | Division of Water Quality, Utah Department of Environmental Quality |
| EA | Environmental Assessment |
| EIS | Environmental Impact Statement |
| ESA | Endangered Species Act |
| FLPMA | Federal Land Policy and Management Act |
| FONSI | Finding of No Significant Impact |
| HDD | Horizontal Directional Drilling |
| MBTA | Migratory Bird Treaty Act |
| NEPA | National Environmental Policy Act |
| NSO | No surface occupancy |
| OHV | Off-Highway Vehicles |
| OSEC | Oil Shale Exploration Company, LLC |
| Project Area | The 160-acre lease and associated road and utility rights-of-way |
| RD&D | Research, Development and Demonstration |
| RD&D Project | OSEC's proposed research, development, and demonstration project using the ATP system at the White River Mine site |
| RMP | Resource Management Plan |
| ROD | Record of Decision |
| ROW | Right-of-Way |
| UDWR | Utah Division of Wildlife Resources |
| UPDES | Utah Pollutant Discharge Elimination System |
| USEPA | United States Environmental Protection Agency |
| USFWS | United States Fish and Wildlife Service |
| VFO | Vernal Field Office of the Bureau of Land Management |
| VRM | Visual Resource Management |
| WRSP | White River Shale Project |
| WSR | Wild & Scenic Rivers |

# 1.0 PURPOSE & NEED

## 1.1 Introduction

This Environmental Assessment ("EA") has been prepared to disclose and analyze the potential environmental consequences of the White River Oil Shale research, development and demonstration project (referred to as the "RD&D Project") as proposed by the Oil Shale Exploration Company, LLC ("OSEC") for the 160-acre White River Mine lease site. The EA is a site-specific analysis of potential impacts that could result from the implementation of the Proposed Action or alternatives to the Proposed Action. The EA 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" impacts may result from the analyzed actions. "Significance" is defined by NEPA and is found in 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 BLM determines that this project may have "significant" impacts following the analysis in the EA, then an EIS may 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 impacts (effects).

## 1.2 Background

Oil Shale Exploration Company, LLC ("OSEC") is proposing an oil shale research, development and demonstration ("RD&D") project on Bureau of Land Management ("BLM") administered public land in northeastern Utah in accordance with BLM's Oil Shale RD&D Program announced in the Federal Register (FR, June 9, 2005, Vol. 70, No. 110).

Pursuant to Section 21 of the Minerals Leasing Act (1920, as amended, 30 USC 241), the BLM solicited RD&D proposals to demonstrate technologies for unlocking deposits of energy now trapped in oil shale deposits, including the nomination of lands to be leased for the RD&D Project. In response to its FR announcement, BLM received 20 nominations for parcels of public land to be leased in Colorado, Utah, and Wyoming. The initiative was subsequently endorsed by Congress in the Energy Policy Act of 2005, Public Law 109-58 (H.R. 6).

An interdisciplinary team, consisting of representatives from the three states (Colorado, Utah, and Wyoming), the Department of Energy, the Department of Defense, and BLM staff members from the affected states, considered the potential of each nomination based on the following criteria prior to recommending proposals for eligibility in the oil shale recovery RD&D program:

- The nomination's potential to advance oil shale technology.
- The nomination's economic viability.
- The nomination's potential environmental effects.

Ultimately, of the 20 nominations received, 6 were accepted and 14 were rejected. Five potential RD&D Projects and the corresponding leases are located in Colorado and OSEC's project is located in Utah.

The RD&D site proposed by OSEC encompasses a 160-acre tract and associated preference right to an additional contiguous area of 4,960 acres as established in the FR notice. The 160-acre tract encompasses a portion of the former White River Oil Shale mine site developed in the early 1980s. The 160-acre lease tract is described as follows:

T. 10 S., R. 24 E., SLM, Utah.
Sec. 22, E½SE¼SE¼SW¼, NE¼NE¼SE¼,
S½ NE¼SE¼, S½ NW¼SE¼,
SW¼SE¼, W½SE¼SE¼;
Sec. 27, NW¼NE¼, E½NE¼NE¼NW¼.

Containing 160.00 acres, more or less.

The larger area may be converted to a commercial lease at a future time after additional BLM review and approval. Upon OSEC's successful production of commercial quantities of shale oil and a determination by BLM that commercial scale operations can be conducted, subject to mitigation measures to be specified in stipulations or regulations, without unacceptable environmental consequences, BLM will non-competitively convert the preference right acreage into a commercial oil shale lease for fair market value. Separate environmental review of the larger preference right acreage would occur at that time because the terms and conditions of the RD&D lease do not guarantee the issuance of the additional 4,960 acres or the conditions under which such lands would be leased. Leases will be issued with sufficient terms and conditions to allow BLM to monitor for and prevent unnecessary and undue degradation to public lands. This Environmental Assessment (EA) addresses only the 160-acre nominated lease site and the associated utility rights-of-way and the Plan of Operations for the RD&D Project proposed by OSEC, and does not analyze additional impacts or development potential associated with the preference right acreage.

In accordance with the National Environmental Policy Act (NEPA), the OSEC proposal (Proposed Action) will be thoroughly analyzed in this EA. Based upon the results, BLM will decide whether a 160-acre lease will be issued to OSEC for research, development and demonstration of oil shale recovery technology, and whether to authorize such activities. If BLM exercises its discretion to issue an oil shale RD&D lease, the lease will be conditioned with sufficient terms to allow BLM to monitor for and prevent unnecessary and undue degradation to public lands.

Section 369 of the Energy Policy Act of 2005, Public Law 109-58 (H.R. 6), enacted August 8, 2005, also directs the Secretary of the Interior (the "Secretary") to complete a programmatic environmental impact statement (PEIS) for a commercial leasing program for oil shale and tar sands resources on public lands with an emphasis on the most geologically prospective lands within each of the states of Colorado, Utah, and Wyoming. On December 13, 2005, the BLM published a Notice of Intent in the Federal Register initiating a PEIS to support a commercial oil shale and tar sands leasing program on federal lands in these three states. This program is being pursued by BLM in addition to the RD&D program. The scope of the PEIS will include an assessment of environmental, social, and economic impacts of leasing oil shale and tar sands resources, including foreseeable commercial development activities on BLM-administered lands located in Colorado, Utah, and Wyoming; discussion of relevant mitigation measures to address these impacts; and identification of appropriate programmatic policies and best management practices to be included in BLM land use plans. The PEIS will address land use plan amendments in the affected resource areas to consider designating lands as available for oil shale and tar sands leasing and subsequent development activities.

### 1.3 Purpose(s) of and Need for the Proposed Action

The Uinta Basin of northeastern Utah contains substantial oil shale resources on public lands. The Department of the Interior has identified the need to research and demonstrate on a pilot scale, within the next ten years, the technical, economic and environmental feasibility of technology to extract liquid energy fuels from oil shale on public lands. The purpose of the Proposed Action is to lease 160 acres of public land for a research, development and demonstration project that will inform and advance knowledge of commercially viable production, development and recovery technologies consistent with sound environmental management. Leasing this 160-acre parcel for OSEC's project will also contribute to information which BLM and other agencies can use to develop strategies for managing environmental effects of, and enhancing community infrastructure for, orderly development of oil shale resources and for rulemaking addressing commercial oil shale leasing.

OSEC's objective is to research, develop and demonstrate the use of surface retorts to extract oil from shale. By addressing this RD&D Project in three phases, the technical feasibility and economical and environmental impacts of shale oil production can be assessed, allowing negative impacts to be evaluated and eliminated or minimized before full-scale production begins. The three phases are progressively more complex and build on knowledge learned from each phase. This methodical approach allows development of the final design for each succeeding phase based on the knowledge gained from the previous phase(s).

Recovery of oil from the oil shale, throughout the three phases of the project, will be accomplished using the Alberta Taciuk Process Technology System ("ATP system") in the RD&D Project to study, test and demonstrate that it is a viable method for thermally processing crushed oil shale. A brief overview of the project is provided below.

### 1.4 Project Overview

OSEC proposes to conduct the RD&D Project at the existing White River Mine site in Uintah County, Utah (Figure 1-1). The RD&D Project is designed to demonstrate, through three separate phases of work, the technical, economic, and environmental feasibility of the recovery of synthetic crude oil from oil shale. OSEC's activities at the White River Mine site will involve one federal RD&D lease of 160 acres (referred to as the "160-acre lease area"). This lease area is within the area of the 5,120-acre Tract Ua of the 1974 Federal Prototype Oil Shale Leasing Program. The project will also require rights-of-way for power, a natural gas pipeline, water lines, and existing roadways outside of the 160-acre lease area. The roadways and proposed locations of the rights-of-way are also shown on Figure 1-1. The natural gas pipeline and power line rights-of-way will be necessary for the third phase of the project. As shown on Figure 1-1, there are two alternative rights-of-way for the natural gas pipeline (a western route and an eastern route). The western natural gas pipeline route, roughly following Rt. 45, is the route included in the Proposed Action. The eastern route is included as an alternative. The 160-acre lease area and the proposed utility rights-of-way are referred to as "the Project Area" in this EA.

Phase 1 of the RD&D Project involves the collection of a bulk sample (approximately 1,000 tons) of oil shale for initial process testing in Calgary, Alberta, Canada. This bulk sample will be collected from an existing stockpile within the White River Mine 160-acre lease area and/or from an existing stockpile BLM has established by U.S. Highway 40 for distribution to interested parties for research purposes. The oil shale sample will be crushed at a commercial gravel pit on private land in Uintah County and then transported by truck to Calgary. The oil shale will be processed in a 4-ton/hour ATP pilot plant operated by UMATAC Industrial Processes. UMATAC Industrial Processes, a division of UMA Engineering Ltd., is the company that develops, manufactures and licenses the use of the ATP retort. Approximately 650 barrels (bbl) of raw shale oil will be produced in Phase 1. OSEC will document the results of the process work, and associated tests and analyses (including shale oil yield; shale oil quality; the geochemistry, geotechnical and engineering properties of the spent shale; and air emissions), at the completion of the pilot plant work in Calgary.

Phase 2 of the RD&D Project will involve mobilizing the UMATAC 4-ton/hour ATP pilot plant and associated equipment from Calgary to the White River Mine lease area. Following reassembly of the pilot plant, OSEC will begin processing oil shale and producing raw shale oil, using shale feed sourced from an existing surface stockpile on the lease area. During this phase, OSEC also plans to reopen the existing underground White River Mine and begin mining fresh shale for use as retort feed during the latter part of Phase 2. Approximately 10,000 tons of oil shale will be processed during Phase 2, resulting in approximately 6,000 bbl of raw shale oil. OSEC will document the results of the pilot test work and will use these results as design criteria for the Phase 3 demonstration-scale study.

Phase 3 of the RD&D Project will involve the design, permitting and construction of a 250-ton/hour ATP demonstration plant to operate within the lease area. The mine will be sufficiently developed to support the mining of 1.5 million tons/year of oil shale, which will be used as feed for the operation of the ATP plant. Following construction and commissioning, the ATP plant will process an estimated 2.7 million tons of oil shale feed and generate approximately 1.8 million bbl of raw shale oil over a two-year operational test period.

OSEC recognizes that other companies with retort technologies might be engaged in similar research and demonstration activities and that these technologies might prove viable over time. To that end, OSEC has offered to supply White River Mine oil shale feedstock to other oil shale research and demonstration projects. As indicated in its application to BLM for the RD&D lease, OSEC will initially supply oil shale to other oil shale research groups, as may be requested, from the existing 50,000 tons of stockpiled oil shale on the surface of the White River Mine leasehold. It will supply this oil shale for pickup at the mine at OSEC's cost of loading the oil shale into a truck. Once OSEC reopens the mine, it is proposing to supply newly mined oil shale for pickup to other research projects at OSEC's cost plus a reasonable rate of return.

#### 1.4.1 Prior Development – The White River Shale Project

Oil shale development within the 160-acre lease area first began in the mid-1970s with the White River Shale Project ("WRSP"), a joint project of Phillips Petroleum Company, Sunoco Energy Development Company, and Sohio Shale Oil Company. Leases for the mine were issued in 1974 as part of the Federal Prototype Oil Shale Leasing Program. Mine development started in 1982 with the sinking of a vertical 1,058-foot deep, 30-foot diameter, concrete-lined main shaft and the driving of a 4,574–foot long, three-segment decline to the Mahogany zone mining horizon (one of the richest sections of oil shale in the Green River Formation). The overlying Birds Nest Aquifer was grouted off in the shaft and the decline to minimize water inflow into the mine. Underground workings developed by WRSP included a crusher station, a rock mechanics test room and other supporting entries. Two other mine openings include a 16-foot diameter ventilation shaft and a 5-foot diameter utility raise.

Primarily for economic reasons, WRSP terminated the project in 1985 before constructing a retort. The mine was never fully commissioned nor fully equipped for production. The leases were relinquished with responsibility for the mine and surface facilities being assumed by the BLM in 1986. After maintaining the mine for a number of years, the BLM decided to abandon the mine and a closure plan was developed. In 1996, under the direction of the BLM, a 10-foot thick concrete bulkhead was placed in the lower decline below the Birds Nest Aquifer; the main exhaust fan installation was removed; the mine hoist and headframe were removed from the 30-foot diameter shaft; the 16-foot diameter ventilation shaft and the 5-foot diameter shaft were capped with reinforced concrete; the decline portal was plugged; 1.5 miles of the power line were removed; and several small support buildings were removed. A methane explosion occurred during the closure of the 30-foot diameter main shaft, resulting in a fatality, and the decision was made not to complete the capping of this shaft. The shaft area is currently surrounded by a barbed-wire-topped chain link fence and chain link fence also covers the shaft opening.

The prior WRSP mine development at the site disturbed a total surface area of approximately 200 acres on the RD&D lease and surrounding areas, including the access road from Utah State Highway 45. Approximately 50 percent of the disturbed area is on the 160-acre RD&D leasehold. In the disturbed areas, all topsoil and natural vegetation were stripped from the surface and the natural surface drainage patterns were significantly modified.

#### 1.4.2 Remaining On-Site Facilities

Miscellaneous infrastructures currently remain at the site from the prior activities, including a mine services building (25,800 square feet), a microwave communications facility, a switchgear building, helicopter pad, water treatment plant and storage tanks, a sewage treatment plant, power lines, and a polyethylene-lined treated effluent holding pond. In addition, surface stockpiles of oil shale mined in the prior development of the mining level (approximately 50,000 tons) are located on-site and topsoil stripped from the surface has been stockpiled in surface piles to the south, north, and northeast of the main shaft (over 200,000 cubic yards).

As part of the prior mine development, a large earthen retention dam with clay core was constructed in a wash downslope of the site. The abutments are grouted to minimize leakage. A small seepage retention dam is immediately downstream. All runoff from the site currently drains to the earthen retention dam where runoff water and associated suspended sediments are retained. The retention dam has a capacity of 211 acre-feet, which is sufficient to retain runoff from a 100-year storm event (3 inches in 24 hours). Specifically, the dam captures runoff from the two catchments (total area 850 acres) which drain the mining and processing areas. This includes all areas within the 160-acre lease area.

During 1983, WRSP signed an agreement with the State of Utah for the use of up to 3,000 acre-feet per year of water. This was to be sourced from water wells drilled into the White River alluvial deposits. An access road to the river, two wells and a pump house were constructed and operated as part of the mine development works. This system was designed to provide 200 gallons/minute of water to the project. In 1983, erosion of the river bank threatened the water wells and pipe work. Riprap was placed along 1,000 feet of the bank to protect the wells and pump house. The wells are currently sealed but the infrastructure remains in place. The previous water withdrawal agreements for these wells are expired or have been terminated.

### 1.5 Conformance with BLM Land Use Plan

The Proposed Action and all alternatives are within the area covered by the Book Cliffs Resource Management Plan and Record of Decision (1985) (referred to hereafter as the "Book Cliffs RMP"). The BLM land management decisions for the Project Area are governed by the Book Cliffs RMP. One objective of the Book Cliffs RMP is to lease oil shale while protecting or mitigating other resource values. The Proposed Action and alternatives (including the utility rights-of-way) presented in this EA are consistent with the land management decisions of the Book Cliffs RMP. Some of those decisions are listed below:

- **Fire Management:** BLM uses fire management categories to assist in determining appropriate fire treatment response based on possible impacts of wildfires. The Project Area is classified as a Category B – unplanned fire is not desired because of current conditions. The Fire Condition Class of a given area pertains to the risk of a catastrophic wildfire occurring based on historical information. The Project Area is considered Category 3 (High Risk).

- **Paleontology:** Condition 1 (high sensitivity) – there are known sites within 1 mile of the 160 acre lease.

- **Travel/OHV:** The 160-acre lease is currently categorized as Open relative to Off-Highway Vehicle (OHV) use. Portions of the proposed utility rights-of-way are located with or adjacent to areas classified as limited or closed to OHV use.

- **Visual Resource Management:** The 160-acre lease is within areas categorized as Class III and IV. The area along the White River to the north of the lease area where the utility rights-of-way will cross the river is Class II. Other areas along the utility rights-of-way are Class III or IV.

The OSEC RD&D proposal is in conformance with the management direction provided in the Book Cliffs RMP.

### 1.6 Relationship to Statutes, Regulations, or Other Plans

The proposed development will be consistent with all applicable Federal and State statutes and regulations, including, but not limited to:

- The Energy Policy Act of 2005, which, among other things, specifies that oil shale resources should be developed to reduce the nation's dependence on imported oil and directs the BLM to make available appropriate public lands for research, development and demonstration projects.

- The Mineral Leasing Act of 1920, as amended, which removed oil shale from the claim-patent system of the 1872 Mining Law.

- The Federal Land Policy and Management Act (FLPMA), which is the primary legislation governing how BLM manages land under its jurisdiction.

- The National Environmental Policy Act (NEPA), which requires an assessment of potential environmental impacts prior to conducting major activities on federal lands.

- The Endangered Species Act (ESA), which regulates activities that may impact threatened or endangered species.

- The National Historic Preservation Act (NHPA), which provides protections to historically significant resources.

- The Wild & Scenic Rivers (WSR) Act, which provides protection to specially designated segments of certain rivers to preserve their wild, free flowing quality.

The terms of the RD&D lease require that OSEC submit a plan of operations in accordance with the requirements of 43 CFR Part 3590 for BLM's review and approval before conducting any operations on the leased lands. This plan must include a description of best management practices for environmental mitigation and reclamation. Any plan approval will include consideration of Native American Trust resources and consultation as required by BLM policy.

Under various federal and state regulations, the proposed development may be subject to various permitting requirements. These include:

- A National Pollutant Discharge Elimination System (NPDES) permit, as administered by the United States Environmental Protection Agency (USEPA) for the discharge/disposal of mine water;

- Air emissions permitting under the Clean Air Act (New Source Review, PSD, and Title V permitting) as administered by the USEPA and the State of Utah;

- A Notice of Intent to Commence Large Mining Operations issued by Utah's Department of Natural Resources Division of Oil, Gas and Mining (DOGM);

- Storm Water permitting, including a UPDES Construction Storm Water Permit, administered by the Utah DWQ;

- Mine-related Health & Safety Permits as required by the U.S. Mine Safety and Health Administration (MSHA);

- Any construction or soil erosion/sediment control permits required by State or Local entities;

- U.S. Army Corps of Engineers permit for discharge of dredged or fill material into wetlands or waters of the United States or for any structure crossing a navigable water; and

- Water rights to withdraw water from surface or ground water sources.

OSEC will obtain the necessary permits and authorizations prior to initiating the covered activities at the site, which will commence in either Phase 2 or Phase 3 of the project.

A draft resource management plan (Draft Vernal RMP) has been prepared for the Vernal Field Office area to replace the Book Cliffs RMP. The draft was issued for public comment in January 2005. Until the draft is finalized and a record of decision is signed, the management of the area is subject to the Book Cliffs RMP. However, NEPA prohibits actions that would limit the BLM's choice of reasonable alternatives in the ongoing planning process (40 CFR 1506.1.a.2). The Draft Vernal RMP considers four alternatives, with varying management prescriptions based on the desired outcome (balanced use, emphasis on resource development, emphasis on resource protection, and maintenance of the current management approach). The RD&D Project would not preclude any of these alternatives as the mine and many of the facilities already exist, and because the Project Area will not be closed to mineral leasing under any of the alternatives considered in the Draft Vernal RMP.

The Draft Vernal RMP was reviewed during the preparation of this document. This review indicates there are no conflicts. Under Alternative A (the preferred alternative), oil shale extraction would be open within 299,831 acres of known oil shale leasing areas. The OSEC lease area lies wholly within this acreage which is open under all four alternatives considered in the draft RMP.

Section 2.4.8.1 of the Draft Vernal RMP (p. 2-19) states that the goals and objectives for mineral and energy resources are to "Continue to meet local and national non-renewable and renewable energy and other public mineral needs and ensure a viable long-term mineral industry related to energy development while providing reasonable and necessary protections to other resources." In this section, it is further noted that the BLM would "encourage and facilitate the development by private industry of public land mineral resources in a manner that satisfies national and local needs and provides for economical and environmentally sound exploration, extraction and reclamation practices." In addition, it is proposed that the Draft Vernal RMP will be consistent with national energy policy by "recognizing the need for diversity in obtaining energy supplies." These preceding statements strongly indicate that the development of oil shale resources within the Vernal Resource Area supports the goals and objectives of the Draft Vernal RMP.

The Draft Vernal RMP discusses goals and objectives for other resources which could be affected by the proposed development. Following is a list of the goals and objectives which would be most relevant to OSEC's RD&D Project:

- "Ensure that authorizations granted to use public lands and BLM's own management programs comply with and support applicable local, state, and federal laws, regulations, and implementation plans pertaining to air quality." (Draft Vernal RMP section 2.4.2, p. 2-5).

- "BLM would apply and comply with water quality standards established by the State of Utah (R.317-2) and the Federal Clean Water and Safe Drinking Water Acts." (Draft Vernal RMP section 2.3.1, p. 2-2).

- “Desired species, including native, threatened, endangered, and special status species, are maintained at a level appropriate for the site and species involved.” (Draft Vernal RMP section 2.3.1, p. 2-2).

- “Control noxious weed or insect infestations.” (Draft Vernal RMP section 2.4.15.1, p 2-33).

- “Maintain or improve the scenic quality of the landscape and design and mitigate visual intrusions consistent with the objectives established for the specific visual resource management classes.” (Draft Vernal RMP section 2.4.16.2, p. 2-36).

- “Dangerous sites, structures, roads, or other facilities (e.g., abandoned mines) would be stabilized or closed if it is determined that they are a public hazard.” (Draft Vernal RMP section 2.3.2.1, p. 2-2).

As well as being in conformance with the Books Cliff RMP, the RD&D Project is designed to meet the stated goals and objectives of all of the alternatives presented in the Draft Vernal RMP with regard to protection of environmental resources. Where appropriate, this EA describes the impacts with respect to the Draft Vernal RMP in addition to comparison to the existing Book Cliffs RMP.

### 1.7 Identification of Issues

The RD&D Project is designed to provide information to better understand the technical, economic and environmental feasibility of shale oil production from oil shale in the western United States. Major components of the proposed project with the potential for environmental impacts and which are considered in the EA include:

- Oil shale mining, including the mining methods, quantity of material mined, and the surface handling, crushing and stockpiling of the raw oil shale;

- Oil shale processing in the ATP retort, which will include production of crude shale oil, generation of air emissions, and generation and handling of spent shale and wastewaters. In addition, the ATP plant will use energy from natural gas or propane and electricity from the nearby Bonanza Power Generation plant;

- Shale oil secondary treatment such as hydrotreatment, which will generate air emissions and minor quantities of solid and liquid wastes;

- Handling, storage and disposal of spent shale, process water and other wastes;

- Infrastructure development, including water and energy supplies, water and sewer treatment facilities, and other on-site construction activities; and

- The Phase 3 construction of an ATP demonstration-scale plant and the installation of utilities along rights-of-way off-site represent the largest infrastructure development activities.

The key environmental issues to be addressed include potential impacts from (1) air emissions; (2) wastewater generation and treatment; (3) water supply and usage; (4) energy supply construction and usage (electricity, propane and natural gas); (5) material and waste handling (including spent shale); and (6) site operational management (e.g., mine dewatering, mine ventilation, dust from crusher).

NEPA requires specific evaluation of potential impacts on resources of concern. To identify these resources of concern, various scoping activities were completed in early 2006. The scoping activities completed to date included the preparation and submittal of the workplan dated February 17, 2006, the April 3 and 4, 2006, site visit and meeting with the BLM, and a subsequent April 17, 2006, scoping meeting with the BLM. A public information session was also held by BLM and OSEC on May 17, 2006. Based on the scoping process, a list of those elements which did not require further consideration in the EA is provided in Appendix A along with the rationale used for dismissing each element from further analysis. The resources of concern that BLM determined did not require detailed analysis for the Project Area included:

- Environmental Justice
- Farmlands (prime or unique)
- Fuels/ Fire Management
- Lands/Access
- Rangeland Health Standards and Guidelines
- Wilderness
- Wild Horses and Burros
- Woodland/Forestry

There are certain resources of concern that were determined through the scoping process to not be of concern for the 160-acre lease but which need evaluation as part of the EA due to the off-site activities along the proposed utility and transportation rights-of-way. Based on information available, surveys for cultural and paleontological resources were conducted along the proposed rights-of-way as part of this EA to determine if any such resources were present that might be affected by the proposed rights-of-way activities. In addition, the potential impacts on visual resources along the rights-of-way from the construction of water, natural gas, and electric lines are evaluated in this EA. Presented below is a summary of the resources of concern that are evaluated in detail in this EA.

### 1.7.1 Air Quality

The OSEC RD&D Project will generate air emissions associated with mining activities, feed preparation and handling, the ATP retort, and gas and oil processing steps. These emissions have the potential to impact regional and local air quality. Specific emissions that are evaluated in this EA include:

*Mine*

- Fugitive particulate emissions from mine opening activities during Phase 2.
- Fugitive particulate emissions from mining activities during Phases 2 and 3.
- Methane gas mine emissions.
- Fuel combustion emissions from vehicles and machinery.

*Feed Preparation and Handling*

- Particulate matter (PM) emissions and odors from crushing and screening equipment.
- Fugitive PM emissions from the shale storage piles.
- Volatile organic compound (VOC) emissions from the oil storage tanks and truck loading operations.

*Retort*

- Products of combustion including PM, $SO_x$, $NO_x$, VOC, CO, and $CO_2$[1, 2].
- Trace contaminants including ammonia, metals, and products of incomplete combustion.
- Fugitive PM emissions from the spent shale handling and storage.

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1 The ATP retort generates a certain quantity of greenhouse gases, including $CO_2$, from combusting spent shale coke to provide heat for the retort. By direct transfer of heat from the hot spent shale with the pre-heated raw oil shale in the reaction zone, $CO_2$ emissions are minimized as compared with concepts of other retorts that use make up energy sources to produce the heat for retorting. Indirect heating, for instance through electric heat, to provide the heat necessary to drive the retort process is less efficient (i.e., relative to the useful Btu energy per mass of fuel combusted).

2 Although not a criteria pollutant, $CO_2$ will be addressed in the EA process. OSEC understands that a Programmatic EIS is being developed by the BLM to address commercial scale shale oil development and that emissions of greenhouse gasses will be addressed in that document.

*Gas and Oil Processing*

- VOC emissions from the oil processing and handling equipment.
- VOC emissions from oil storage tanks.
- Non-condensable light ends, including CO, $CO_2$, and $H_2S$.

### 1.7.2 Wastes (Hazardous and Solid)

Construction, mine development, mining, oil shale processing and shale oil upgrading activities of the project will all produce wastes. The solid and liquid wastes generated by the RD&D Project have the potential, if inappropriately handled and treated, to adversely impact air quality and surface and ground water resources in the area. In this EA, the following specific waste issues were evaluated to assess potential environmental impacts:

*Solids*

- Spent shale.
- Solids produced as part of the mine reopening works.
- Construction wastes generated during construction of facilities on the lease.
- Sulfur and nitrogen wastes from recovery and secondary processing of raw shale oil.
- Spent catalysts from shale oil hydrotreatment.

*Liquids*

- Mine water.
- Waste oils.
- Product waters from shale oil retorting (connate and retort water, defined in Section 2).
- Process wash down water.
- Sewage effluent.

### 1.7.3 Water Resources

Several aspects of the RD&D Project that have the potential to impact the water resources at and in the vicinity of the site include mine development (and its potential impact at the surface and on the Birds Nest Aquifer), water supply requirements, storm water runoff waste management practices, environmental management practices, the long-term environmental effectiveness of spent shale disposal structures, and rehabilitation and revegetation practices and success. The following factors were examined as part of this EA to determine potential impacts to water resources:

- Impacts of mining on the Birds Nest Aquifer.
- Impacts of water supply requirements on the White River.
- Impacts of wastewater (e.g., precipitation, run off) discharges and leachate from spent shale impoundments on the surrounding water resources.
- Drawdown of the local water table affecting water supply wells in the vicinity of the mine site.
- Impacts on flows of springs which recharge the White River, Evacuation Creek, and Bitter Creek.
- Decreases in flow in the White River which could potentially impact threatened and endangered fish species in the Colorado River system.
- Erosion and sedimentation impacts associated with the construction and operation of the water wells at the river.
- Decreases in water available for existing uses.

### 1.7.4 Soils

Construction and waste disposal activities as part of the RD&D Project have the potential to impact soils on-site and in designated rights-of-way. This EA has evaluated the following elements to determine the potential impacts to area soils:

- Runoff causing erosion.
- Dispersion and compaction of soils due to construction and resulting impacts on vegetation.
- Potential for accidental spills or leaks of petroleum products and hazardous materials during construction resulting in soil contamination and an associated decrease in soil fertility and revegetation potential.

### 1.7.5 Geology/Mineral Resources/Energy Production

Disturbance of the land surface, stockpiling of waste materials, mining activities, and retort operations will have an effect on the geological environment of the area. The mining activities have the potential to affect future use of the site for other types of energy production or mineral exploitation. This EA has examined the following elements to determine the potential impacts to the geology, mineral resources, and energy production of the area:

- Potential for landslides due to on-site operations and construction in designated rights-of-way.

- Potential for debris flows and rockfalls due to on-site operations and construction in designated rights-of-way.
- Potential for an earthquake to impact operations or infrastructure associated with the RD&D Project.
- Presence and impact on other local mining activities.
- Presence and impact on other local energy production ventures.

### 1.7.6 Flood Plains

The area along the White River contains relatively narrow alluvial banks and terraces that flood during periods of high flow (i.e., flood plains). Although the flood plains do not occur within the 160-acre lease area, ground water wells, possible water supply lines, and gas and power lines are planned to be installed along rights-of-way during the RD&D Project. Potential effects on the floodplain as a result of these activities along the utility rights-of-way are examined in this EA. The following aspects have been evaluated to determine potential impacts to floodplains:

- Impacts of water well development in the vicinity of the White River.
- Potential impacts of installing power and gas lines which will cross the flood plain.

### 1.7.7 Wetland/Riparian Zones

There are no wetlands or riparian zones in the 160-acre lease area. However, the White River alignment is a riparian zone and activities along the various utility rights-of-way which cross the White River could have impacts on this area. In this EA, the following have been evaluated to determine potential impacts to the White River riparian zone and associated wetlands:

- Discharges from the 160-acre property.
- Well development and pumping in the vicinity of the White River.
- Construction and maintenance activities for the possible water supply, power and natural gas lines.

### 1.7.8 Threatened/Endangered (T&E) Wildlife Species

Aspects of the project have the potential to impact threatened or endangered wildlife species if any are present in the area or if the site or identified rights-of-way are considered suitable habitat for threatened or endangered species. Following is a list of animals that were identified by the BLM as present in Uintah County and that have been considered during the completion of this EA:

- *Bald Eagle* (Threatened) – Suitable bald eagle habitat exists in the Project Area. Both potential nesting and roosting habitat have been identified along the White River but no active bald eagle nests are known to occur in Uintah County. Although bald eagles are listed as a threatened species, they are presently being considered for delisting.

- *Black-footed ferret* (Endangered) – The only black-footed ferret population that exists in Uintah County is designated as experimental and was introduced into Coyote Basin approximately seven miles north of the project area. Potential adequate habitat in the Project Area would be any white-tailed prairie dog town greater than 200 acres. There are no prairie dog towns present on the 160-acre lease site and no active towns were located along the proposed rights-of-way.

- *Canada Lynx* (Threatened) – The Project Area is not suitable habitat for this species.

- *Mexican Spotted Owl* (Threatened) – Suitable habitat for the owl does not exist within 0.5 mile of the 160-acre lease or the proposed utility rights-of-way.

- *Yellow-billed Cuckoo* (Candidate) – Habitat for this species would typically be found in riparian zones along major rivers such as the White River. The 160-acre lease is approximately one mile south of the river.

- *Bonytail chub, Colorado pikeminnow, Humpback chub, and Razorback sucker* (Endangered) – These four Colorado River fish have critical habitat within Uintah County. The White River is included in the upper Colorado River Basin. As part of this EA, water withdrawals associated with the project as well as other potential impacts on these fish from sources such as dam failure are evaluated with regard to the criteria described in the pertinent fish recovery plans.

### 1.7.9 Fish and Wildlife Including Special Status Species other than USFWS Candidate or Listed Species

Because of the development of a water supply, the construction activities and site operations, aspects of the project have the potential to impact fish and wildlife in the area.

The following species (including Special Status Species, excluding those listed as U. S. Fish and Wildlife Services (USFWS) candidate or listed threatened and endangered species) were identified in consultations with the Vernal Field Office (VFO) of the BLM. These species could be affected by the RD&D Project if they are present in the Project Area. The fish and wildlife that have been considered during the completion of this EA include:

- *Ferruginous Hawk* (BLM Sensitive Species) – Afforded a 0.5 mile timing stipulation limitation (TSL) from March 1 through July 15. Surveys for ferruginous hawk nests were included as part of the 2006 raptor surveys and will be included in future surveys conducted during the appropriate time period (March 1 – July 15) prior to construction.

- *Raptors* – Afforded protection under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. Surveys for all raptors within 0.5 mile of the Project Area were conducted as part of this EA.

- *Migratory Birds* - All birds are protected under the Migratory Bird Treaty Act except for European starlings, rock doves (common pigeons), and house sparrows. Birds commonly referred to as upland game birds such as pheasants, chukers, and grouse are also not covered under the Migratory Bird Treaty Act but are managed by the Utah Division of Wildlife Resources.

- *Townsend's big-eared bat* – A BLM sensitive species adapted to living underground in caves and mines.

- *Big game* – Including elk, mule deer, and antelope. The habitat assessment completed as part of this EA was designed to determine if designated crucial winter range was present on the 160-acre lease or along the proposed utility rights-of-way.

### 1.7.10 Threatened/Endangered (T&E) Plant Species

Aspects of the project have the potential to impact threatened or endangered plant species. Following is a list of plants that were identified by the BLM as present in Uintah County and that have been considered during the completion of this EA:

- *Clay reed-mustard* (Threatened) - Suitable habitat does not exist in the 160-acre lease or along the proposed rights-of-way.

- *Graham's beardtongue* (Proposed) - There is no habitat for Graham's beardtongue on the 160-acre lease. A rare plant survey will be conducted along the rights-of-way during the appropriate time period prior to the start of construction activities.

- *Horseshoe milk-vetch* (Endangered) - Suitable habitat does not exist in the 160-acre lease or along the rights-of-way.

- *Shrubby reed-mustard* (Endangered) - Suitable habitat does not exist in the 160-acre lease or along the rights-of-way.

- *Uinta Basin hookless cactus* (Threatened) - There is no habitat for Uinta Basin hookless cactus on the 160-acre lease. A rare plant survey will be conducted along the rights-of-way during the appropriate time period prior to the start of construction activities.

- *Ute ladies'-tresses orchid* (Threatened) - There is no habitat for Ute ladies'-tresses orchid on the 160-acre lease area. However, habitat may exist along the White River.

- *White River beardtongue* (Candidate) - There is no habitat for White River beardtongue on the 160-acre lease area. A rare plant survey will be conducted along the rights-of-way during the appropriate time period prior to the start of construction activities.

### 1.7.11 Vegetation Including Special Status Species other that USFWS Candidate or Listed Species

Construction, operational and waste disposal activities conducted as part of the RD&D Project have the potential to impact local vegetation. Also, one special status species (Huber pepperweed) was identified as having the potential to be affected by the RD&D Project if it is present in the Project Area. This EA will examine the following elements to determine the potential impacts to area vegetation:

- Loss of vegetation due to activities on the 160-acre lease including construction and stockpiling.
- Loss of vegetation due to installation of ground water wells, water pipelines, electrical lines, and gas lines along designated rights-of-way.

- Potential revegetation activities.
- Weed invasion impacts to native vegetation.
- Presence of special status plant species - One special status plant species (Huber pepperweed) may occur within the Project Area. The habitat assessment was designed to determine whether specific surveys would be required. Flowering periods typically range from May through September.

### 1.7.12 Invasive, Non-native Species

Human activity, soil disturbance, and vehicle or construction activities can increase the spread and establishment of invasive plant species at a site. Soils on-site will be disturbed by the mining, oil shale processing and spent shale disposal activities, and vehicular traffic. In addition, installation of the water supply, power and natural gas lines will disturb soils along these rights-of-way. In this EA, the following factor has been evaluated to determine potential impacts of invasive, non-native species:

- Presence of invasive, non-native species in the lease area and along specified rights-of-way.

### 1.7.13 Recreation

Access roads, surface or ground water withdrawal equipment, and on-site activities may have an effect on recreational usage of the area by limiting area access and disrupting the scenic views of the area. Construction activities along the rights-of-way where they cross the White River may affect recreational uses of the White River (fishing, rafting). This EA has examined the following elements to determine the potential impacts to recreational uses of the area:

- Access to the area by Off-highway Vehicles (OHV).
- Location of access roads and water wells.
- Potential drawdown of the White River as a result of well pumping and the effect on recreational river usage.

### 1.7.14 Visual Resources

The construction and permanent installation of the utilities could potentially cause visual intrusions and impact scenic quality along the rights-of-way. In assessing the potential impacts of the utility rights-of-way, the following was considered:

- The BLM-defined visual resource inventory classes of the lands being crossed by the proposed utilities and the allowed levels of visual intrusion for these lands, both under the existing Book Cliffs RMP and the Draft Vernal RMP.

### 1.7.15 Cultural Resources

Previous studies confirmed that no known cultural resource sites are located within the 160-acre lease. The construction activities and disturbance along the proposed utility rights-of-way have the potential to affect archaeological sites, if such sites are present along the proposed rights-of-way. As part of this EA, available data sources were reviewed and site reconnaissance along the rights-of-way was completed to determine the presence of any such resources that might be impacted. Specific factors evaluated included:

- Proximity of any identified resources.
- Nature of proposed activities along rights-of-way.

### 1.7.16 Paleontological Resources

Previous studies indicated that no known paleontological resource sites are present at the surface within the 160-acre lease. The construction activities and disturbance along the proposed utility rights-of-way have the potential to affect paleontological sites, if such sites are present along the proposed rights-of-way. As part of this EA, available data sources were reviewed and site reconnaissance along the rights-of-way was completed to determine the presence of any such resources that might be impacted. Specific factors evaluated included:

- Proximity of any identified resources.
- Nature of proposed activities along rights-of-way.
- Potential for destruction of paleontological resources during mining.

### 1.7.17 Socio-economics

The RD&D Project will require local staff during Phase 2 and 3 and will therefore impact the socio-economics of the area. This EA will examine the following elements to determine the potential impacts to the socio-economics of Uintah County:

- Employment opportunities due to mine reopening and retort work.
- Potential population increases as a result of project employment.

- Long-term effects of the continuation or termination of the project to the community.
- Need for new infrastructure and services.

### 1.7.18 Special Designation Areas

Currently, under the Book Cliffs RMP, there are no Wild & Scenic River segments, Areas of Critical Environmental Concern (ACEC), Wilderness Areas, or Wilderness Study Areas in the vicinity of the Project Area. However, as discussed below, certain portions of the White River and Evacuation Creek are being considered for inclusion in the Wild & Scenic River system and for designation as an ACEC under certain alternatives considered in the Draft Vernal RMP.

***Wild & Scenic Rivers***

Under certain alternatives being considered in the Draft Vernal RMP, segments of the White River and Evacuation Creek would be proposed for inclusion in the Wild & Scenic River system. A portion of the White River is being evaluated for suitability for inclusion in the Wild & Scenic River system as a scenic segment. In addition, a portion of Evacuation Creek is being evaluated for suitability for inclusion in the Wild & Scenic River system as a recreation segment. The 160-acre lease site is not in or adjacent to the Wild & Scenic River segments, but the utility rights-of-way would be adjacent to or cross both the White River and Evacuation Creek segments. To assess the impacts of the proposed development on the potential Wild & Scenic River designation, the following factors were reviewed:

- The specific boundaries of the areas which may be designated as eligible for inclusion.
- The allowed activities under the Wild & Scenic Rivers Act for such areas.
- The nature of proposed activities along the rights-of-way which cross any such areas.
- The effect on the free-flowing nature of the river.

***Areas of Critical Environmental Concern***

Under BLM’s Draft Vernal RMP, portions of the White River (and adjacent lands) have been identified as a potential Area of Critical Environmental Concern to protect unique geologic formations with scenic values and high-value river riparian ecosystems. The lease area is located adjacent to the potential White River ACEC. The possible development of a water supply from the White River or associated alluvial deposits, and construction activities associated with the installation of the power and natural gas lines may affect the potential

White River ACEC.  In the Draft Vernal RMP, the potential Coyote Basin ACEC has been identified because of the presence of populations of white-tailed prairie dog.  This potential ACEC is located approximately seven miles north of the lease site and just north of the terminus of the proposed powerline right-of-way.  In this EA, the following have been evaluated to determine potential impacts to ACECs:

- The exact boundaries, legal descriptions and other pertinent information regarding the potential ACECs.
- Discharges from the 160-acre property.
- Well development and pumping in the vicinity of the White River on the ACEC.
- Activities along the utility rights-of-way that cross the White River ACEC and that are near the Coyote Basin ACEC.

**1.8  Summary**

This chapter has presented the purpose of and need for the proposed project on the 160-acre White River Mine lease site as well as those elements of the environment that could be affected by the implementation of the proposed RD&D Project.  Chapter 2 describes the Proposed Action (mining of oil shale and processing with the ATP retort), as well as alternative actions that were considered consistent with NEPA requirements.  Chapter 3 presents the existing baseline of environmental conditions at the site and surrounding area.  The potential environmental impacts 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

The purpose of OSEC's RD&D Project is the research, development and demonstration of a sound environmental and economical means for extracting crude oil from oil shale deposits. A number of methods were reviewed as possibilities for developing oil shale resources at the existing White River Mine site, including the ATP retort technology, vertical retort systems, and in-situ technologies. In reviewing the economic feasibility, performance capabilities (e.g., oil yield, operability), and the level of current knowledge regarding environmental emissions, energy efficiency and waste byproducts, OSEC concluded that the ATP retort technology offered the best opportunity for oil shale development at this site for the following reasons:

(1) UMATAC has over 30 years of experience in the design and operation of both pilot scale and semi-commercial scale ATP retort facilities, including the operation of a demonstration project retort for several years at the Stuart Oil Shale site in Australia that produced approximately 1.5 million barrels of shale oil. The ATP retort thus offers an advanced, proven technology as an excellent place for OSEC to begin its RD&D Project, with less risk of pursuing technological "dead ends" or experiencing unanticipated, adverse environmental outcomes compared to other options.

(2) The energy and material balances involved in the ATP retorting process are well understood, at least for Australian oil shale. OSEC concluded that the energy efficiency of the ATP retort was equal to any other technology currently under development. OSEC reached this conclusion based on technical analysis, including the fact that the carbon left in the shale solids after the available hydrocarbons are liberated (retorted) from the kerogen is subsequently combusted to generate heat to keep the process going. Using the energy generated by the combustion of the retorted, coked shale to heat the fresh shale (as the ATP system does in a zone separate from the retorting reaction) enhances the overall energy efficiency of the process and enables recovery and use of practically all of the BTUs in the feed shale. The technology thus offers an excellent basis on which further improvements in energy efficiency can be developed and incorporated during the three phases of the RD&D Project using Utah oil shale (which is substantially different than Australian oil shale).

(3) The UMATAC experience with the ATP technology includes the successful operations of a small, commercial ATP plant in the United States on four soil remediation projects under the USEPA Superfund Program. For those projects, the ATP system met the environmental performance requirements of the respective states and the USEPA.

(4) A key objective of the RD&D Project is to develop an understanding of how spent shale can be disposed of at the surface in a manner that is economical, environmentally acceptable in the very long term, and practical at high rates of spent shale production. Based on more complete pyrolysis and combustion of the shale feed in the ATP system, it was concluded that the spent shale has a greater likelihood of being environmentally benign than spent shale from most other retorts. Also, because all kerogen is fully retorted in the ATP system and residual coke plus other organics with the shale are combusted in the ATP system, a consistent and predictable solid waste stream is produced.

(5) The ATP retort has the advantage of being able to handle less than ½-inch shale feed including all the fines generated during the mining, crushing and handling prior to processing. This avoids waste of the resource and avoids the need to dispose of non-retorted shale fines (particles less than 0.25 inches) or constructing a separate retort to handle the fines.

(6) The Stuart Oil Shale Project in Australia demonstrated the challenges in scaling up a small pilot plant to a demonstration plant (4 to 250 tons per hour [tph]), particularly with regard to infrastructure requirements. More importantly, however, these difficulties were largely overcome, providing valuable large-scale materials handling experience, and the ATP system was shown to be successful, as demonstrated by the 1.5 million barrels of oil produced by the 250 tph ATP oil shale retort.

(7) In-situ oil shale retorting approaches were deemed inappropriate for the White River Mine site because such methods are most applicable in areas where the oil shale deposits are very thick and the economies of heating large volumes of rock can be achieved. At the White River Mine site, the Mahogany zone is only approximately 100 feet thick and the richest layer is about 10 feet thick. Also, in-situ processes can take years to raise the temperature of the target zones to the necessary temperature to liquefy the kerogen. Finally, the presence of the existing mine makes surface retorting approaches more appropriate than in-situ techniques.

During the three phase RD&D Project, OSEC will research how the ATP surface oil shale processing technology can be improved so as to provide assurance of (a) predictable and safe air emissions employing best available control technologies, even during start-up/shutdown and upset conditions; (b) predictable and complete extraction of recoverable hydrocarbons from the kerogen fraction of the feed oil shale; and (c) a consistent spent shale waste stream. OSEC will investigate how the handling and disposal of spent shale at the surface can be done in such a way that the surrounding surface and ground water resources are not impacted by leaching from the spent shale. OSEC will also work with specialists in taking residual materials, such as spent shale, to possibly find an opportunity for appropriate beneficial use, that could generate a new revenue source and minimize waste disposal on-site. In addition, OSEC is committed to mining the shale safely. It will employ mining strategies that maximize resource recovery; minimize roof caving; ensure no surface subsidence; and minimize any adverse impact on other resources of the region. Mining during the RD&D Project will help OSEC refine mine design elements for the future commercial operations. Finally, OSEC will begin analysis of the feasibility of capturing and sequestering $CO_2$ emissions from the retort.

## 2.2 Alternative A – Shale Oil Recovery using the ATP System and Western Gas Pipeline Right-of-Way (Proposed Action)

OSEC proposes to lease the White River Mine site (160 acres) in Uintah County, Utah to conduct a RD&D Project to test shale oil recovery using the ATP system and to construct the natural gas pipeline through the "western" right-of-way alignment. The three-phase project is designed to demonstrate the technical, economic, and environmental feasibility of producing synthetic fuels from oil shale. Following is a description of the ATP System and the activities involved under each phase of the project.

### 2.2.1 The ATP System

Shale oil recovery will be accomplished using the ATP system, a proprietary technology owned by UMATAC Industrial Processes ("UMATAC"), a wholly-owned division of UMA-AECOM. UMATAC's experience and its existing pilot plant facility, located in Calgary, Alberta, Canada, will be used to support the research and development programs required to establish that the ATP system is an effective, economical, and environmentally acceptable method for thermally processing crushed oil shale mined from the White River Mine site to recover a range of hydrocarbon products and gases.

The ATP system is a thermal process for pyrolyzing the oil shale. The primary unit is the ATP retort, which is a modified horizontal rotary kiln. The ATP retort has four internal zones in which the four stages of processing occur: (1) preheating of the feedstock; (2) pyrolysis of the oil shale under anaerobic conditions; (3) combustion of coked solids to provide the process heat requirements; and (4) cooling of the combustion products by heat transfer to the incoming feed.

The ATP system was originally conceived in 1974 for processing Canadian oil sand. The ATP system has been developed and applied in primary resources (processing of oil sands, oil shales, and heavy oils) and in environmental fields (hazardous organic and hydrocarbon-contaminated soil treatment). A more detailed description of the ATP retort and a schematic diagram of the unit are provided in Appendix B.

### 2.2.2 Phase 1

Phase 1 of the project is expected to last approximately eleven months. During this time, OSEC will remove approximately 1,000 tons of oil shale from the White River Mine on-site surface stockpile for processing at the existing ATP pilot plant unit in Calgary, Canada. Stockpiled oil shale will also be made available to other research groups during this phase of work, with OSEC loading and handling the material.

The 1,000 tons of previously mined shale will be transported by truck from the on-site surface stockpile and/or from an existing gravel pit site in Uintah County where a small amount of shale is currently stockpiled. This shale will be crushed to design specifications (minus 3/8 inch) and transported to the ATP pilot unit in Calgary, Canada. During Phase 1, no crushing of oil shale will be performed within the White River Mine lease area. The exact crushing location has yet to be determined and will depend on which crushing facility has capacity to complete the work at the time the Phase 1 activities are initiated. The existing commercial gravel pits with crushing operations are all located within an approximately 25-mile radius of Vernal, Utah. It is estimated that approximately 40 truckloads (25 tons/load) will be transported to the selected crushing operation. Although the exact route has not been determined, most of the route toward Vernal will be along Highway 45, which is already highly utilized by trucks servicing the oil, gas and mining activities in the area. The total travel distance for each truck will be on the order of 50 to 75 miles. Transport of the shale to the crushing facility is expected to occur over a one to two week period.

The crushed shale (total 1,000 tons) will subsequently be trucked to Calgary for testing by UMATAC in its 4-ton/hour ATP pilot plant. It is expected that a total of 33 to 40 trucks (25-30 tons/load) will be required to transport the crushed shale to Calgary. Although the exact route has yet to be determined, it is anticipated that the route will primarily utilize major highways and Interstates, such as US 40, I-80 and I-15, which already carry significant truck traffic. The total mileage to Calgary from the Vernal area is approximately 1,050 miles.

Approximately 650 bbl of raw shale oil is expected to be produced from the 1,000 tons of oil shale processed. The expected shale oil yield is based on an assumed 92% recovery of oil from feed shale with an average Fischer Assay yield of 30 US gallons/ton. Samples of this oil will be analyzed in Calgary and in the United States. Any oil not needed for testing will be processed or disposed of in the Calgary area by UMATAC.

Approximately 800 tons of non-RCRA hazardous spent shale will be produced from the processing of the 1,000 tons of feed shale. Samples of this material will be retained for testing and analysis in Canada and the United States. The testing will include analyses for both geotechnical properties (e.g., particle size analysis, compaction, permeability) and chemical properties (e.g., chemical analysis of both the spent shale and leachate for total metals, organic compounds (VOCs, SVOCs, and phenols), and major cations). The remaining spent shale will be disposed in a licensed landfill in Alberta, or stored on-site in Alberta pending identification of a beneficial reuse.

No fuel storage, office facilities, overnight accommodations, or drinking water supply will be established at the White River Mine lease area during Phase 1. As a result, no sewage treatment facilities will be required on-site and no wastewater management issues will arise. Sanitation needs while the existing oil shale stockpile is being removed will be taken care of by portable toilet facilities.

Although the loading and trucking operation is not expected to be dusty, some minor amounts of water may be required to control dust during the loading of the shale feed into the trucks at the White River Mine. All water requirements for this phase will be trucked in by a local supplier and dispensed from a water truck. No water rights will be needed for this phase of work. The fugitive dust emissions associated with loading of the oil shale from the existing surface stockpile, road dust, and exhaust emissions from the front end loader and trucks, both short term activities, will be the only air emissions associated with the Phase 1 operations within the 160-acre leasehold.

OSEC will document the results of the Canadian processing work, and associated testing and analyses (including shale oil yield, shale oil quality, as well as the geochemistry, geotechnical and engineering properties of the spent shale), at the completion of the test work in Calgary.

OSEC will complete the planning of the Phase 2 work at the completion of the Phase 1 program. This will include planning for the reopening of the existing underground White River Mine, and the preparation and submittal of all necessary applications for permits and licenses required for the Phase 2 work. No physical preparatory work for Phase 2 activities will be done on-site during Phase 1, although mine characterization work (e.g., mine water testing, mine gas monitoring) may be initiated during Phase 1.

#### 2.2.3 Phase 2

Phase 2 of the RD&D Project will last a total of approximately 14 months and involve the mobilization of the UMATAC 4-ton/hour ATP pilot plant and associated equipment from

Calgary to the White River Mine lease area. Approximately three months of site preparation and setup will be necessary at the beginning of Phase 2 before the processing of oil shale and production of raw shale oil can begin. Shale for processing will initially come from the existing surface stockpiles. OSEC will reopen the White River Mine and begin mining fresh oil shale for use as feed to the plant during the latter stage of Phase 2.

The final design and arrangement of OSEC's Phase 2 facilities will be developed during the permitting process and will incorporate lessons learned during Phase 1. It is currently anticipated that Phase 2 construction will involve a relatively small amount of new construction work on-site. The trailer-mounted ATP pilot plant will be mobilized from Calgary and set up on-site on an impervious base pad. A small group of trailers will house offices, labs, and sleeping quarters, and these will be placed on an existing level area near the pilot plant. A gray water and sewage collection tank will be installed near these trailers; the contents will be trucked off-site regularly. A potable water tank will be placed near the trailers to supply domestic needs; the potable water will be trucked to the site. A 750-barrel (approx. size) capacity process water tank will be installed adjacent to the plant. A fuel tank area will be constructed with a liner and a bermed embankment surrounding it. It is anticipated that two 15,000-gallon diesel fuel tanks will suffice. Two 1,000-gallon propane tanks also will be placed near the pilot plant and another near the trailers. An additional aboveground storage tank area will be established for shale oil product storage and load out; these tanks will sit on a liner within a bermed embankment. There will also be the on-site crushing, stockpiling and ore handling facility.

The major Phase 2 construction activity will involve reopening the mine and constructing a spent shale disposal area. The proposed mine reopening plan is included as Appendix C. The mine will first be restored to a condition similar to what existed at the end of operations in the mid-1980s. During the mine dewatering steps, OSEC will truck contaminated water off-lease. A number of water tanks will be brought on-site to store contaminated water during dewatering and prior to final disposal. These tanks will be placed within a temporary, lined, bermed structure to contain any spilled contaminated water. Water meeting or exceeding water quality standards will be discharged to an existing drainage channel within the 160- acre lease area near the 50,000-ton shale stockpile.

The small spent shale disposal area for Phase 2 is located on Figure 2-1. Approximately 8,000 tons of spent shale will be generated and placed in a small valley impoundment, less than two acres in size. Until the testing and analytical results demonstrate that the spent shale does not need to be isolated from the environment, BLM will require that the disposal area be constructed with an impervious liner and bermed so that surface water runoff will be directed around the impoundment to prevent contact of storm water runoff from other areas of the lease with the spent shale pile. Overall flow will be directed to the gully near the dam. Precipitation falling directly on the spent shale must be contained within the lined disposal area and will be allowed to evaporate. No water will be removed from the containment area unless it meets the approved water standards.

During Phase 2, OSEC will install lysimeters or similar soil moisture/leachate monitoring devices at multiple depths (such as 1, 3 and 5 meters) within the spent shale disposal area. Following rainfall events, the monitoring points will be checked regularly and samples will be collected of any leachate that accumulates in the devices. The samples will be tested for the parameters determined from the Phase 1 analyses. In addition, a storm water monitoring point will be identified to allow sampling of runoff from the Phase 2 spent shale area. This information will allow OSEC to consider the potential for leaching of constituents in designing the Phase 3 spent shale disposal area.

#### 2.2.3.1 Mine Reopening/Operation Activities

Mine reopening activities will include the characterization of current mine conditions, the dewatering of the mine, removal of the plug and bulkhead, and the installation of a ventilation system. Water generated from dewatering activities, if contaminated, will be stored on-site before being trucked by licensed operators to an off-site, licensed treatment or disposal facility. Water meeting water quality standards will be discharged to the on-site drainage channel leading to the dam area.

During mine reopening activities, a front-end loader and track-hoe will be used to excavate the backfilled earth and rock in the portal plug. After completion of portal plug removal, the bulkhead in the decline will be removed using a machine-mounted hydraulic hammer with water sprays for dust control and a machine-mounted hydraulic shear to remove imbedded rebar. Rubble and rebar will be taken off-site to a licensed disposal facility. Prior to and during these activities, all appropriate air monitoring and other safety measures will be undertaken to ensure a safe reopening.

The main shaft will be equipped with a continuous methane monitoring device to log methane levels and provide an alarm in the event of the presence of unsafe methane levels. Surface air, surface water, and ground water will also be monitored in association with mine activities as required by air and water permits.

All mining activities and surface crushing operations will take place within the 160-acre lease area. Oil shale for retort tests will be mined from the area identified during the mine planning stage. The mine will be developed using a two-bench room and pillar method. The blasted ore will be hauled to the surface using front end loaders (LHDs) initially. Eventually, once higher production levels are needed, underground haul-trucks will be utilized for ore hauling. Equipment used during this mining phase will include a two-boom drill jumbo, a bench drill, an explosives loading machine, a mechanical scaling machine, a roofbolter, LHDs, low-profile articulated haul trucks, crew transportation vehicles, auxiliary fans and ancillary equipment; all of which will meet MSHA requirements for a gassy underground oil shale mine.

#### 2.2.3.2 Retort Activities

Approximately 10,000 tons of oil shale will be processed through the ATP pilot plant during Phase 2. Shale to be processed will be crushed to design specifications at the surface within the 160-acre lease area. The ATP pilot plant will operate intermittently over the Phase 2 period and will process up to 4 tons/hour of oil shale while operating. The general layout of the Phase 2 pilot plant is shown on Figure 2-2.

Approximately 6,000 bbl of raw shale oil will be produced during Phase 2. All oil produced will be temporarily stored in aboveground tanks located within the 160-acre lease area, before being trucked to an off-site facility for sale. Samples of this oil will be collected for analysis and testing off-site. These tests will include hydrotreater tests to design a facility for Phase 3.

Phase 2 shale processing will produce approximately 8,000 tons of spent shale. The spent shale will be moistened at the pilot plant to aid in cooling, control dust, and aid material handling and compaction. The material will be placed in a bermed and graded surface impoundment covering approximately 2 acres within the 160-acre lease area. The surface impoundment will be designed and constructed to avoid surface water erosion and contact with runoff from other portions of the site, and to minimize infiltration of rainwater. The impoundment area will also be lined with an impervious barrier until such time that BLM determines that a liner is not necessary. The specific impoundment design will be based on the results of the testing and analysis of the spent shale (including geochemistry and leach testing). The impoundment will be provided with a topsoil cover at the completion of Phase 2 operations. OSEC will collect samples of the spent shale during Phase 2 for further material testing to better understand the engineering and environmental properties of the material. This testing will be done off-site. In addition, OSEC will include instrumentation in the spent shale impoundment that will monitor moisture ingress and any leachate generation during this phase of work. Along with the results from the particle size and permeameter testing completed during Phase 1, the inclusion of instrumentation in the spent shale impoundment will allow an evaluation of the potential infiltration rate of leachate through the spent shale.

The Phase 2 make up water requirement associated with processing the oil shale is estimated to be approximately two barrels (~84 gallons) of water per ton of shale feed, half of which is required to cool and moisten the spent shale. This means the total make up water requirement for Phase 2 is 84,000 gallons of water. Small amounts of additional water may be required on-site to provide water for drinking, cooking, laundry and toilet facilities for the Phase 2 workforce. All Phase 2 water needs, potable and process, will be trucked to the site by a local supplier with the appropriate water rights. The water will be stored in aboveground tanks within the 160-acre lease area. No water rights will be needed by OSEC for this phase of work.

Electricity required for the mine, pilot plant and the on-site accommodations will be provided by diesel generators established within the 160-acre lease area (1 megawatt (MW) total capacity). Propane will be used to provide heat to the process during start-up periods, as well as for office and field trailers. Diesel also will be used to fuel surface and underground mine vehicles and equipment on-site. All diesel and propane will be trucked in and stored on-site in aboveground tanks. The diesel tanks will be placed within lined and bermed containment areas.

Two streams of process water (connate water and retort water) will be generated during the processing of the shale feed. Connate water is water trapped in the pore spaces of the shale and is driven off in the preheat zone of the retort and condensed. The average connate water content in the shale feed is assumed to be 1.5% by weight. Thus, approximately 150 tons (~ 36,000 gallons) of connate water will be produced during the Phase 2 operations. Depending on the water quality, it may be possible to use this preheat zone water to moisten the spent shale prior to its disposal on-site. Retort water is the chemically bound moisture in the shale which is driven off during pyrolysis in the retort. This aqueous byproduct, also known as "sour water", typically contains phenols, hydrogen sulphide and other organics. The average retort water content in the shale feed is assumed to be 2.0% by weight. Thus, approximately 200 tons (~48,000 gallons) of retort water will be produced during the Phase 2 operations. All the retort water generated by this phase will be stored on-site and tested before being trucked off-site for treatment and/or disposal at a licensed liquid waste treatment facility.

No refining or upgrading of the raw shale oil will be performed on-site during Phase 2. All shale oil will be trucked off-site for analysis and test work prior to sale. OSEC will use the results of the test work to assess the upgrading and refining options during Phase 3.

The design and construction of all facilities on the 160-acre lease will incorporate water management structures designed to prevent surface discharge of contaminated water. Storm water runoff from the lease area will be directed to the existing runoff retention dam north of the lease area. Given the low precipitation in the area and the fact that water from the process will either be re-used to moisten the spent shale, or if contaminated, will be contained and trucked off-site, it is not expected that significant amounts of water will accumulate behind the dam. Any storm water that does accumulate behind the dam will either evaporate or percolate into the ground surface in a relatively short period of time the length of which will depend on the magnitude of the precipitation event. The dam is designed to contain storm water runoff from a 100-year rainfall event and was found to be safe based on an inspection by regulators in 2005.

Up to 15 people will be employed on-site during Phase 2 operations, plus 10 additional individuals for the mine reopening work. All site workers will commute to the lease area from nearby communities. Offices, shower facilities and toilet blocks will be provided on-site, as well as limited sleeping quarters. The on-site facilities will be sized to handle the projected number of on-site workers as well as any occasional visitors that may tour the site. Sewage effluent will be collected and trucked off-site for treatment at a municipal facility.

The air emission sources on-site will include the diesel generators, propane burners, vehicle emissions, the combustion flue gas stream from the ATP retort, particulates from materials handling and mining activities, on-site equipment, flaring of gas from the process, and the small quantities of methane gas seepage from the mine.

Greenhouse gas (GHG) emissions generated on-site during the Phase 2 operations will largely originate from the retorting of the shale feed and the use of diesel fuel to generate electrical power.

### 2.2.4 Phase 3

Phase 3 of the RD&D Project will involve the design, permitting and fabrication of a 250-ton/hour ATP demonstration plant and construction of that plant within the 160-acre lease area. OSEC plans on two years to permit, engineer and construct the plant. Also, the mine will be developed sufficiently to support the mining of 1.5 million tons/year of oil shale, which will be used as shale feed for the operation of the demonstration plant. Following commissioning, the plant will then operate for two years to provide operational, technical, environmental, and financial information necessary to make an informed decision on whether or not to proceed to a commercial project.

#### 2.2.4.1 Construction Activities

A conceptual layout of the Phase 3 facilities has already been developed (Figure 2-3) and a final plan will be developed following completion of Phase 2. Preparation for Phase 3 operations will involve additional on-site construction activity, particularly related to the new 250-ton/hour ATP demonstration plant and all the ancillary equipment.

Many of the demonstration plant components will be fabricated elsewhere and transported to the site for final assembly and erection. This will lessen the amount of lay down space required during construction and the number of construction workers at the site. This will also help OSEC minimize potential on-site environmental issues associated with construction, shorten the construction time, and lessen congestion within the 160-acre lease area.

The largest permanent surface feature constructed during Phase 3 will be the expanded spent shale storage area shown on the Phase 3 plot plan (Figure 2-3). The 38-acre storage area is adequate to contain the 2.2 million tons of spent shale that could be generated during this phase of work. The design and construction of all Phase 3 facilities will incorporate measures to prevent surface discharge of water that does not meet water quality standards. Any drainage of storm water from the lease area will be directed to the existing runoff retention dam north of the lease area.

#### 2.2.4.2 Retort Activities

Approximately 2.7 million tons of oil shale will be processed through the ATP demonstration plant during Phase 3. The shale feed will be sourced from the reopened mine. All mined shale will be stockpiled and crushed/blended at the surface within the 160-acre lease area. It is expected that all shale mined will be processed (i.e., there will be no fines rejects produced during the shale crushing activities). The general arrangement of the Phase 3 processing units is shown on Figure 2-4.

Approximately 1.8 million bbl of raw shale oil is expected to be produced during Phase 3. Currently, it is anticipated that this oil will be hydrotreated on-site to produce a synthetic crude oil product. The synthetic crude oil will be temporarily stored in aboveground tanks on-site. The product will be trucked off-site to a refinery or delivered to a nearby pipeline with both the capacity and specifications to accept this upgraded shale oil.

Approximately 2.2 million tons of spent shale will be produced during Phase 3. The spent shale will be moistened at the processing plant to aid cooling of the spent shale, control dust and aid material handling and compaction. All spent shale generated will be disposed of in a separate engineered surface impoundment. The final impoundment design will reflect the results of the Phase 1 and 2 research program. It is estimated the Phase 3 spent shale impoundment will require a storage volume of up to 2.0 million cubic yards. A 38-acre area has been identified for spent shale disposal within the 160-acre lease area. The spent shale impoundment for Phase 3 will be designed and constructed to prevent stormwater runoff from other areas of the site from contacting the pile and to minimize the infiltration of precipitation into the spent shale. This will be accomplished by maintaining surface grading that will not allow water to pond and consequently infiltrate the pile. The pile will be constructed with a minimum 3:1 (horizontal:vertical) slope with 10-foot wide intermediate catch benches to divert runoff water to lined drainage channels to remove runoff from the pile. Compaction will be limited to that provided by the hauling equipment as it travels over the spent shale surface. Prior to placement of spent shale in the impoundment area, top soil will be removed and stockpiled for future reclamation of the pile. Berms will be constructed to contain runoff from the pile and exclude runoff from outside the pile area. A small lined catchment basin at the downstream berm will be constructed to collect runoff water from the pile. Because of the size of the spent shale disposal area in Phase 3, a portion of the main access road to the site on the 160-acre lease will need to be re-routed around the spent shale impoundment.

Based on the results of the Phase 1 and Phase 2 testing, the need for a routine testing program during Phase 3 to verify the chemical composition of the spent shale will be determined by the BLM. If the results of the Phase 1 and Phase 2 testing demonstrate that the spent shale needs to be isolated from the environment, the spent shale disposal area will be engineered with an impervious liner and appropriate run-on, run-off controls to isolate this material from the environment.

The hydrotreatment process generates a variety of waste products including sulfur-containing residuum and spent catalysts. Spent catalysts are listed RCRA hazardous wastes. These waste materials will be disposed at an appropriate off-site disposal facility. Prior to disposal, the wastes will be contained in constructed waste storage areas with appropriate spill containment features to prevent discharges to the environment.

The total amount of Phase 3 water needed to process the oil shale (referred to as "make-up water") is estimated to be 4.1 million barrels (approximately 172 million gallons or approximately 528 acre-feet). This is equivalent to a peak water demand of 380,000 gallons/day while the processing plant is operating. Currently, the make-up water is proposed to be supplied from water wells established in the Birds Nest Aquifer (2 to 3 wells located in the northwestern portion of the 160-acre lease) or in the White River alluvial deposits (wells installed as part of the earlier mine development activities are present north of the 160-acre lease) or from a direct intake in the White River. Water pumped from these sources will be stored in aboveground tanks on-site.

Up to 14 MW of electrical power may be required at the site during Phase 3, and it is assumed that electrical power to the site will be provided from the grid via a new 138 KV transmission line. The transmission line right-of-way is assessed in this EA. Emergency diesel generator capacity will also be provided on-site to meet both plant backup and mine operational and safety requirements.

Natural gas or propane will be required for the operation of the ATP demonstration plant. Further studies are required to assess whether it will be feasible to truck in propane gas or whether a pipeline connection to a natural gas supply will be required. The potential natural gas pipeline right-of-way is assessed in this EA.

About 10.7 million gallons of connate water and 14.7 million gallons tons of sour water will be produced over the 24-month Phase 3 demonstration period. This is equivalent to peak connate and sour water production rates of 22,000 and 29,000 gallons/day during the 2 years that the processing plant is operating. Depending on its quality, it may be possible to blend the connate water to moisten the spent shale prior to its placement in the engineered surface impoundment. All the sour water generated during Phase 3 will be stored and treated on-site prior to being used for dust control or moistening of the spent shale. Depending on chemical analyses, the sour water treatment may include stripping of ammonia and hydrogen sulfide, followed by biological aeration.

It is estimated that the operational workforce at the site during Phase 3 operations will be approximately 120 individuals. Offices, shower and toilet blocks will be provided on-site. Wastewater produced in these facilities will be treated on-site in the existing closed sewage treatment system. This treated water could be blended into the water used to moisten spent shale.

The air emission sources on the 160-acre lease will include the diesel generators, propane burners, vehicle emissions, fugitive emissions from the recovered product gas streams from the ATP retort, particulates from shale crushing, materials handling and mining activities, on-site equipment, flaring of product gas under emergency conditions (under normal operations, the product gas (also referred to as "off-gas") will be used as fuel, possibly to fuel the hydrogen plant) and the small quantities of methane gas seepage from the mine. The ATP unit and the hydrotreatment unit will be fully permitted under the Clean Air Act and will have all necessary emissions control equipment required by the Act.

Greenhouse gas (GHG) emissions generated on-site during the Phase 3 operations will largely originate from the retorting of the shale feed. Additional GHG emissions will be produced from the burning of coal at the Bonanza Power Plant to generate electrical power.

#### 2.2.4.3 Proposed Rights-of-Way (Western Gas Pipeline Route)

In addition to the construction of the ATP retort and ancillary equipment on the 160-acre lease, it will be necessary to construct/install natural gas, power and water lines along the proposed rights-of-way. The proposed rights-of-way are shown on Figure 1-1, including a right-of-way east of Highway 45 for the power line, a right-of-way essentially paralleling Highway 45 for the natural gas line, and a right-of-way for the water line along the existing access road to the wells adjacent to the White River. During construction/installation of these utilities, measures will be taken to minimize the land area disturbed, to minimize the potential for invasive weeds, and to restore disturbed areas along the rights-of-way. Pipeline installation beneath the channel of the White River will be completed using horizontal directional drilling techniques.

### 2.2.5 Applicant-Committed Environmental Control and Management Measures

As part of the proposed RD&D Project, several environmental control and/or management measures will be undertaken to prevent or minimize potential impacts to resources of concern. Some of these measures (e.g., air emissions controls and water treatment) have been described generally above in the description of the process. Provided below is a general listing, by resource of concern, of applicant-committed environmental control and management measures that will be undertaken and that are an integral part of the Proposed Action. The specific details of these control and management measures, as well as potential impacts of the Proposed Action, are provided in Section 4.

*Air Quality*

- Measures, such as the use of water trucks and moisture control and baghouses, will be implemented to minimize fugitive dust emissions.

- OSEC will obtain and comply with all necessary air permits and install, operate and maintain air emission control devices on the ATP system during Phase 2 and Phase 3 and on units of the wastewater treatment system and hydrotreatment system during Phase 3. This will include, for Phase 3, Best Available Control Technology (BACT) that complies with the Prevention of Significant Deterioration (PSD) requirements of the Clean Air Act.

*Wastes*

- The spent shale disposal areas for Phases 2 and 3 will be designed and constructed to prevent contact with storm water from other areas and minimize infiltration of precipitation that lands on the shale pile. The disposal areas will also have drainage features to control runoff. Monitoring of the spent shale disposal areas and runoff areas will be conducted throughout the project. The results of the Phase 1 and Phase 2 testing will be used to determine the continued need for an impervious liner to isolate the spent shale from the environment.

- Prior to and during mine dewatering, testing will be performed and water that does not meet water quality standards will be contained and transported for off-site treatment.

- OSEC will develop and implement all necessary plans and engineering measures (e.g., bermed, lined and covered storage areas) to comply with the Resource Conservation and Recovery Act (RCRA) and to properly manage hazardous wastes and oil wastes generated during Phases 2 and 3.

- OSEC will develop and implement a plan for the handling and disposal of construction related wastes at licensed off-site facilities.

- OSEC will dispose of (Phase 2) or treat on-site (Phase 3) any process waters that do not meet water quality standards prior to re-use for moisture control or discharge on the 160-acre lease.

- OSEC will evaluate and upgrade as necessary the on-site sewage treatment facility and treat all sewage waters generated on the 160-acre lease.

*Water Resources*

- OSEC will monitor water levels in the White River and the pumped aquifer to verify anticipated impacts on these resources.

- OSEC will evaluate and implement measures to reduce, to the extent practicable, water usage for the process.

*Soils*

- OSEC will develop and implement a soil erosion/sediment control plan to stipulate methods for minimizing soil erosion or sedimentation using appropriate practices, such as maximum allowable slopes, silt fencing or straw wattles.

- OSEC will develop and implement a soil management plan stipulating appropriate practices for the handling, staging, and re-use of topsoil and soil reclamation activities to be conducted following construction, such as soil pile seeding and reclamation requirements.

*Geology/Energy Production/Mineral Use*

- OSEC will coordinate its activities with the oil & gas lessee for the 160-acre lease and lessees along the utility rights-of-way to avoid development conflicts.

- Gilsonite veins will be crossed by the proposed gas pipeline within existing pipeline ROWs. OSEC will coordinate construction of utility lines with American Gilsonite Company, the operator of gilsonite mines crossed by the proposed utility line ROWs.

*Floodplains*

- Horizontal directional drilling (HDD) techniques will be used to install the natural gas pipeline beneath the channel of the White River at a minimum depth of 3 meters below grade. The floodplain area at the proposed gas line crossing location (adjacent to Highway 45) is heavily disturbed by existing/past uses, including water truck filling, existing gilsonite water wells, the remnant structure from a former bridge, and access by recreational users to the White River. Every effort will be taken to conduct all drilling activities associated with the gas pipeline installation within these already disturbed areas. Upon completion of this work, reclamation activities will be undertaken to return disturbed areas to pre-construction conditions to the extent possible.

- Upon completion of installation of any new water wells and associated utilities in the floodplain, reclamation activities will be undertaken to return disturbed areas to pre-construction conditions to the extent possible.

*Wetlands/Riparian Zones*

- Surveys will be conducted prior to utility construction to establish the presence or absence of wetlands or riparian zones. If wetlands or riparian zones are present, they would be avoided to the extent practicable. If avoidance is not possible, disturbance within the wetland or riparian zone would be minimized to the extent practicable in accordance with any state or federal wetland permitting requirements.

- OSEC will limit construction equipment working in wetlands or riparian zones to that essential for clearing, trench excavation, pipe fabrication and installation, backfilling, and restoration.

- Horizontal directional drilling techniques will be used to install the natural gas pipeline beneath the channel of the White River at a minimum depth of 3 meters below the channel bottom. Every effort will be made to conduct all drilling activities in existing disturbed areas adjacent to Highway 45. The power line will be constructed to span the river with poles located in upland areas. These measures will minimize impacts to any riparian areas.

- OSEC will prohibit storage of hazardous materials, chemicals, fuels, lubricating oils, concrete coating, and refueling activities within 200 feet of any wetland or riparian area.

*Threatened/Endangered Wildlife Species*

- OSEC will conduct pre-construction clearance surveys in the spring prior to construction to identify active bald eagle nests within 1.0 mile of the surface occupancy area and in the winter to identify active bald eagle roosts within 0.5 mile of the project site and utility rights-of-way. Construction activities will not occur within 1.0 mile of any active bald eagle nest without further consultation with the USFWS. Construction activities will not occur within 0.5 mile of roosting areas from November 1 through March 31.

- OSEC will implement measures determined by the USFWS to mitigate potential impacts to Colorado River endangered fishes due to water withdrawals. The Biological Opinion on the proposed project will provide "Reasonable and Prudent Alternatives" that the USFWS gives for all projects that deplete water. The reasonable and prudent alternative which allows the project proponent to offset the impacts caused by the depletion is a one-time contribution to the Recovery Implementation Program.

*Fish and Wildlife Including Special Status Species other than FWS Candidate or Listed Endangered or Threatened Species*

- In accordance with the VFO timing stipulations, no construction would be undertaken between November 1 and March 31 within big game crucial winter range areas identified.

- OSEC will conduct clearance surveys, each spring prior to construction, to identify active raptor nests within 0.5 mile of the construction ROWs. Construction activities will not be conducted within 0.5 mile of active raptor nests between February 1 and August 31 or until fledging and dispersal of the young.

- OSEC will conduct clearance surveys each spring prior to construction, to identify presence of any BLM Sensitive species. If any BLM sensitive species are found, consultations with the BLM will be conducted to determine an appropriate action to reduce impacts.

- The White River mine shaft is not expected to be suitable bat habitat because of the presence of methane in the mine. However, if bats are found in the White River Mine, OSEC will install one-way doors or other suitable mitigation at the mine shaft entrances allowing sufficient time prior to re-opening the mine for bats to leave but not to re-enter the mine shafts.

*Threatened/Endangered Plant Species*

- Horizontal directional drilling techniques will be used to install the natural gas pipeline beneath the channel of the White River at a minimum depth of 3 meters below grade. Every effort will be made to conduct all drilling activities in already disturbed areas of the floodplain adjacent to Highway 45. The power line will be constructed to span the river with poles located in upland areas. These measures will avoid impacts to any potential habitat for the Ute-ladies' tresses.

- Following the completion of utility construction, disturbed areas will be reclaimed in a timely manner and in accordance with a project revegetation plan.

- OSEC will conduct clearance surveys each spring prior to construction along the rights-of-way to identify the presence of any T&E plant species.

*Vegetation Including Special Status Species other than FWS Candidate or Listed Endangered or Threatened Species*

- OSEC will minimize vegetation removal to the extent necessary to allow for safe and efficient construction activities.

- OSEC will develop and implement a revegetation/reclamation plan using appropriate practices to restore disturbed areas to pre-construction conditions to the extent practicable.

- OSEC will conduct clearance surveys each spring prior to construction along the rights-of-way to identify the presence of any BLM sensitive plant species.

*Invasive, Non-Native Species*

- An invasive, non-native weed management plan, conforming to the requirements of the BLM and local weed management agencies, will be adopted and followed for the project.

*Recreation*

- The RD&D facility on the 160-acre lease will minimize potential light pollution by limiting the height of light poles and using light shields provided that use of such shields does not affect worker safety.

- OSEC will minimize light and sound pollution to the extent possible at the White River shoreline by use of topographic shielding to ensure that recreational experiences within the Book Cliffs Extensive Recreation Management Area (ERMA) and/or proposed White River Special Recreation Management Area (SRMA) are not diminished.

*Visual Resources*

- OSEC will develop and implement a plan using appropriate measures (detailed in Section 4.2.14) to minimize visual impacts from the construction and operations of the facility and utilities in the Project Area, including visual impacts from dust during construction.

- Within all VRM Class II areas, OSEC will construct utility lines within or parallel and nearby to existing utility ROWs.

*Cultural Resources*

- OSEC will develop and implement standard operating procedures for avoiding historic or archaeological sites in the project, including stop work and notification procedures in the event that such sites are discovered during construction activities, and develop steps to be taken to prevent damage to any such discoveries, consistent with the NHPA and other applicable laws and regulations.

*Paleontology*

- OSEC will develop and implement standard operating procedures for managing the discovery of fossils to minimize damage to scientifically important fossil discoveries, including stop work and notification procedures in the event that such sites are discovered during construction activities, and develop steps to be taken to prevent damage to any such discoveries, consistent with best management practices.

*Special Designation Areas*

- OSEC will construct the proposed power line immediately adjacent to the existing power line at the White River crossing to minimize additional impacts to visual resources within potential Special Designation Areas.

- Horizontal directional drilling techniques will be used to install the natural gas pipeline beneath the channel of the White River at a depth of 3 meters below the channel bottom. The crossing will occur at the already disturbed Highway 45 crossing location and every effort will be taken to conduct drilling activities in already-disturbed areas of the floodplain to protect the Outstanding Remarkable Values and scenic classification of the eligible WSR.

- Upon completion of construction, disturbed areas will be restored to preconstruction conditions to the extent practicable in accordance with a project reclamation and revegetation plan.

- Power poles will be located to minimize their view from eligible WSR and ACEC areas.

### 2.3 Alternative B – Shale Oil Recovery using the ATP System with Alternate Eastern Natural Gas Pipeline Right-of-Way

The second alternative considered in this EA is identical to the Proposed Action with respect to all activities that will take place within the 160-acre lease. However, this alternative includes a different right-of-way for the incoming natural gas pipeline. Under this alternative, the natural gas pipeline would follow the same right-of-way as the power line rather than following Highway 45. Thus, this alternative pipeline right-of-way runs to the east of the pipeline right-of-way in the Proposed Action. The alternate natural gas pipeline right-of-way is shown on Figure 1-1.

### 2.4 Alternative C – No Action

Consideration of a No Action Alternative is required under the President's Council on Environmental Quality (CEQ) regulations (40 CFR 1502.14(d)), and applicable BLM implementing guidance. CEQ regulations require that a No Action Alternative must be considered in all EAs to provide a baseline for comparison of impacts.

Under the No Action Alternative, the BLM would reject the RD&D Project as submitted by OSEC in the White River Mine lease area. Therefore, the Proposed Action would not be implemented and existing land uses would continue throughout the Project Area. In the case of the White River Mine site, the buildings would remain vacant, the mine would remain partially closed, and the existing shale stockpile and other site infrastructure would remain in place. Under this alternative, none of the information and knowledge on oil shale resource development to be gained from the RD&D Project would be realized.

## 2.5 Alternatives Considered, but Eliminated from Further Analysis

### 2.5.1 Oil Shale Recovery Using Other Retorts

There are numerous surface retort designs but only a few have been tested beyond laboratory bench scale experiments. During the retorting process, oil shale is heated to about 900°F to convert the solid kerogen mineral to a hydrocarbon vapor; the conversion process is called pyrolysis. The pyrolysis can be done by heating the oil shale rock in a retort on the surface after the rock is mined or the rock can be heated in the ground by what is referred to as in-situ retorting. At the White River Mine site, the White River Shale Project developed the underground mine in the early 1980s and had planned to use surface retorts.

One of the other more advanced surface retort designs is the vertical retort concept. This vertical shaft kiln technology has also been adapted from mineral industry applications. These vertical, packed-bed retorts depend on shale moving vertically downward by gravity through the vessel while counter-flowing hot retorting gases move vertically up and out the top of the retort. These are coarse rock retorts that cannot use fine particles, since the fines can block air flow or they can be fluidized within the retort. The movement of the oil shale bed down through the retort needs to be slow to assure complete retorting and the gas flow upward needs to be slow to avoid fluidizing the bed. The air flow must also be evenly distributed to keep a uniform, balanced heat front to avoid channeling and an irregular retorting zone. If the system gets out of balance and a blockage forms in the retort, the entire machine might need to be cooled to remove the obstruction.

Also, obtaining high total hydrocarbons yield from the kerogen can be difficult in a vertical retort since some of the rising product gas can condense on the raw incoming shale and then later be combusted. Not all vertical retorts have an internal combustion and heat recovery system, like ATP, so a separate vessel may be required to combust the residual carbon (char) on the spent shale to assure these BTUs are utilized. The ATP uniquely-designed, internal four-zone system results in a cleaner spent shale with very little residual carbon or hydrocarbon material, making it environmentally friendly for surface disposal.

Other surface retorts have been designed to use straight grate and circular grate systems, also adapted from the minerals industry. Also, test work has been done on fluidized bed retorts and turbulent bed retorts.

While, there are a number of surface retorting options, none have been tested, built, and operated successfully in the United States at a commercial demonstration scale. After comparing the ATP system with other advanced surface retorts, OSEC became confident that the ATP system was the most advanced, proven system and that the other surface retorts were not sufficiently advanced to meet the needs of the RD&D Project. OSEC feels the ATP system is the best choice for the current RD&D program and that it has the greatest potential for advancing to a full commercial scale retort; therefore, the other retorts were not included in proposed RD&D project and were eliminated from further analysis.

### 2.5.2 In-Situ Method

OSEC also considered in-situ retorting for the White River Mine site. The in-situ method is being tested by Shell in Colorado using down-hole electric heaters in drill holes.

In-situ methods are most applicable in areas where the oil shale occurs in a very thick sequence, such as certain parts of the Piceance Creek Basin of Colorado, where the rich oil shale zone can exceed 1,000 feet in thickness. In these areas a single vertical drill hole can apply heat to a large amount of rock. However, if the rock is wet and the location involves ground water and aquifers, this water can complicate the heating process and the water needs to be removed. Heating the rock in-situ is a slow process, taking perhaps years to reach the temperature of pyrolysis.

OSEC determined that the in-situ process was not practical at the White River Mine site. At this site, the rich Mahogany zone oil shale unit is only about 100 feet thick and occurs about 1,000 feet below surface. The other rich shale zones found below the Mahogany zone in Colorado are essentially absent in the Uinta Basin of Utah, or they are so low grade to be of no commercial significance today. As such, at the White River Mine site, it is not practical or economical to drill 1,000-foot holes to heat just one 100-foot thick section of oil shale. Instead, the White River Mine was designed to recover 30 gallon-per-ton oil shale from a 58-foot mining zone by the room and pillar underground mining method.

The in-situ retorting method, as it is now envisioned, was determined to be not applicable to the White River Mine site and that portion of the Uinta Basin and this alternative was eliminated from further analysis.

### 2.5.3 Oil Shale Retorting using 4-ton/hour ATP System without Mine Reopening (Implementing Phases 1 and 2 Only)

A third alternative considered but eliminated from detailed analysis was to complete Phase 1 and the portions of Phase 2 that do not require mine reopening as described for the Proposed Action. This option would entail transporting and retorting test quantities of the stockpiled oil shale at the UMATAC processor unit in Calgary, Canada during Phase 1 and then processing oil shale from the existing shale pile at the 160-acre lease using the relocated, on-site 4-tons/hour pilot unit during Phase 2. This alternative would not include re-opening the mine and processing any fresh oil shale or subsequently constructing and operating the Phase 3 250-ton/hour demonstration plant.

This alternative was not carried forward for detailed analysis because it was deemed to not meet the overall goals of the RD&D Project. Because no mining and retorting of fresh shale would be involved, important information would not be gathered on the processing of the fresh oil shale, the characteristics of the shale oil, and the characteristics of the spent shale derived from the fresh shale. Clearly, since commercial operations would involve processing of fresh oil shale, it is critically important to gather technical, economic and environmental information on unweathered oil shale. Further, because this alternative does not include the crucial Phase 3 demonstration phase, critical information on the ability to scale up the retorting, mining, and material handling processes would not be obtained. This information is critically important for making an assessment of the commercial viability of oil shale, as well as the potential environmental issues related to the industry. This is a key component of the entire RD&D effort. As such, this alternative, though considered, was eliminated from further analysis.

# 3.0 AFFECTED ENVIRONMENT

## 3.1 Introduction

This chapter describes the existing environment (e.g., physical, biological, socio-economic) around the White River Mine lease area. Provided below in Section 3.2 is a brief overview of the regional setting. Section 3.3 provides a baseline description of the current conditions of Resources of Concern as identified in Section 1.7 and the Interdisciplinary Team Analysis Record Checklist found in Appendix A.

## 3.2 General Setting

The 160-acre White River Mine lease area is in Uintah County in northeast Utah, approximately 7 miles west of the Colorado border. The area is approximately 55 miles south-southeast of Vernal, Utah and approximately 5 miles south of the gilsonite mining camp of Bonanza, Utah. Access to the area is by road on State Highway Route 45 to a point approximately 5 miles south of Bonanza and then via a WRSP-constructed paved and gravel road to the mine site. The lease area lies within a north sloping upland plateau dissected by steep-sided drainage features (canyons and washes) containing ephemeral streams. Land elevations range from 5,300 to 5,700 feet across the 160-acre lease area. The lease area lies south of the White River. At its nearest point, the river runs within approximately one mile of the lease area boundary. The surrounding area is dominated by dryland plant associations and by animals that are adapted to hot, dry conditions.

### 3.2.1 Climate

The climate of the area is categorized as semi-arid, with hot, dry summers and occasional thunderstorms. Winters are cold, with sparse snow accumulation. The mean temperature varies from 16.8 $^{o}$F in January to 75.2 $^{o}$F in July, with a maximum and minimum ranging between 94.3 and 3.9 $^{o}$F, respectively. Mean annual precipitation (rain and snow) near the White River[3] from 1971 to 2000 was 7.38 inches, ranging from an average of 0.34 inches in February to 1.0 inch in October. During the period from 1974 to 1984, precipitation weather conditions were monitored by the WRSP on the 160-acre lease area. During that period, precipitation averaged approximately 10 inches, which is consistent with the longer term data from the NOAA station. Annual pan evaporation rates range from 22 to 34 inches.

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[3] From the Ouray 4 NE monitoring station located near the lease area (*Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Days 1971-2000.* National Oceanic and Atmospheric Administration).

Severe local thunderstorms in the summer may cause strong, gusty winds and local flash flooding.

Surface airflow is complicated by the rough local terrain. During early morning hours, the air generally flows along the drainage channels toward low terrain and the White River. In the afternoon, winds are generally stronger and less variable, flowing generally from the west or southwest. As discussed further in Section 3.3, air quality in the area has been consistently good.

### 3.2.2 Geology

The lease area lies on the southern flank of the Uinta Basin, an intermountain syncline located on the northeastern edge of the Colorado Plateau. Lacustrine sediments of a prehistoric lake basin dominate the stratigraphy of the Uinta Basin. Major land features bordering the Basin include the Uinta Mountains to the north, the Wasatch Mountains to the west, the Book Cliffs or Taveputs Plateau to the south, and the highlands associated with the subsurface Douglas Creek Arch to the east (BLM 2002). The area is a gently north sloping, highly dissected plateau characterized by steep-walled canyons with ephemeral streams or dry washes that are subject to occasional flashfloods. The relief of the canyons averages between 30 and 50 feet, but is as much as 1,000 feet in some places (Bechtel Petroleum, Inc., 1981).

The near-surface geologic units consist of, in descending order, unconsolidated Quaternary alluvium and colluvium; the Tertiary (Eocene) age Uinta Formation (siltstone and fine-grained sandstone); the Eocene age Parachute Creek Member of the Green River Formation (lacustrine marlstone); the Eocene age Douglas Creek Member of the Green River Formation; and the Renegade Tongue Member of the Wasatch Formation. The most economically important sequences of oil shales lie within the Parachute Creek Member. Within the White River Mine lease area, the base of the Uinta Formation and Parachute Creek Member lie at elevations of 5,000 feet and 4,460 feet, respectively.

The area is seismically quite stable, and lies within the second lowest seismic risk zone in the United States. Occasional landslides and debris flows can occur, as a result of flash flooding. Physical weathering processes in the area include frost action and mass wasting. Chemical weathering in this area occurs by solution, oxidation and carbonation.

### 3.2.3 Surface Water Resources

The lease area lies within the White River Basin catchment, which is part of the Colorado River system. The White River is the only permanent surface water stream in the area. Evacuation Creek, which flows north into the White River a few miles east (upstream) of the White River lease area, is intermittent. Water flows in the washes and canyons of the area (including Asphalt Wash and Southam Canyon just south and west of the lease area) are ephemeral.  Local flash flooding in the canyons and washes, in response to local thunderstorms, occurs occasionally during the summer months.

### 3.2.4 Ground Water Resources

Shallow ground water is present in the unconsolidated alluvial aquifers associated with the White River.  Tertiary bedrock aquifers in the Project Area are found in the lower Uinta Formation, Parachute Creek Member of the Green River Formation (the “Birds Nest Aquifer”), the Douglas Creek Member of the Green River Formation, and Wasatch Formation.  The aquifers below the Birds Nest Aquifer are too deep to be significant water resources for the RD&D Project.  Total dissolved solids (TDS) concentrations generally range from 500 to 3000 mg/l within these aquifers in the Uinta Basin and can exceed 10,000 mg/l in some deeper parts of the Uinta Formation.  Lower TDS concentrations are prevalent near recharge areas (Robson and Banta, 1995).

Based on observations in the main shaft at the White River Mine site, the Birds Nest Aquifer has a vertical thickness of 115 feet and lies approximately 620 feet below ground level.  The aquifer is confined by the overlying Uinta Formation.  Recharge of the aquifer occurs by leakage from the Uinta Formation and through infiltration to the aquifer where it outcrops in Evacuation Creek.  Based on available information, the majority of the 160-acre site has artesian water pressure above the top of the Birds Nest Aquifer.  Localized discharge from the aquifer is via upward leakage to the White River alluvial deposits.

Ground water occurs in the Birds Nest Aquifer above the oil shale and in the Douglas Creek Aquifer below the mine zone, but data indicate that the yields are generally low.  The water in the Birds Nest Aquifer is not potable and is unsuitable for stock watering or irrigation (Bechtel 1981).

### 3.2.5 Livestock Grazing

The 160-acre lease area and corridors are located in the Book Cliffs and Bonanza livestock forage assignment localities (BLM, 2005 Draft EIS).  The White River mine site is within the Hell’s Hole Allotment.  Sheep are grazed in that allotment from December 1 to April 30 and are allowed 3,999 AUMs.  None of the AUMs is allocated to the 160-acre lease area, which is not managed as rangeland due to the existing mine site.

## 3.3 Resources of Concern Brought Forward for Analysis

Presented below are descriptions of the existing conditions for each of the Resources of Concern which, based on the scoping efforts, were determined to require further evaluation as part of the EA.  These baseline conditions form the basis for evaluating potential impacts to the environment as described in Chapter 4.

### 3.3.1 Air Quality

With few exceptions, air quality in the lease area has consistently been very good, as is expected for a remote location (BLM, 2005). The region has been designated as either attainment or unclassified for all regulated pollutants under the National Ambient Air Quality Standards (NAAQS), meaning that ambient air quality meets the air quality standards for regulated pollutants under ambient conditions. In addition, the area of the site is designated as Class II under the Prevention of Significant Deterioration (PSD) regulations of the Clean Air Act of 1977. Under these rules, Class II areas are areas where moderate, controlled growth can take place. Class I PSD areas are public lands such as national parks, wilderness areas, and memorial parks established prior to 1977, and have the greatest limitations on potential air quality degradation. Nearby Class I areas include the Flat Tops Wilderness Area in Colorado, located about 70 miles east of the site, and Arches National Park in Utah, located about 130 miles south of the site. Dinosaur National Monument, located 24 miles north of the site, is not a designated Class I area.

### 3.3.2 Wastes (Hazardous and Solid)

There are no known quantities of any wastes currently on-site, except there may be small quantities of various wastes remaining from the prior development contained within existing structures. Although not considered a waste, there are still large surface stockpiles of oil shale produced during the prior development of the mine currently present on site. The raw oil shale (~ 50,000 tons) is primarily stored in two surface piles, one is essentially a talus slope on the side of a steep ravine and the other pile is a large mounded area. Much of this raw oil shale will be processed as part of this project during Phase 1 and Phase 2, resulting in the generation of spent shale.

### 3.3.3 Water Resources

*Surface Water*: In the vicinity of the site, the surface hydrologic system is composed of the White River, Evacuation Creek, and three washes (Hells Hole Canyon, Southam Canyon, and Asphalt Wash). Only the White River contains sufficient flow to satisfy the water demand of Phase 3. Evacuation Creek flows intermittently with the exception of a few days a year. Flow in the washes is ephemeral, usually of very short duration and highly dependent on rainfall or snowmelt. Only the White River and Evacuation Creek have been gauged so that their flows can be discussed in detail.

The State of Utah has designated the White River and tributaries from its confluence with the Green River upstream to the Colorado state line for the following uses: Class 2B—Protected for secondary contact recreation such as boating, wading, or similar uses; Class 3B—Protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain; and Class 4—Protected for agricultural uses including irrigation of crops and stock watering (Utah Div. of Admin. Rules, 2005). In a recent report to Congress, the Utah Division of Water Quality (2004) stated that the White River is fully supporting for all these beneficial uses. The White River is not classed as impaired water.

The flow volume of the White River is so much greater than that of the tributaries flowing into it in this region that there is no noticeable contribution to flow from these tributaries between stations upstream and stations downstream of the lease area. Flow in the White River has three identifiable periods: a low flow period (approximately August through February), a medium flow period (late February through April), and a high flow period (May through July). The low flow period is sustained by ground water seepage mainly from above Meeker, Colorado. Stream flow is usually low because of light precipitation and averages about 423 cubic feet per second (cfs). During the medium flow period surface runoff below Meeker contributes substantial flow averaging about 638 cfs. Snowmelt from the mountains above Meeker produces the maximum annual flow with an average of 1,290 cfs during the high flow period.

Flow patterns in Evacuation Creek are more complex compared to the White River and show several variations with time. Surface runoff contributes substantial amounts of water to the creek. Ground water seepage contributes less water than surface runoff (between 10% and 40% according to VTN 1977) but it is a consistent source of flow in the Evacuation Creek. Peak flows are usually related to rainfall periods. Evacuation Creek has two distinct periods, a low flow period (usually between August and February) in which the flow is sustained by seepage from consolidated-rock aquifer (mainly Birds Nest Aquifer) and a high flow period where surface runoff and snowmelt increase flow substantially. The actual dates of these periods fluctuate from year to year and are strongly influenced by rainfall events. The average flow is 1.3 cfs during August to February, increasing to 2.1 cfs during May to June.

Surface water quality of the White River near the proposed project was measured at several locations from 1974 through 1984. It was found that specific conductance and total dissolved solids (TDS) were usually inversely related to volume of flow (VTN, 1977). TDS measurements in the White River were generally at their lowest during spring when flows were at their highest and snowmelt represented the major portion of the flow. As the contribution of snowmelt diminished during the summer, flow in the White River decreased. Water quality also changed during the summer as ground water seepage contributed a larger portion of the flow. During the fall and winter, flows were at their lowest because of low precipitation. TDS measurements were generally highest during the fall and winter period. Total suspended sediment (TSS) concentrations for the White River in the mid-1970s were found to generally increase with increasing flow volume (VTN, 1977). Thus, TSS levels were highest during the spring and lowest during the fall and winter. During the 1974 –

1984 period, TSS values in the White River ranged from 46 to 28,500 mg/l (WRSOC, 1985).

_Ground Water – Alluvial Aquifers_: Alluvial aquifers exist along the major drainages of Bitter and Evacuation Creeks, and the White River. Alluvial aquifers of smaller extent exist in minor drainages such as Southam Canyon and Hells Hole Canyon. They mainly consist of silt and clay, with minor amounts of sand and gravel. The alluvial aquifers average a thickness of 100 ft in the Bitter Creek drainage and about 30 ft in Evacuation Creek, White River, and smaller tributaries. The largest values of hydraulic conductivities occur in aquifers along the White and Green Rivers. Hydraulic conductivity values range from 1 to 25 ft per day. Smaller values of hydraulic conductivity generally occur along Bitter and Evacuation Creeks. Reported specific yield ($S_y$) values ranged from 0.02 to 0.21. Water moves from recharge areas along perennial reaches of streams downstream toward the mouths of major drainages. Most of the water is consumed by evapotranspiration and never reaches the mouths of major drainages. Water level gradients in major drainages average about 40 ft per mile and the average velocity of water moving through alluvial aquifers is about 0.4 ft per day (Holmes and Kimball 1987).

Recharge to alluvial aquifers originates from leakage from unconsolidated-rock aquifers in the Uinta and Green River Formations that are in contact with the alluvial aquifers and infiltration from stream flow, along the perennial and intermittent reaches of major tributaries and along the White and Green Rivers. Maximum infiltration occurs during periods of snowmelt and summer months. Precipitation falling on the alluvium is less than 12 inches per year and is probably almost all consumed by evapotranspiration.

Discharge from the alluvial aquifers occurs in springs, evapotranspiration, wells, and subsurface flow into consolidated aquifers. Two springs discharge an estimated 600 acre-ft per year along Bitter Creek (Holmes and Kimball 1987). Other springs exist in the area of the 160-acre lease site but the discharge points are masked by perennial stream flow and the total amount is probably less than 50 acre-ft per year. Holmes and Kimball (1987) estimated the evapotranspiration from the alluvium in the White River, Bitter Creek and Evacuation Creek drainage basins to be about 7,300 ac-ft/yr, 2,276 ac-ft/yr, and 566 ac-ft/yr, respectively.

Discharge from alluvial aquifers to consolidated aquifers near the Site occurs where the Birds Nest Aquifer is in contact with the alluvial aquifer along Evacuation Creek. Discharge also occurs along the White River where the alluvial aquifers leak water to the underlying Uinta Formation. Overall in the southeastern Uinta Basin, discharge to consolidated-rock aquifers is estimated to be about 2,000 ac-ft/yr.

An estimate of the recoverable water from the alluvium is obtained by multiplying the specific yield by the volume of saturated alluvial deposits. For the White River alluvium, the amount of water theoretically recoverable from storage is equal to 39,000 acre-ft (Holmes and Kimball 1987).

Five alluvial monitoring wells in the White River valley in the vicinity of the proposed project were installed in association with the White River Shale Project in 1976 (VTN, 1977). These wells confirmed the presence of ground water in the White River alluvium. Water quality was found to be variable containing high salinity levels in some samples. Based on information from the pump tests, the wells in the alluvium produced yields of 170 and 300 gallons per minute ("gpm") over six and eleven hour time frames.

*Ground Water – Birds Nest Aquifer*: The Birds Nest Aquifer is the principal aquifer that was investigated during the baseline study for the White River Shale Project. It is located near the top of the Parachute Creek Member of the Green River Formation and consists predominantly of cavities formed by leaching of nahcolite from the marlstone strata. Although there are a few non-continuous, intermittent water-bearing zones above the Birds Nest Aquifer, they do not fit the definition of a regional aquifer, and the Birds Nest Aquifer is considered the shallowest aquifer beneath the site. The thickness of the aquifer ranges from 90 to 205 feet and averages about 115 feet. The upper surface of the aquifer slopes uniformly to the northwest at approximately 250 feet per mile. The stratigraphic position of the aquifer is very consistent, typically occurring in the top 50 to 125 feet of the Green River Formation. The Birds Nest Aquifer is exposed continuously at the confluence of the White River and Evacuation Creek, and then southward for several miles along the banks or canyon walls of Evacuation Creek. Springs and seepage from the aquifer are common throughout the area (Bechtel Petroleum, Inc., 1981). The aquifer's aerial extent to the west and north is unknown, but it has been estimated to extend as far as Bitter Creek to the west and several miles beyond the White River to the north. Water levels in the aquifer range from a few feet below the surface where the aquifer crops out in the Evacuation Creek to more than 400 feet below the surface a few miles to the west.

The aquifer is characterized by nahcolite nodules set in marlstone overlain by a zone of thin, brittle shale beds, and by fine-grained homogeneous sandstone. The transmissivity of the aquifer is variable. Aquifer tests performed in the 1970s for the White River Shale Project indicate a range in transmissivity from about 1 to 15,000 $ft^2$/day and a range in storage coefficient from about $1 \times 10^{-1}$ to $7 \times 10^{-6}$ (VTN, 1977). The aquifer is unconfined at the southern edge of the area covered by former tracts Ua and Ub in approximately 36 percent of the area. The aquifer is confined in the rest of the former tracts. Water moves to the west from recharge areas along Evacuation Creek and from the south and north toward discharge areas in the lower reaches of Bitter Creek. The majority of the 160-acre lease site has artesian water pressure above the top of the Birds Nest Aquifer.

Recharge in the aquifer originates primarily from infiltration of stream flow from Evacuation Creek, through alluvial deposits overlaying the aquifer, and from downward leakage from the Uinta Formation. Upward leakage from the Douglas Creek Aquifer as a source of aquifer recharge to the Birds Nest Aquifer is assumed to be negligible because of the low vertical hydraulic conductivities of the beds separating the two aquifers. Precipitation falling in the outcrop area of the Birds Nest Aquifer averages less than 12 inches per year and probably accounts for an insignificant amount of total recharge. Table 3-1 presents a summary of ground water budget for the Bird's Nest Aquifer as calculated by the ground water model set up by Holmes and Kimball (1987). As shown in Table 3-1, the total long term recharge is 670 acre-ft/yr.

**TABLE 3-1**
**Summary of Ground Water Budget for the Birds Nest Aquifer**

| Component | Long-term average (acre-ft per year) |
|---|---|
| **Recharge** | |
| Infiltration from Evacuation Creek | 420 |
| Downward leakage from Uinta Formation | 250 |
| Upward leakage from Douglas Creek aquifer | Negligible |
| Precipitation falling on the outcrop area | Negligible |
| **Total** | **670** |
| **Discharge** | |
| Upward leakage to White River and associated alluvial aquifer | 30 |
| Upward leakage to Bitter Creek and associated alluvial aquifer | 640 |
| **Total** | **670** |

Note: Adapted from Holmes and Kimball (1987).

Discharge from the Birds Nest Aquifer primarily occurs from upward leakage through the Uinta Formation and alluvial aquifers to Bitter Creek and discharge to the White River. A number of springs also discharge to Evacuation Creek but the amount of discharge is small. Discharge in the form of seeps and springs is also common along the east wall of Hells Hole Canyon. Maximum yield to individual wells, based on model simulations, was estimated to be 5,000 gallons per minute, with a maximum drawdown of about 200 ft after 30 days of pumping. Holmes and Kimball (1987) estimated the amount of recoverable water stored in the Birds Nest Aquifer to be about 1.9 million ac-ft based upon an areal extent of 300 square miles of the aquifer, a specific yield equal to 0.1, and an average thickness of 100 ft. Drilling investigations of the White River Shale Project located another aquifer of limited areal extent within a zone near the contact of the Uinta and Green River

Formations at the north border of former tract Ua. This aquifer was not encountered at any other location during drilling activities for the baseline investigation. Aquifer tests and well borings estimated the transmissivity equal to 150 gpd/ft, the storage coefficient equal to $1.34 \times 10^{-5}$, and an average thickness of 30 ft (Bechtel Petroleum Inc. 1981).

*Storage Water Management*: Storm water runoff from the 160-acre lease site currently flows to a runoff retention dam where all runoff water and associated suspended sediments are retained, thus limiting potential off-site impacts. The dammed area has a capacity of 211 acre-feet, which is designed to hold runoff from a 100-year storm event (3 inches in 24 hours). The dam captures runoff from the two drainage catchments (total area 850 acres) which drain the mining and processing areas, including all the areas within the 160-acre lease area. The dam is an earthen dam with clay core. The abutments are grouted to minimize leakage. A small seepage retention dam is immediately downstream.

### 3.3.4 Soils

Soils at the mine site have been mapped as Walknolls extremely channery sandy loam – Gilston association, 2-50% slopes (Leishman et al., 2003) (Table 3-9). Walknolls soils have formed from alluvium and colluvium in upland areas including the slopes and tops of dissected plateaus and mesas. Gilston soils were formed from alluvium and are found in the bottoms of larger ephemeral drainages. These are deep, well-drained soils derived from sandstone of the Uinta Formation. The water table is more than 6 feet below the surface, and there is no flood hazard except for rare flash floods in ephemeral drainages. The water erosion hazard is slight to moderate (highest on steep slopes) and the wind erosion hazard is none to moderate. These soils are poor sources of topsoil and subsoil for reclamation because of rock fragments, sodium content, shallow depth to bedrock (Walknolls soils), steep slopes (Walknolls soils), carbonate content (Walknolls soils), and low organic matter content (Gilston soils). Minor components of this association include rock outcrop, Cadrina extremely flaggy loam, badlands, Mikim silt loam, Walknolls very channery sandy loam, and Turzo loam.

The Walknolls extremely channery sandy loam – Gilston association, 2-50% slopes is also found along the utility rights-of-way along with four other soil types shown in Table 3-2. All are upland soils with the exception of the Green River – Fluvaquents complex, 0-2% slopes, which is found in the White River floodplain. Table 3-2 lists some of the environmental and construction-related constraints associated with these soils.

**TABLE 3-2**
**Soil Types and Properties in the Vicinity of the White River Mine Site and Proposed Corridors**

| Soil type | Location | Landform | Parent material | Drainage class | Depth to bedrock | Shrink-swell potential | Flooding hazard | High water table | Water erosion hazard | Wind erosion hazard | Material source |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Walknolls extremely channery sandy loam – Gilston association, 2-50% slopes | mine site & rights-of-way | Walknolls: hills Gilston: drainage ways | alluvium and colluvium derived from sandstone | well drained | Walknolls: 8-20"; Gilston: >60" | low | none | >6 ft. | slight – moderate | none – moderate | poor |
| Badland-Walknolls-Rock outcrop complex, 50-90% slopes | rights-of-way | erosion remnants, hills, cliffs | Walknolls: colluvium derived from sandstone | somewhat excessive – well drained | 0-20" | badland – high; Walknolls – low | none | >6 ft. | moderate – very severe | none – moderate | poor |
| Green River – Fluvaquents complex, 0-2% slopes | rights-of-way | floodplains & oxbows | alluvium derived from sandstone & shale | very poor – moderately well drained | >60" | low | rare – frequent | 0 – 48" | none – slight | moderate – high | fair – poor |
| Walknolls very channery loam, 25-50% slopes | rights-of-way | hills | colluvium derived from sandstone | well drained | 8 – 20" | low | none | >6' | severe | slight | poor |
| Walknolls – Gilston association, 2-25% slopes | rights-of-way | Walknolls: hills Gilston: drainage ways | alluvium derived from sandstone | well drained | Walknolls: 8-20"; Gilston: >60" | low | none | >6' | slight – severe | slight – moderate | poor |

The low precipitation associated with the semi-arid climate has suppressed vegetation growth and slowed the chemical and biological processes commonly associated with soil development (BLM, 1994). In addition, soil fertility is hampered by high salinity and erosion. Soils in the Project Area support low-density livestock grazing and wildlife habitat; only alluvial valleys are capable of supporting irrigated crops, principally hay and alfalfa.

Soils with severe water erosion hazards tend to be found on steeply sloping land. These soils also tend to be relatively impermeable so that more precipitation runs off the surface than infiltrates into the soil. Other characteristics which make a soil highly erodible by water include high contents of silt and very fine sand; expansive clay minerals; a tendency to form surface crusts; the presence of impervious soil layers; and blocky, platy, or massive soil structure (Brady and Weil, 2002).

Soils which are highly erodible by wind include very fine sand, fine sand, sand, or coarse sand (SCS, 1994). These soils are also characteristically dry. Stripping sandy soil vegetation during construction tends to accelerate wind erosion.

If a soil is relatively shallow (depth to bedrock less than 60 inches), construction activities will often encounter bedrock. Thus, blasting or use of special ripping equipment may be necessary for excavations.

Soils subject to frequent flooding and/or a high water table are found in the White River valley. These soils present construction challenges and are relatively susceptible to erosion during spring runoff and summer thunderstorms.

### 3.3.5 Geology/Mineral Resources/Energy Production

*General Physiography and Geology:* The Project Area is located within the Uinta Basin section of the Colorado Plateau physiographic province (Fenneman, 1931). This region is characterized by a dissected plateau with strong relief. The Uinta Basin is a structural depression underlain by northwesterly dipping Tertiary strata in the Project Area. South of the site, above 6,000 feet elevation, the Uinta Basin grades into the northerly sloping Tavaputs Plateau. Elevations at the mine site range from 5,319 to 5,694 feet above sea level. Elevations along the utility rights-of-way range from approximately 4,930 feet (the water well site in the White River floodplain (NE¼, Section 14, T10S, R24E) to approximately 5,710 feet along the power line right-of-way east of Bonanza (NE¼, Section 30, T9S, R25E).

At the mine site, bedrock of the Tertiary-age (Eocene) Uinta Formation is found close to the surface and crops out in many locations. This formation is comprised of very fine-grained sandstone, siltstone, marlstone, a few lenses of pebble conglomerate, and a massive tuffaceous bed (Cashion, 1974). The formation is divided into two units (B and A), but the younger "B" bed occurs only at the higher elevations on the tops of mesas at the mine site and surrounding area.

The base of the Uinta Formation (300-400 feet below the land surface at the mine site) is conformable with the Parachute Creek Member of the Green River Formation (Eocene). The two formations interfinger with several tongues present in the Bonanza area. The tongues are not depicted on geologic maps as they are too thin to be distinguished at conventional geologic map scales.

The Parachute Creek Member consists of marlstone and oil shale as well as numerous thin beds of tuff and some thin beds of siltstone. The upper part of this unit contains small pods and lenses of nahcolite ($NaHCO_3$). A rich oil shale sequence, called the Mahogany zone, is approximately 100 feet thick and occurs approximately 500 feet below the contact with the Uinta Formation. The richest layer in this zone, the Mahogany oil shale bed, is approximately 10 feet thick. Information on the general geochemistry of the Mahogany oil shale bed, gathered during the prior work at the White River Mine site, is included in Appendix D.

The Douglas Creek Member of the Green River Formation lies below the Parachute Creek Member. Below the Douglas Creek Member is the Eocene-age Wasatch Formation.

Thin, unconsolidated Quaternary colluvial deposits, consisting of large flattened rock slabs in an unsorted matrix of silt, sand, and gravel are found on the steeper slopes in the Project Area, while Quaternary alluvium is found in the White River and Evacuation Creek valley floors as well as several ephemeral stream valleys crossed by the utility rights-of-way (Cashion, 1974 & 1986). The White River alluvium consists of sorted silt, sand, and gravel.

*Geologic Hazards*: The Project Area is outside (100 miles east of) the Intermountain seismic belt which runs through central Utah (Heckler, 1993). Quaternary tectonism has been largely absent from eastern Utah, including much of the interior of the Colorado Plateau. No Quaternary faults or folds are present in the project vicinity in Utah, and there is no evidence of Quaternary volcanism.

The National Earthquake Information Center data base was searched for the area within approximately 100 miles of the RD&D mine site. Since 1950, the largest earthquake event within the search area was magnitude 5.7 (Modified Mercalli Intensity VII), and was centered approximately 45 miles southeast of the mine site (USGS, 2006). This event occurred in 1973 and was larger than normal seismic events for the area. The Project Area is located within Seismic Risk Zone 1, which corresponds to intensities V and VI of the Modified Mercalli Intensity scale (Algermissen, 1969). Within Zone 1, it is predicted that distant earthquakes may cause minor damage to structures.

No landslides or other unstable slope situations have been mapped within the RD&D site or utility rights-of-way (Harty 1992a & 1992b and Cashion, 1974 & 1986).

Flash flood hazards are present in the numerous ephemeral washes crossed by the pipeline right-of-way. Large flash floods can scour stream beds resulting in several feet of alluvium being removed and deposited further down the channel.

*Mineral Resources and Energy Production*: Utah's richest oil shale resources are located in the Uinta Basin, where 90 to 115 billion barrels of oil are contained in deposits that have the potential to yield twenty-five or more gallons of oil per ton (Train Web, 2001). These deposits are located within the Tertiary-age Green River Formation. They are found within the Federal Prototype Oil Shale Lease Tracts U-a and U-b (which includes the OSEC RD&D site) as well as the surrounding area where resources are relatively close to the surface. The richest oil shale zones crop out to the south of tracts U-a and U-b. Oil shale is not currently mined commercially in Utah.

The Uinta Basin of northeastern Utah has been producing oil and gas for more than 50 years. The project mine site is located immediately east of the small Southam Canyon gas field (Brown and Ritzma, 1982 and Chidsey et al., 2004). Production from this field is from

Tertiary and Cretaceous formations. The 160-acre lease overlies an existing oil and gas lease (U66422) held by the Black Dragon Unit. There are also several oil and gas leases located along the proposed utility rights-of-way.

Other potential extractable energy sources in the vicinity of the site include tar sands and coal bed methane. Significant tar sand deposits (oil impregnated sandstone) are found within the Uinta Basin. The closest tar sands to the proposed mine site and utility rights-of-way are found in the P.R. Spring deposit located approximately 10 miles southeast of the proposed mine site (Blackett, 1996). The Uinta Basin is reported to have an 11 trillion cubic feet (TCF) reserve of coal bed methane (CBM) (Rice et al., 2004). However, there is no current production in the vicinity of the proposed project.

Gilsonite is a mineral also known as asphaltum, uintaite or uintahite, which is found in commercial quantities near Bonanza, Utah and other locations in the Uinta Basin. Gilsonite is a black, tar-like, brittle substance which has been formed as a residue of natural petroleum. It is used in more than 160 products, primarily in dark-colored printing inks and paints, oil well drilling muds and cements, asphalt modifiers, foundry sands additives, and a wide variety of chemical products (American Gilsonite Co., 2005). Gilsonite veins are vertical and vary from a few inches to 30 ft. wide (most are less than five feet wide). They crop out as straight black lineaments striking northwest across the Bonanza area (Osmond, 1992). The pipeline and power line rights-of-way cross at least two gilsonite veins which have been mined near Bonanza.

Sand and gravel resources are found in the White River valley. However, there is no active exploitation of these resources near the proposed project.

There is no metal mining in the Project Area and no known metallic ore minerals occur in the underlying sedimentary bedrock. There are no mineable coal resources found in the Project Area. No other commercial mineral deposits are found in the Project Area.

### 3.3.6 Floodplains

Floodplains are relatively flat areas adjoining water bodies and are occasionally inundated during high water periods. Approximately 16,000 acres of floodplains are found along the Green and White Rivers and Bitter, Evacuation, Sweetwater, and Willow Creeks in the Book Cliffs area. Flooding of perennial streams in the Colorado Plateau typically occurs during the spring snowmelt/runoff period. The ecological condition of the wetland and riparian areas along these drainages is considered to be threatened by flow alterations, non-native plant species, and grazing (BLM, 2005).

The area along the White River contains relatively narrow alluvial banks and terraces that flood during periods of high flow. According to flood insurance rate maps, no designated 100-year floodplains (subject to inundation at least once in 100 years) are present within the 160-acre RD&D site (US HUD, 1977). However, the proposed utility rights-of-way and the alternate eastern gas line right-of-way cross the 100-year floodplains of the White River and Evacuation Creek.

The proposed power line right-of-way crosses the Evacuation Creek floodplain in the NE¼, Sec. 13, T10S, R24E. The floodplain is approximately 200 feet wide at this location. The proposed powerline crosses the White River floodplain in the NE¼, Sec. 12, T10S, R24E. The White River floodplain width at this location is approximately 400 feet. The proposed western natural gas line right-of-way crosses the White River floodplain approximately 1½ miles to the northwest (downstream) in the NE¼, Sec. 2, T10S, R24E at the Highway 45 bridge. The alternative eastern natural gas line right-of-way crosses the White River floodplain approximately ¼ mile downstream (west) of the proposed power line crossing location.

The proposed water supply wells in the White River alluvium will be located at the south edge of the White River floodplain in the NW¼, Sec. 14, T10S, R24E. The water pipeline to the 160-acre lease, the power line, and access road for these pumps will cross approximately 100 feet of the floodplain to reach these wells.

Although they are not officially designated 100-year floodplains, there are several small ephemeral drainages located at the RD&D site. In addition, the utility rights-of-way (both the proposed and alternative routes) also cross a number of ephemeral drainages. These drainages are subject to flash flooding mainly in response to summer thunderstorms.

### 3.3.7 Wetlands/Riparian Zones

Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of wetland vegetation typically adapted for life in saturated soil conditions (EPA, 2006). In eastern Utah, wetlands are typically located along perennial streams. Riparian areas occur as narrow zones between stream and wetland areas and adjacent uplands. Wetlands and riparian areas may be a source of substantial biodiversity and serve a variety of functions, including providing wildlife habitat, naturally improving water quality, and flood control. In arid eastern Utah, wetland and riparian areas support higher population densities and greater diversity of species of both plants and animals than any other vegetation community.

There are no wetland or riparian zones within the 160-acre lease area. However, small wetland areas are found on either side of the White River at the proposed and alternative utility line crossing locations. In the Project Area, riparian species such as cottonwood, tamarisk, and russian olive are common along the White River riparian zone including at the proposed and alternative utility line crossing locations. The WRSP alluvial wells are located at the edge of the riparian zone on the south side of the White River. The wetland and riparian zones at the power line crossing locations on Evacuation Creek are narrow and confined by canyon walls. As is common in the arid west at some locations, upland vegetation communities (sagebrush, greasewood, and rabbitbrush) are found growing to the water's edge.

### 3.3.8 Threatened/Endangered (T&E) Wildlife Species

Federally listed, proposed, and candidate wildlife species are managed under the Endangered Species Act (ESA) of 1973 (as amended) by the U.S. Fish and Wildlife Service (USFWS). Nine (9) of these species were identified as occurring in Uintah County (USFWS, 2006). Five (5) federally listed endangered, 3 federally listed threatened, and 1 candidate species were identified by the USFWS as potentially occurring in the Project Area. These species, protection status, potential for occurring within the Project Area, and associated habitats are summarized in Table 3-3.

Field surveys to assess habitat were conducted within the 160-acre lease site and along the utility rights-of-way in the spring of 2006. The field data and all available wildlife information sources such as the USFWS, Utah Division of Wildlife Resources, and BLM were compiled. The VFO conducted an evaluation to determine which special status species required detailed analysis and clearance surveys. Based on the data presented in Table 3-3 and determinations made by the VFO, there are certain mammal and bird species which can be eliminated from detailed analysis based on the lack of suitable habitat at the 160-acre lease area and along the proposed rights-of-way. It is anticipated that the following listed wildlife species may occur in the Project Area and are, therefore, carried forward for detailed analysis:

- Bald Eagle (*Haliaeetus leucocephalus*) – Federally Listed Threatened
- Bonytail Chub (*Gila elegans*) – Federally Listed Endangered
- Colorado Pikeminnow (*Ptychocheleilus lucius*) – Federally Listed Endangered
- Humpback chub (*Gila cypha*) – Federally Listed Endangered
- Razorback Sucker (*Xyrauchen texanus*) – Federally Listed Endangered

### 3.3.9 Fish and Wildlife Including Special Status Species other than USFWS Candidate or Listed Species

<u>*Sensitive Species*</u>: Both the BLM and State of Utah maintain lists of sensitive animal species that are not listed or proposed as Threatened and Endangered Species. The restricted distributions, specialized habitat requirements, and population pressures (human induced and natural) facing special status species contribute to a high potential for federal listing. Thus, their populations are of conservation interest. There are 13 wildlife and 4 fish species that occur within the project area or which may be affected by implementation of the proposed

project. These species' potential for occurring within the Project Area and associated habitats are summarized in Table 3-4.

**TABLE 3-3**
**Federally Listed and Proposed (P), Endangered (E), Threatened (T), and Candidate (C) Species and Habitat in Uintah County, Utah Updated January 2006**

| Species | Scientific Name | Status | Eliminated From Detailed Analysis | Habitat |
|---|---|---|---|---|
| **MAMMALS** | | | | |
| Black-footed Ferret[1] | Mustela nigripes | E | Yes, adequate prairie dog colonies do not exist within the project boundaries or along the ROW. | Limited to open habitat, the same habitat used by prairie dogs: grasslands, steppe, and shrub steppe. Healthy and adequately sized prairie dog populations are critical to black-footed ferrets. |
| Canada Lynx | Lynx canadensis | T | Yes, suitable habitat does not exist within the Project Area. | Boreal and montane regions dominated by coniferous or mixed forest with thick undergrowth. Also sometimes enters open forest, rocky areas, and tundra to forage for abundant prey. |
| **BIRDS** | | | | |
| Bald Eagle[2] | Haliaeetus leucocephalus | T | **No** Nest surveys were conducted during 2006. Nest and winter roost surveys will be conducted at appropriate times of the year prior to the start of construction activities. Water depletions may affect foraging habitat. | Nests and roosts in conifers or other tall trees; typically selects the larger, more accessible trees. Often near water. |
| Mexican Spotted Owl[3] | Strix occidentalis | T | Yes, suitable habitat does not exist along the project boundaries or along the ROW. | In Utah and Colorado, most nests are in caves or on cliff ledges in steep-walled canyons. Requires cool summer roosts, such as near canyon bottoms, in dense forests, on shady cliffs or in caves. Sometimes occurs in deep canyons in areas that lack extensive forests. |
| Yellow-billed Cuckoo[4] | Coccyzus americanus | C | Yes, HDD will be used where the ROW crosses the White River to reduce impacts to habitat. | Nests in deciduous woodlands, moist thickets, orchards, overgrown pastures; in tree, shrub, or vine, an average of 1-3 meters above ground. |
| **FISH** | | | | |
| Bonytail Chub[3,5] | Gila elegans | E | **No** Water depletions from the White River may affect habitat. Designated critical habitat is present in the White River. | Typically lives in large, fast-flowing waterways of the Colorado River system. Spawns in the spring and summer over gravel substrate. |
| Colorado Pikeminnow[3,5] | Ptychocheilus lucius | E | **No** Water depletions from the White River may affect habitat. Designated critical habitat is present in the White River. | Swift flowing muddy rivers with quiet, warm backwaters. |
| Humpback Chub[3,5] | Gila cypha | E | **No** Water depletions from the White River may affect habitat. | Deep, fast-moving, turbid waters often associated with large boulders and steep cliffs. |
| Razorback Sucker[3,5] | Xyrauchen texanus | E | **No** Water depletions from the White River may affect habitat. Designated critical habitat is present in the White River. | Found in deep, clear to turbid waters of large rivers and some reservoirs over mud, sand or gravel. |

| **TABLE 3-3**<br>**Federally Listed and Proposed (P), Endangered (E), Threatened (T), and Candidate (C) Species and Habitat in Uintah County, Utah Updated January 2006** | | | | |
|---|---|---|---|---|
| **Species** | **Scientific Name** | **Status** | **Eliminated From Detailed Analysis** | **Habitat** |

[1] Historical range.
[2] Wintering populations, only eight known nesting pairs in Utah.
[3] There is designated critical habitat for the species within the county.
[4] Western" Yellow-billed Cuckoo = distinct population segment in Utah.
[5] Water depletions from any portion of the occupied drainage basin are considered to adversely affect or adversely modify the critical habitat of the endangered fish species, and must be evaluated with regard to the criteria described in the pertinent fish recovery populations.

**TABLE 3-4**
**BLM Sensitive Wildlife Species**

| **Species** | **Scientific Name** | **Eliminated From Detailed Analysis** | **Habitat** |
|---|---|---|---|
| **MAMMALS** | | | |
| Townsend's big-eared bat | *Corynorhinus townsendii* | **No**<br>Potential habitat exists in the Project Area and individuals could be using the mine shaft. | Maternity and hibernation colonies typically are in caves and mine tunnels. Prefers relatively cold places for hibernation, often near entrances and in well-ventilated areas. |
| White-tailed Prairie Dog | *Cynomys leucurus* | Yes, no active colonies were located at the RD&D site or utility rights-of-way. | Xeric sites with mixed stands of shrubs and grasses in plains, plateaus, desert shrub habitat. |
| **BIRDS** | | | |
| Northern Goshawk | *Accipiter gentiles* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Nests in a wide variety of forest types including deciduous, coniferous, and mixed forests. Often in dense forests on the edge of aspen groves and near a water source. |
| Grasshopper Sparrow | *Ammodramus savannarum* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Prefers grasslands of intermediate height and is often associated with clumped vegetation interspersed with patches of bare ground. Other habitat requirements include moderately deep litter and sparse coverage of woody vegetation. |
| Burrowing Owl | *Athene cunicularia* | Yes, adequate prairie dog colonies do not exist at the RD&D site or utility rights-of-way. | Grasslands and mountain parks, usually in or near prairie dog towns. Also uses well-drained, steppes, deserts, prairies and agricultural lands. |
| Ferruginous Hawk | *Buteo regalis* | **No**<br>A Raptor Survey will be conducted at the RD&D site and utility rights-of-way during the appropriate time of year prior to the start of construction. | Open country, primarily prairies, plains and badlands; sagebrush, saltbush-greasewood scrubland, periphery of pinyon-juniper, and other woodland, desert. |
| Sage Grouse | *Centrocercus urophasianus* | Yes, the RMP/EIS indicates no sage grouse leks are present at the RD&D site or utility rights-of-way. | Foothills, plains, and mountain slopes where sagebrush is present. Use mixes of low and tall sagebrush with abundant forbs, riparian and wet meadows. |
| Bobolink | *Dolichonyx orvzivorus* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Tall grass areas, flooded meadows, prairie, deep cultivated grains, and hayfields. |

**TABLE 3-4**
**BLM Sensitive Wildlife Species**

| Species | Scientific Name | Eliminated From Detailed Analysis | Habitat |
|---|---|---|---|
| Lewis' Woodpecker | *Melanerpes lewis* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Open forest and woodland, often logged or burned, including oak, coniferous forest (primarily ponderosa pine), riparian woodland and orchards, less commonly in pinyon-juniper. |
| Long-billed Curlew | *Numenius americanus* | Yes, HDD will be used where the ROW crosses the White River to reduce impacts to habitat. | Prairies and grassy meadows, generally near water. Nests in dry prairies and moist meadows. Nests on ground usually in flat area with short grass, sometimes on more irregular terrain, often near rock or other conspicuous object. |
| American White Pelican | *Pelecanus erythrorhynchos* | Yes, HDD will be used where the ROW crosses the White River to reduce impacts to habitat. | Rivers, lakes, reservoirs, estuaries, bays, marshes; sometimes inshore marine habitats. Nests usually on islands or peninsulas in brackish or freshwater lakes, isolated from mammalian predators. Usually nests in open area, but often near vegetation, driftwood, or large rocks. |
| Three-toed Woodpecker | *Picoides tridactylus* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Coniferous forest (primarily spruce), less frequently mixed forest. Cavity nests placed in dead (occasionally live) tree (commonly conifer or aspen). Sometimes nests in utility poles. |
| **REPTILES** | | | |
| Smooth Greensnake | *Opheodrys vernalis* | Yes, HDD will be used where the ROW crosses the White River to reduce impacts to habitat. | Habitats include meadows, grassy marshes, moist grassy fields at forest edges, mountain shrublands, stream borders, bogs, open moist woodland, abandoned farmland, and vacant lots. This snake has been found hibernating in abandoned ant mounds. |
| **FISH** | | | |
| Bluehead Sucker | *Catostomus discobolus* | Yes, HDD will be used where the ROW crosses the White River to reduce impacts to habitat. | Usually in large rivers and mountain streams, rarely in lakes. Occupies a wide range of fluvial habitats including cold, clear mountain streams to warm, turbid streams. Adults almost always in moderate to fast flowing water above rubble-rock substrate; young prefer quiet shallow areas near shoreline. |
| Flannelmouth Sucker | *Catostomus latipinnis* | Yes, HDD will be used where the ROW crosses the White River to reduce impacts to habitat. | Moderate to large rivers, seldom in small creeks, absent from impoundments. Typical of pools and deeper runs and often entering mouths of small tributaries; also riffles and backwaters. |
| Roundtail Chub | *Gila robusta* | Yes, HDD will be used where the ROW crosses the White River to reduce impacts to habitat. | Rocky runs, rapids, and pools of creeks and small to large rivers; also large reservoirs in the upper Colorado River system; generally prefers cobble-rubble, sand-cobble, or sand-gravel substrate. |
| Colorado River Cutthroat Trout | *Oncorhynchus clarki pleuriticus* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Requires cool, clear water and well-vegetated streambanks for cover and bank stability; in stream cover in the form of deep pools and boulders and logs also is important; adapted to relatively cold water, thrives at high elevations. |

The VFO determined which special status species required detailed analysis and clearance surveys. Field surveys to assess habitat were conducted at the 160-acre lease site and all utility rights-of-way in spring 2006. The field data and all available wildlife information sources such as the USFWS, UDWR, and BLM were compiled to determine which special status species will require detailed analysis and clearance surveys.

Based on the data presented in Table 3-4, nearly all of these sensitive species can be eliminated from the detailed evaluation because habitat is not present in the Project Area or, in some cases, because the proposed activity (horizontal directional drilling) nearby would not affect potential habitat. It is anticipated that the following sensitive wildlife species may occur in the Project Area:

- Ferruginous Hawk (*Buteo regalis*)
- Townsend's big-eared bat (*Corynorhinus townsendii)*

*UDWR Managed Species*: The terrestrial wildlife species found in the Vernal Planning Area (VPA) are typical of the intermountain region of the United States (Table 3-5). Management goals for most wildlife populations in the VPA are determined primarily by the UDWR, with the exception of federally protected wildlife populations, which are determined by the USFWS.

**TABLE 3-5**
**Utah Department of Wildlife Resources Managed Species**

| Species | Scientific Name | Eliminated From Detailed Analysis | Habitat |
|---|---|---|---|
| **BIG GAME** | | | |
| Moose | *Alces alces* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Prefers mosaic of second-growth forest, openings, swamps, lakes, wetlands. Requires water bodies for foraging and hardwood-conifer forests for winter cover. Avoids hot summer conditions by utilizing dense shade or bodies of water. Young are born in protective areas of dense thickets. |
| Pronghorn Antelope | *Antilocapra Americana* | **No** Those areas north of the White River contain year-long range. | Grasslands, sagebrush plains, deserts, and foothills. Need for free water varies with succulence of vegetation in the diet. Birth and fawn bedding sites in a sagebrush-steppe community were in dense shrub cover, but the tallest, most dense cover was avoided. |
| Bison | *Bison bison* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Open plains and grasslands in south; woodland and openings in boreal forest, meadows, and river valleys in north. |
| Rocky Mountain Elk | *Cervus elaphus* | Yes, the RMP/EIS indicates no elk range at the RD&D site or utility rights-of-way. | Uses open areas such as alpine pastures, marshy meadows, river flats, and aspen parkland, as well as coniferous forests, brushy clear cuts or forest edges, and semi-desert. |
| Mountain Lion | *Puma concolor* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Now associated generally with mountainous or remote undisturbed areas. May occupy wide variety of habitats: swamps, riparian woodlands, broken country with good cover of brush or woodland. |

**TABLE 3-5**
**Utah Department of Wildlife Resources Managed Species**

| Species | Scientific Name | Eliminated From Detailed Analysis | Habitat |
|---|---|---|---|
| Mule Deer | *Odocoileus hemionus* | **No** Much of the Project Area and ROW south of the White River lie within winter range. The RD&D site and utility rights-of-way lie within year-long range. | Coniferous forests, desert shrub, chaparral, grasslands with shrubs. Often associated with successional vegetation, especially near agricultural lands. Often on warmer slopes in winter. |
| Bighorn Sheep | *Ovis canadensis* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Mesic to xeric, alpine to desert grasslands or shrub-steppe in mountains, foothills, or river canyons. Escape terrain (cliffs, talus slopes, etc.) is an important feature. In winter, Rocky Mountain Bighorns spend as much as 86% of their time within 100 meters of escape terrain, and usually stay within 800 meters of escape terrain throughout the year. |
| Black Bear | *Ursus americanus* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Prefers mixed deciduous-coniferous forests with a thick understory, but may occur in various situations. When inactive, occupies den under fallen tree, in ground-level or above-ground tree cavity or hollow log, in underground cave-like sites, on ground surface in dense cover. Young are born in a den. |
| **UPLAND GAME BIRDS/WATERFOWL** | | | |
| Chukar | *Alectoris chukar* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Prefers rocky slopes in sagebrush-grassland communities where water is available. |
| Waterfowl | *Anatidae* | Yes, HDD will be used where the ROW crosses the White River to minimize impacts. | Occur throughout the area but concentrations of nesting and winter utilization occur along the White River. |
| Ruffed Grouse | *Bonasa umbellus* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Dense forest with some deciduous trees, in both wet and relatively dry situations from boreal forest (especially early seral stages dominated by aspen) and northern hardwood ecotone to eastern deciduous forest and oak-savanna woodland. Young forest provides optimum conditions. |
| California Quail | *Callipepla californica* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Brushy, grassy and weedy areas in both humid and arid regions, including chaparral, forest edge, cultivated lands, semi-desert scrub, thickets, sagebrush and, less frequently, open second-growth woodland. Usually near water. |
| Sage Grouse | *Centrocercus urophasianus* | Yes, the RMP/EIS indicates no sage grouse leks are present at the RD&D site or utility rights-of-way. | Foothills, plains, and mountain slopes where sagebrush is present. Uses mixes of low and tall sagebrush with abundant forbs, riparian and wet meadows. |
| Blue Grouse | *Dendragapus obscurus* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Coniferous forest, especially fir, mostly in open situations with a mixture of deciduous trees and shrubs. Spends winter, usually at higher elevations than summer habitat, in conifer forest of various categories of age and tree density; roosts in large conifers with dense foliage (e.g., Douglas-fir during day, subalpine fir at night in northeastern Utah). |
| Wild Turkey (Merriam's and Rio Grand) | *Meleagris gallopavo* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Forest and open woodland, scrub oak, deciduous or mixed deciduous-coniferous areas, especially in mountainous regions. |

| TABLE 3-5 Utah Department of Wildlife Resources Managed Species | | | |
|---|---|---|---|
| **Species** | **Scientific Name** | **Eliminated From Detailed Analysis** | **Habitat** |
| Ring-necked Pheasant | *Phasianus colchicus* | Yes, no individuals were observed during habitat surveys. | Open country (especially cultivated areas, scrubby wastes, open woodland and edges of woods), grassy steppe, desert oases, riverside thickets, swamps and open mountain forest. Winter shelter includes bushes and trees along streams, shelterbelts, and fencerows. |
| Mourning Dove | *Zenaida macroura* | **No** Individuals were observed during habitat surveys. | Open woodland, forest edge, cultivated lands with scattered trees and bushes, parks and suburban areas, arid and desert country (generally near water) and second growth (Tropical to Temperate zones). |

Field surveys to assess habitat were conducted at the RD&D site and utility rights-of-way in spring 2006. The field data and all available wildlife information sources such as the UDWR and BLM were compiled and consultations with the VFO took place to determine which managed species will require detailed analysis and clearance surveys. Based on the data presented above in Table 3-5, it is anticipated that the following wildlife species may occur in the Project Area:

- Pronghorn antelope (*Antilocapra americana*),
- Mule deer (Odocoileus hemionus), and
- Mourning dove (Zenaida macroura).

*Migratory Birds*: All birds are protected under the Migratory Bird Treaty Act (MBTA) except for European starlings, rock doves (common pigeons), and house sparrows. Birds commonly referred to as upland game birds such as pheasants, chukers, and grouse are also not covered under the MBTA but are managed by the Utah Division of Wildlife Resources. There are currently several agencies, both Federal and private, and several conservation plans which protect and enhance the habitat of migratory birds and follow the premise of the MBTA and other bird protection legislation (USC, IWJV, 2005).

The most efficient method of managing bird species is to manage habitat types to achieve healthy populations of bird species. Habitat types designated as Priority A Habitats by USC, IWJV (2005) that either exist in the 160 acre lease area or are crossed by the utility rights-of-way include sagebrush steppe, lowland riparian, and wetland. Descriptions of these habitats and representative bird species for each habitat type are described below but the list is not all inclusive. Listed species have potential to occur near the project site (SU, NR, DWR, 2006) and are included in conservation plans (USC, IWJV, 2005).

Sagebrush Steppe: Shrub land principally dominated by big sagebrush (*Artemisia tridentata*), black sagebrush (*Artemisia nova*), low sagebrush (*Artemisia arbuscula*), or silver sagebrush (*Artemisia cana*); or dominate sagebrush shrub land and perennial grassland at 2,500-11,500 ft elevation (UPF. 2002). Representative bird species include Brewer's sparrow (*Spizella breweri*), sage sparrow (*Amphispiza belli*), and sage thrasher (*Oreoscoptes montanus*).

Lowland Riparian: Principal woody species include Fremont cottonwood (*Populus fremontii*), salt cedar (*Tamarix pentandra*), netleaf hackberry (*Celtis reticulata*), velvet ash (*Fraxinus velutina*), desert willow (*Chilopsis linearis*), willow (*Salix* spp.), and squawbush (*Rhus trilobata*) at less than 5,500 ft elevation (UPF, 2002). Representative bird species include blue grosbeak (*Guiraca caerulea*), broad-tailed hummingbird (*Selasphorus platycercus*), and common grackle (*Quiscalus quiscula*).

Wetland: Principal plant species include cattail (*Typha latifolia*), bullrush (*Scirpus* spp.), and sedge (*Carex* spp.) in marsh and wetland areas that are less than 5,500 ft elevation (UPF, 2002). Representative bird species include American avocet (*Recurvirostra americana*), black-crowned night heron (*Nycticorax nycticorax*), black-necked stilt (*Himantopus mexicanus*), cattle egret (*Bubulcus ibis*), and Wilson's phalarope (*Phalaropus tricolor*).

Other habitat types that are either present in the 160-acre lease area or are crossed by the rights-of-way include pinyon-juniper and high desert scrub. Bird species representative of these habitat types are not any less important from a management standpoint, but may have slightly fewer outside influences that impact their habitat and thus their survival.

Pinyon-Juniper: It is principally dominated by Rocky Mountain juniper (*Juniperus scopulorum*), Oneseed Juniper (*Juniperus monosperma*), and Utah juniper (*Juniperus osteosperma*); or conifer forest principally dominated by two-needle pinyon (*Pinus edulis*) or singleleaf pinyon (*Pinus monophylla*); or conifer forest principally co-dominated by *Pinus edulis* or *Pinus monophylla* and *Juniperus scopulorum*, *Juniperus monosperma* and *Juniperus osteosperma* located at 2,700 – 11,000 ft elevation. Representative bird species include ash-throated flycatcher (*Myiarchus cinerascens*), black-chinned hummingbird (*Archilochus alexandri*), black-throated gray warbler (*Dendroica nigrescens*), common nighthawk (*Chordeiles minor*), and pinyon jay (*Gymnorhinus cyanocephalus*).

High Desert Shrub: They are principally dominated by greasewood (*Sarcobatus vermiculatus*), shadscale (*Atriplex confertifolia*), graymolly (*Kochia vestita*), mat-atriplex (*Atriplex corrugata*), castle valley clover (*Atriplex cuneata*), winterfat (*Ceratoides lanata*), budsage (*Artemisia spinescens*), four-wing saltbush (*Atriplex canescens*), halogeton (*Halogeton glomeratus*), Mormon tea (*Ephedra* spp.), horsebrush (*Tetradymia canescens*), snakeweed (*Gutierrezia sarothrae*) and rabbitbrush *(Chrysothamnus* spp.); or low elevation perennial Grassland co-dominate with shrub land at 2,200 -10,300 ft elevation (UPF, 2002). Representative bird species include black-throated sparrow (*Amphispiza bilineata*), loggerhead shrike (*Lanius ludovicianus*), northern mockingbird (*Mimus polyglottos*), Say's phoebe (*Sayornis saya*), and western meadowlark (*Sturnella neglecta*).

Field surveys to assess habitat were conducted within the 160-acre lease site and along the utility rights-of-way in the spring of 2006. Migratory birds present in the area included but are not limited to; black-billed magpie (*Pica hudsonia*), cliff swallow (*Petrochelidon pyrrhonota*), common raven (*Corvus corax*), golden eagle (*Aquila chrysaetos*), great-horned owl (*Bubo virginianus*), horned lark (*Ermophila alpestris*), loggerhead shrike (*Lanius ludovicianu*), mountain bluebird (*Sialia currucoides*), mourning dove (*Zenaida macroura*), red-tailed hawk (*Buteo jamaicensis*), western meadowlark (*Sturnella neglecta*), and unidentified sparrow species.

### 3.3.10 Threatened/Endangered (T&E) Plant Species

Federally listed, proposed, and candidate plant species are protected under the Endangered Species Act (ESA) of 1973 (as amended) by the U.S. Fish and Wildlife Service (USFWS). Seven of these species were identified as occurring in Uintah County (USFWS, 2006). Two federally listed endangered, three federally listed threatened, one federally listed proposed, and one candidate species were identified by the USFWS as potentially occurring in the Project Area. These species, protection status, potential for occurring within the Project Area, and associated habitats are summarized in Table 3-6.

The VFO determined which special status species required detailed analysis and clearance surveys. Field surveys to assess habitat were conducted within the 160-acre lease area and along the utility rights-of-way in the spring of 2006. BLM historical survey data were examined. There was a population of White River beardtongue located during a 1994 survey that is located between both utility rights-of-way. The nearest known population of Graham's beardtongue (survey date unknown) lies more than 2 miles east of the closest portion of the powerline and eastern pipeline right-of-way. All known populations of these two plant species lie at least 3 miles to the north, east, and south of the 160-acre lease area.

The field data and all available information from sources such as the USFWS, UDWR, and BLM were compiled. Based on the data presented in Table 3-6, there are certain plant species which can be eliminated from detailed analysis based on the lack of suitable habitat at the 160-acre lease area and along the proposed rights-of-way. It is anticipated that the following plant species may occur in the Project Area and are, therefore, carried forward for detailed analysis:

- Graham's beardtongue (*Penstemon grahamii*) – Listing declined; litigation pending.
- Uinta Basin hookless Cactus (*Sclerocactus glaucus*) – Federally Listed Threatened.

**TABLE 3-6**
**Federally Listed and Proposed (P), Endangered (E), Threatened (T), and Candidate (C) Plant Species and Habitat in Uintah County, Utah Updated January 2006**

| Species | Scientific Name | Status | Eliminated From Detailed Analysis | Habitat |
|---|---|---|---|---|
| **PLANTS** | | | | |
| Clay Reed-mustard | Schoenocrambe argillacea | T | Yes, suitable habitat does not exist along the project boundaries or along the ROW. | Mixed desert shrub on the lower Uinta and upper Green River shale formations. 4800 to 5600 ft. Flowers May – early June. |
| Graham's beardtongue | Penstemon grahamii | P | **No** Suitable habitat does not exist within the 160 acre lease. There is potential sutiable habitat along the utility ROWs. A rare plant survey will be conducted along the ROW during the appropriate time period prior to the start of construction activities. | Sparsely vegetated shadscale, Eriogonum, horsebrush, ryegrass, and pinyon-juniper communities on shale ledges and talus of the Green River Formation. 4600 to 6700 ft. Flowers late May – mid June. |
| Horseshoe Milk-vetch | Astragalus equisolensis | C | Yes, suitable habitat does not exist along the project boundaries or along the ROW. | Mixed desert shrub on the Duchesne River Formation. 4800 to 5200 ft. Flowers May – early June. |
| Shrubby Reed-mustard | Schoenocrambe suffrutescens (Glaucocarpum suffrutescens) | E | Yes, suitable habitat does not exist along the project boundaries or along the ROW. | Shadescale, pygmy sagebrush, mountain mahogany, juniper, and other mixed desert shrub communities in calcareous shale of the Green River Formation. 5400 to 6000 ft. Flowers late May – mid August. |
| Uinta Basin Hookless Cactus | Sclerocactus glaucus | T | **No** Suitable habitat does not exist within the 160 acre lease. There is potential suitable habitat along the utility ROWs. A rare plant survey will be conducted along the ROW during the appropriate time period prior to the start of construction activities. | Salt desert shrub and pinyon-juniper communities on river benches, valley slopes, and rolling hills of the Duchesne River, Green River, and Mancos Formations, in dry, fine-textured soils overlain with cobbles and pebbles. 4500 to 6600 ft. Flowers April-May. |

| TABLE 3-6<br>Federally Listed and Proposed (P), Endangered (E), Threatened (T), and Candidate (C) Plant Species and Habitat in Uintah County, Utah Updated January 2006 | | | | |
|---|---|---|---|---|
| **Species** | **Scientific Name** | **Status** | **Eliminated From Detailed Analysis** | **Habitat** |
| Ute Ladies'-tresses | Spiranthes diluvialis | T | **No**<br>While habitat does not exist within the project boundary or ROW, water depletions from the White River could impact habitat below where water is being removed and building the alluvial well sites could impact habitat. | Wet meadows, stream banks, abandoned oxbow meanders, marshes, and raised bogs. 4500 to 6800 ft. Flowers late July – September. |
| White River beardtongue | Penstemon scariosus var. albifluvis | C | **No**<br>Suitable habitat does not exist within the 160 acre lease. There is potential suitable habitat along the utility ROWs. A rare plant survey will be conducted along the ROW during the appropriate time period prior to the start of construction activities. | Mixed desert shrub and pinyon/juniper communities, on sparsely vegetated shale slopes of the Green River formation. 5000 to 6800 ft. Flowers late May – June. |

- Ute Ladies'-tresses (*Spiranthes diluvialis*) – Federally Listed Threatened.
- White River beardtongue (*Penstemon scariosus var. albifluvis*) –Candidate for Federal Listing.

### 3.3.11 Vegetation Including Special Status Species other than USFWS Candidate or Listed Species

Eleven ecological systems which may be crossed or disturbed during construction activities associated with the proposed RD&D site and utility rights-of-way were identified for the area. The geographic distribution and description of the ecological systems were obtained from the Southwest Regional Gap Analysis Project or SWReGAP (USGS, 2004). The SWReGAP drew their classifications and descriptions from NatureServe's Ecological System concept (Comer et al., 2003). Following are descriptions of the identified ecological systems.

*Colorado Plateau Mixed Bedrock Canyon and Tableland:* This ecological system is comprised of barren and sparsely vegetated landscapes (generally less than 10 percent plant cover) of steep cliff faces, narrow canyons, and open tablelands of predominantly sedimentary rocks, such as sandstone, shale, and limestone. The vegetation is characterized by very open tree canopy or scattered trees and shrubs with a sparse herbaceous layer.

*Colorado Plateau Mixed Low Sagebrush Shrubland:* This ecological system is found in canyons, gravelly draws, hilltops, and dry flats at elevations generally below 5,900 feet. Soils are often rocky, shallow, and alkaline. It includes open shrublands and steppe. Semi-arid grasses may form a graminoid layer with over 25 percent cover.

*Colorado Plateau Pinyon-Juniper Shrubland:* This ecological system is characteristic of the rocky mesa tops and slopes, Substrates are shallow/rocky and shaley soils at lower elevations (3,950-6,550 feet). The vegetation is dominated by dwarfed (usually less than 10 feet tall) trees forming extensive tall shrublands in the region along low-elevation margins of pinyon-juniper woodlands. Herbaceous layers are sparse to moderately dense and typically composed of xeric graminoids.

*Inter-Mountain Basins Big Sagebrush Shrubland:* This ecological system typically occurs in broad basins between mountain ranges, plains and foothills between 4,900 – 7,550 feet elevation. Soils are typically deep, well-drained and non-saline. Perennial herbaceous components typically contribute less than 25 percent vegetative cover. Some semi-natural communities often originate on abandoned agricultural land or on other disturbed sites where annual bromes and invasive weeds can be abundant.

*Inter-Mountain Basins Greasewood Flat:* This ecological system typically occurs near drainages on stream terraces and flats or may form rings around more sparsely vegetated playas. Sites typically have saline soils, a shallow water table and flood intermittently, but remain dry for most growing seasons. The water table remains high enough to maintain vegetation, despite salt accumulations. This system usually occurs as a mosaic of multiple communities, with open to moderately dense shrublands. The herbaceous layer, if present, is usually dominated by graminoids.

*Inter-Mountain Basins Mat Saltbush Shrubland:* This ecological system occurs on gentle slopes and rolling hills. Substrates are shallow, typically saline, alkaline, fine-textured soils developed from shale or alluvium and may be associated with shale badlands. Infiltration rate is typically low. These landscapes typically support dwarf-shrublands. The herbaceous layer is typically sparse. Scattered perennial forbs occur. In less saline areas, there may be grassland inclusions. Annuals are seasonally present.

*Inter-Mountain Basins Mixed Salt Desert Scrub:* This extensive ecological system includes open-canopied shrublands of typically saline basins, alluvial slopes and plains. Substrates are often saline and calcareous, medium- to fine-textured, alkaline soils, but include some coarser-textured soils. The vegetation is characterized by a typically open to moderately dense shrubland. The herbaceous layer varies from sparse to moderately dense. Various forbs are also present.

*Inter-Mountain Basins Semi-Desert Shrub-Steppe:* This ecological system typically occurs at lower elevations on alluvial fans and flats with moderate to deep soils. This semi-arid shrub-steppe is typically dominated by graminoids (more than 25 percent cover) with an open shrub layer. The woody layer is often a mixture of shrubs and dwarf-shrubs. The general aspect of occurrences may be either open shrubland with patchy grasses or patchy open herbaceous layer. Disturbance may be important in maintaining the woody component.

*Inter-Mountain Basins Shale Badland:* This ecological system is composed of barren and sparsely vegetated substrates (less than 10 percent plant cover) typically derived from marine shales but also include substrates derived from siltstones and mudstones (clay). Landforms are typically rounded hills and plains that form a rolling topography. The harsh soil properties and high rate of erosion and deposition are driving environmental variables supporting sparse dwarf-shrubs and herbaceous vegetation.

*Invasive Annual Grassland:* This includes areas that are dominated by introduced annual grass species.

*Rocky Mountain Lower Montane Riparian Woodland and Shrubland:* This system has a broad elevation range from approximately 2,950 to 9,200 feet. It often occurs as a mosaic of multiple communities that are tree-dominated with a diverse shrub component. This system is dependent on a natural hydrologic regime, especially annual to episodic flooding. Generally, the upland vegetation surrounding this riparian system is different and ranges from grasslands to forests.

The Draft Vernal RMP (BLM, 2005) classifies vegetative cover by Dominant Vegetation Communities. This system of classification was reviewed and compared to the SWReGAP system for compatibility. While most of the SWReGAP ecological systems fit well into the larger BLM vegetation communities, several overlaps and inconsistencies between the two classification systems arose. As the SWReGAP provided the spatial data used to calculate disturbance and evaluate affected systems, the decision was made to use the classification system based on the ecological system approach.

*Special Status Species:* Both the Bureau of Land Management (BLM) and State of Utah maintain lists of sensitive plant species that are not listed or proposed as

Threatened and Endangered Species. The restricted distributions, specialized habitat requirements, and population pressures (human induced and natural) facing special status species contribute to a high potential for federal listing. Thus, their populations are of interest. There are 12 plant species on the BLM and Utah's list. Of the 12 plant species, 11 are restricted to specific soil types. These species' potential for occurring within the Project Area and associated habitats are summarized in Table 3-7.

Field surveys to assess habitat were conducted at the 160-acre lease site and all utility rights-of-way in spring 2006. The field data and all available information sources were compiled to determine which special status species will require detailed analysis and clearance surveys. Based on the data presented in Table 3-7, all but one of these sensitive species (Huber pepperweed) can be eliminated from the detailed evaluation because habitat is not present at the RD&D site or utility rights-of-way.

**TABLE 3-7**
**BLM Sensitive Plant Species (Utah BLM Sensitive Species List, 2003)**

| Species | Scientific Name | Eliminated From Detailed Analysis | Habitat |
|---|---|---|---|
| **PLANTS** | | | |
| Park Rockcress | *Arabis vivariensis* | Yes, no habitat is present at the RD&D site or utility ROWs. | Mixed desert shrub and pinyon-juniper communities in limestone and sandstone outcrops. 5,000 to 6,000 ft. Flowers in May. |
| Hamilton Milkvetch | *Astragalus hamiltonii* | Yes, no habitat is present at the RD&D site or utility ROWs. | Pinyon-juniper and desert shrub communities in the Duchesne River, Wasatch, and less commonly Mowry Shale, Dakota, and other formations. 5,250 to 6,200 ft. Flowers May – June. |
| Owenby's Thistle | *Cirsium owenbyii* | Yes, no habitat is present at the RD&D site or utility ROWs. | Sagebrush, juniper, and riparian communities. 5,500 to 6,200 ft. Flowers late May – August. |
| Untermann daisy | *Erigeron untermanii* | Yes, no habitat is present at the RD&D site or utility ROWs. | Pinyon-juniper, mountain mahogany, limber and bristlecone pine, and sagebrush communities on calcareous shales and sandstones of the Uinta and Green River Formations. 7,000 to 9,400 ft. Flowers May – June. |
| Goodrich Cleomella | *Cleomella palmeriana* | Yes, no habitat is present at the RD&D site or utility ROWs. | Type specimen found growing with *Machaeranthera venusta, Phacelia demissa, Astragulus flavus,* and *Atriplex corrugate* on eroded slopes of heavy clay in the Morrison Formation. 5,400 ft. Flowers in May. |
| Alcove Bog-orchid | *Habenaria zothecina* | Yes, no habitat is present at the RD&D site or utility ROWs. | Seeps, hanging gardens, and moist stream banks in mixed desert shrub, pinyon-juniper, and oakbrush communities. 4,000 to 6,200 ft. Flowers late July – August. |
| Rock Hymenoxys | *Hymenoxys lapidicola* | Yes, no habitat is present at the RD&D site or utility ROWs. | Ponderosa pine-manzanita and pinyon-juniper communities, usually in rock crevices. 6,000 to 8,100 ft. Flowers in June. |

| TABLE 3-7<br>BLM Sensitive Plant Species (Utah BLM Sensitive Species List, 2003) | | | |
|---|---|---|---|
| **Species** | **Scientific Name** | **Eliminated From Detailed Analysis** | **Habitat** |
| Huber Pepperweed | *Lepidium huberi* | **No**<br>Potential habitat is present within the utility ROWs. | Black sagebrush, mountain brush, ponderosa pine, lodgepole pine, and spruce-fir communities, in sand or silty sands derived from the Shinarump Member of the Chinle, Park City, and Weber Sandstone and Green River Formation. 5000 to 8000 ft. Flowers June – August. |
| Stemless Penstemon | *Penstemon acaulis* | Yes, no habitat is present at the RD&D site or utility ROWs. | Pinyon-juniper and sagebrush-grass communities on semibarren substrates. 5,900 to 8,200 ft. Flowers June – July. |
| Flowers Penstemon | *Penstemon flowersii* | Yes, no habitat is present at the RD&D site or utility ROWs. | Shadscale, horsebrush, Ephedra, mat-saltbush, galleta, and rabbitbrush communities in clay badlands in the vicinity of Roosevelt. 4,900 to 5,400 ft. Flowers May – June. |
| Gibbens Penstemon (Gibbens beardtongue) | *Penstemon gibbensii* | Yes, no habitat is present at the RD&D site or utility ROWs. | Shaley slopes and bluffs along the Green River, with mixed desert shrubs and scattered juniper. 5,500 to 7,700 ft. Flowers June. |
| Goodrich Penstemon (Goodrich beardtongue) | *Penstemon goodrichii* | Yes, no habitat is present at the RD&D site or utility ROWs. | Blue gray to reddish clay badlands of the Duchesne River Formation in shadscale and juniper/mountain mahogany communities. 5,600 to 6,200 ft. Flowers late May – June. |

### 3.3.12 Invasive, Non-native Species

Invasive plant species have become a large management concern to the Vernal BLM, especially the management of potential and existing populations of invasive species in area oil and gas fields. The Uintah County Weed Management Area has been formed to manage weeds across lands under various jurisdictions and to pool resources for weed control activities and education (BLM, 2005). Noxious weeds and other invasive plants are considered non-native, undesirable native, or introduced species that are able to exclude and out-compete desired native species, thereby decreasing overall species diversity. A weed may be defined as a plant that interferes with management objectives for a given land area at a given point in time (UW, 2001). Invasive plants include noxious weeds and other plants not native to the United States, and may include plants introduced into an environment where they did not evolve. Invasive plants and noxious weeds often invade and persist in areas where native vegetation has been disturbed. An infestation of noxious weeds can reduce agricultural productivity or wildlife habitat, poison wildlife or livestock, decrease biodiversity, diminish aesthetics, impair wetland ability, and cause many other detrimental effects. Once established, noxious weeds can be very difficult to eradicate. Noxious weeds and their continued encroachment on both public and private lands represent a serious threat to the BLM objective to maintain healthy and diverse ecosystems and rangelands on BLM administered lands. Noxious weed lists were compiled based on published State and Uintah County weed lists maintained by State of Utah Department of Agriculture and Food (2003 &

2006). Table 3-8 identifies state and county noxious weeds and other invasive weeds that may be present in the Project Area.

A weed survey was conducted in 2006. The survey area included the 160-acre lease area, the proposed utility rights-of-way, and the alluvial well sites. Tamarisk (salt cedar) and russian olive are common along the banks of the White River. They are found at all proposed utility line crossings as well as the proposed alluvial well sites. Individual tamarisk plants are also found in upland portions of the 160-acre lease area. Tamarisk has a great ability to spread, it is hardy, consumes high amounts of water (300 gallons/plant/day), and it increases the salinity of the soil around it, making it capable of completely displacing native plants in wetland areas (NPS, 2004). In addition, tamarisk is of little value to wildlife and is often considered detrimental because of its low nutrient value. Russian olive can out-compete native vegetation, interfere with natural plant succession and nutrient cycling, tax water reserves, and is a nitrogen fixer (NPS, 2005). Although russian olive provides a plentiful source of edible fruits for birds, ecologists have found that bird species richness is actually higher in riparian areas dominated by native vegetation.

**TABLE 3-8**
**State and County Noxious Weeds and Invasive Weed Species Potentially Present in the Project Area**

| Common Name | Scientific Name | Utah | Uintah County | Invasive |
|---|---|---|---|---|
| Bermudagrass | *Cynodon dactylon* | X | | |
| Canada thistle | *Cirsium arvense* | X | | |
| Diffuse knapweed | *Centaurea diffusa* | X | | |
| Dyers woad | *Isatis tinctoria* | X | | |
| Field bindweed (Wild Morning Glory) | *Convolvulus arvensis* | X | | |
| Hoary cress | *Cardaria drabe* | X | | |
| Johnsongrass | *Sorghum halepense* | X | | |
| Leafy spurge | *Euphorbia esula* | X | | |
| Medusahead | *Taeniatherum caput-medusae* | X | | |
| Musk thistle | *Carduus mutans* | X | | |
| Perennial pepperweed | *Lepidium latifolium* | X | | |
| Perennial sorghum | *Sorghum halepense & S. almum* | X | | |
| Purple loosestrife | *Lythrum salicaria* | X | | |
| Quackgrass | *Agropyron* repens | X | | |
| Russian knapweed | *Centaurea repens* | X | | |
| Russian olive | *Eleagnus angustifolia* | | X | |
| Scotch thistle | *Onopordum acanthium* | X | | |
| Spotted knapweed | *Centaurea maculosa* | X | | |
| Squarrose knapweed | Centaurea squarrosa | X | | |
| Tamarisk/Salt cedar | *Tamarix parviflora & T. ramosissima* | | X | |

**TABLE 3-8**
**State and County Noxious Weeds and Invasive Weed Species Potentially Present in the Project Area**

| Common Name | Scientific Name | Utah | Uintah County | Invasive |
|---|---|---|---|---|
| Yellow starthistle | *Centaurea solstitialis* | X | | |
| Black henbane | *Hyoscyamus niger* | | | X |
| Bull thistle | *Cirsium vulgare* | | | X |
| Buffalobur | *Solanum rostratum* | | | X |
| Camelthorn | *Alhagi camelorum* | | | X |
| Common cocklebur | *Xanthium strumarium* | | | X |
| Common crupina | *Crupina vulgaris* | | | X |
| Goat's rue | *Galega officinalis* | | | X |
| Jointed goatgrass | *Aegilops cylindrica* | | | X |
| Low larkspur | *Delphinium nuttallianum* | | | X |
| Poison hemlock | *Conium maculatum* | | | X |
| Poverty weed | *Iva axillaris* | | | X |
| Purple starthistle | *Centaurea calcitrapa* | | | X |
| Silverleaf nightshade | *Solanum elaeagnifolium* | | | X |
| St. John's wort | *Hypericum perforatum* | | | X |
| Velvetleaf | *Abutilon theophrasti* | | | X |
| Water hemlock | *Cicuta douglasii* | | | X |
| Wild proso millet | *Panicum miliaceum* | | | X |
| Yellow nutsedge | *Cyperus esculentus* | | | X |
| Toadflax, Dalmation | *Linaria dalmatica* | | | X |
| Toadflax, yellow | *Linaria vulgaris* | | | X |
| Whorled or poison milkweed | *Asclepias subverticillata* | | | X |
| Halogeton | *Halogeton glumerata* | | | X |
| Cheatgrass | *Bromus tectorum* | | | X |
| Houndstongue | *Cynoglossum vulgare* | | | X |

Large infestations of cheatgrass as well as some halogeton were found along the utility rights-of-way. Cheatgrass is widely adapted to grow on all exposures and all types of topography from desert valley bottoms to the tops of the highest mountain peaks, 2,500 to 13,000 feet in elevation (USU, 2002a). It invades heavily grazed rangeland, roadsides, waste places, burned areas, and disturbed sites quickly. In the spring and summer, cheatgrass fires are dangerous to life and property and injurious to perennial plants. Deer and pronghorn graze it in the spring while it is actively growing. It furnishes some food for upland birds and rodents. Halogeton has become common in dry deserts, barren areas, overgrazed prairies, roadsides, and other disturbed areas where native vegetation has been removed (USU, 2002b). Dense stands are found on burned-over areas, overgrazed ranges, dry lakebeds, roadsides, and abandoned dry farms. Halogeton was introduced into North

America as late as 1930 and has rapidly spread, becoming a serious weed on rangeland. It contains toxic amounts of sodium, potassium, and calcium oxalates. Halogeton cannot compete with healthy range plants. Therefore, control involves maintaining a healthy cover of desirable forage plants.

### 3.3.13 Recreation

The goals and objectives regarding recreation for lands managed by the VFO are to ensure the continued availability of quality outdoor recreation opportunities and experiences that are not readily available from other sources; protect the health and safety of visitors; protect natural, cultural, and other resources encouraging public enjoyment of public lands; and enhance recreational opportunities. The basic units of recreation management are the Special Recreation Management Area (SRMA), where recreational use is emphasized and the Extensive Recreation Management Area (ERMA), which provides for unstructured and dispersed recreation, where minimal recreation-related investments are required, and where minimal regulatory constraints are imposed.

The RD&D site is located in the Book Cliffs area, which is currently classified under the Book Cliffs RMP as an ERMA and would continue be classified as such under the Draft Vernal RMP. The Book Cliffs ERMA provides for a variety of recreational opportunities including trails, off-highway vehicle (OHV) use, hunting and wildlife viewing, scenic drives, river recreation, and boating/swimming. More than 40 commercially-permitted recreational activity businesses use these lands.

OHVs commonly use the southern portion of the Book Cliffs ERMA. The closest OHV area is Glen Beach ATV area north of Fantasy Canyon (an unofficial site). It is located north of the White River and several miles northwest of the Project Area. Under the Book Cliffs RMP, the Project Area occupies non-designated OHV, Open-Managed OHV, and Limited OHV areas and would not include any Closed OHV areas.

Hunting and wildlife viewing are widespread throughout the Vernal Planning Area (BLM, 2005). Concentrated hunting and wildlife viewing activities occur in the Book Cliffs ERMA. Big game hunting is more common in the Book Cliffs area than other areas within the Vernal Planning Area given the excellent hunting opportunities with greater public access to the Book Cliffs area.

The White River provides river recreation opportunities in the Books Cliffs ERMA. It is a major resource for commercial and non-commercial boating, especially from the Bonanza (Highway 45) Bridge to the Enron take-out (32 miles downstream). There are also several visual, historic, cultural, and wildlife resources along the White River. The 160-acre lease is not adjacent to the White River. The water, powerline, and natural gas line (both proposed western and alternative eastern) rights-of-way are either located adjacent to or cross the White River. However, the proposed utility lines will all be located within existing, previously disturbed rights-of-way or on private land (the alluvial wells).

The proposed utility rights-of-way and the alternative eastern gas line right-of-way are not located near any unique recreational or visual resources along the river. However, the proposed natural gas pipeline right-of-way crosses the White River adjacent to the Highway 45 bridge at a popular river recreation access point on Uintah County-managed lands. The third utility right-of-way does not cross the White River, but the associated alluvial wells are located within the White River floodplain. The existing access road to the wells may be improved as part of the project.

Other resources within the Book Cliffs ERMA include rock formations and geologic points of interest, including Duck Rock, which is located in the NW¼ SW¼ SW¼ of Sec. 12, T10S, R24E several hundred feet south of the natural gas pipeline right-of-way. Duck Rock is a local landmark located adjacent to an existing access road.

Under the Draft Vernal RMP, there would be some changes to the OHV usage areas. Under Alternative A of the Draft Vernal RMP, the 160-acre lease and utility rights-of-way would be located in Non-Designated OHV areas as well as Limited OHV designated areas. Under Alternative D, they would be located in Open-Managed as well as Non-Designated and Limited OHV areas. No Closed OHV areas are within the 160-acre lease area or cross utility rights-of-way under any alternative. Limited OHV areas are the most common designations for lands in the Project Area under Alternatives A, B, and C. Limited OHV areas have restrictions at certain times, in certain areas, and/or to certain vehicular use. Under Alternative D, the most common OHV designations would be Open-Managed or Non-Designated. Open-Managed areas are less restrictive than Limited OHV areas relative to allowed OHV use.

Under Alternative A of the Draft Vernal RMP, two proposed SRMAs—the White River SRMA and the Book Cliffs SRMA—would be added within the Book Cliffs ERMA. The Project Area is not within the Book Cliffs SRMA. The power line right-of-way would cross the east segment of the White River SRMA, including the White River within the NE¼, Sec. 12, T10S, R24E. The goals and objectives of the potential White River SRMA are to preserve and enhance this segment of the river for commercial and non-commercial recreational boating and for observation of visual resources. The proposed western natural gas pipeline right-of-way would cross the White River immediately west of Highway 45. This highway right-of-way is exempted from inclusion in the White River SRMA described in Alternative A of the Draft Vernal RMP. Therefore, this pipeline crossing location is not located within the eligible White River SRMA. The alternative eastern gas pipeline right-of-way included in Alternative B of this EA would cross the White River SRMA. The third utility right-of-way includes a proposed power line and water pipeline to alluvial wells located at the edge of the White River floodplain. This utility right-of-way will parallel an existing access road that would require minor upgrades. The water pipeline and power line do not cross the White River, but will be located adjacent to the White River SRMA. The wells are located on private land, in the NW¼, Sec. 14, T10S, R24E.

Under Alternative C of the Draft Vernal RMP, the White River SRMA and Book Cliffs SRMA would also be added to the Book Cliffs ERMA. The boundary of the White River SRMA described in Alternative C differ from the Alternative A boundary. The White River SRMA extends the length of the White River from the Utah-Colorado border to the Uintah and Ouray Indian Reservation boundary, under Alternative C. The powerline, pipeline and alluvial wells utility rights-of-way (including the eastern alternative gas pipeline right-of-way) would all be located within the White River SRMA under Alternative C. However, within this SRMA, they would all be located within existing, previously disturbed rights-of-way or on private land (the alluvial wells).

### 3.3.14 Visual Resources

The VFO current management objective for visual resources is to manage public lands to preserve those scenic vistas that are deemed most important and to design or mitigate all visual intrusions so that intrusions do not exceed the established Visual Resource Management (VRM) class objectives (BLM, 2005). The VFO considers surface-disturbing activities, including minerals exploration and development, OHV use, and road development as the primary activities that could potentially cause visual intrusions and impact scenic quality. The BLM's Visual Resource Inventory Manual describes the methodology used to assign BLM lands to four visual resource inventory classes (BLM, 1986). These VRM classes represent the relative value of the visual resource. They provide a basis for considering visual value objectives defining how the visual resource is to be managed. VRM Class I is most protective of the resource and VRM Class IV allows the most modification to the existing landscape character.

The Project Area is located on BLM-administered lands that have been inventoried for visual resources. The Project Area is not located within any VRM Class I areas. The Project Area includes portions of Class II, Class III, and Class IV VRM areas. The VRM objectives for these classes are as follows:

- Class II: The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

- Class III: The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

- Class IV: The objective of this class is to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of the viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements (BLM, 1986).

Based on the Book Cliffs RMP, the 160-acre lease is located within VRM Class III and IV areas. The proposed utility rights-of-way and the eastern gas pipeline right-of-way included in Alternative B cross VRM Class II areas associated with the White River. The proposed alluvial wells adjacent to the White River floodplain are also located in a VRM Class II area. The water pipeline right-of-way is located in VRM Class II areas near the river but cross into VRM Class IV areas near the 160-acre lease. The power line and gas pipeline rights-of-way also cross portions of VRM Class III areas for approximately 1.1 miles. The remainder of the utility rights-of-way crosses a VRM Class IV area (north and south of the White River).

Under Alternatives A and C of the Draft Vernal RMP, the predominant VRM Class associated with the proposed RD&D site and utility rights-of-way is Class III, but the Project Area also includes lands designated VRM Class II and Class IV as shown in Table 3-9. The RD&D site would be located in a VRM Class IV area. The east pipeline route and associated power line would start in VRM Class IV areas from the RD&D site and extend into VRM Class III areas which are located south and north of the White River Corridor. The White River right-of-way is classified as a VRM Class II area under Alternative A of the Draft Vernal RMP. The proposed power line and alternative eastern gas pipeline route would cross the White River right-of-way and associated VRM Class II areas. The west gas pipeline right-of-way would also start in VRM Class IV areas and, like the alternative east pipeline right-of-way, extend into VRM Class III areas south and north of the White River. At the White River, the west pipeline route crossing is located adjacent to the State Highway 45 (Bonanza) bridge. The crossing area is located within a VRM Class II area.

| TABLE 3-9<br>VRM Classes Associated with the OSEC Project | | |
|---|---|---|
| | **VRM Class** | **Comments** |
| Book Cliffs RMP | I | None |
| | II | White River: proposed and eastern alternative pipeline right-of-way, power line, and water pipeline and wells |
| | III | Small area south of White River |
| | IV | 160-acre lease and most of utility rights-of-way |
| Draft Vernal RMP Alternative A | I | None |
| | II | White River: proposed and eastern alternative pipeline right-of-way, power line, and water pipeline and wells |
| | III | Most of utility rights-of-way except at White River crossing |
| | IV | 160-acre lease |
| Draft Vernal RMP Alternative B | I | None |
| | II | same as Alternative A |
| | III | Small area south of White River |
| | IV | 160-acre lease and most of utility rights-of-way |
| Draft Vernal RMP Alternative C | I | None |
| | II | same as Alternative A |
| | III | same as Alternative A |
| | IV | 160-acre lease |

The proposed alluvial wells adjacent to the White River floodplain are located in a VRM Class II area. The water pipeline and power line to the wells are also located in VRM Class II areas near the river but cross into VRM Class IV areas near the RD&D site.

Vernal RMP Alternatives B and D have placed the proposed RD&D site and the majority of the utility rights-of-way within VRM Class IV areas (Table 3-9). The east and west pipeline route options and power line cross a small segment of VRM Class III areas. Both pipeline alternative routes and power lines cross the White River which is classified as VRM Class II. The water wells and associated utility line rights-of-way are also located within a VRM Class II area near the river.

### 3.3.15 Cultural Resources

A Class I inventory (literature and file search) was conducted for cultural resources at the Utah Historical Society, Division of State History (SHPO) on June 13 and 14, 2006, for all cultural resources located within the proposed oil shale development area as well as surrounding lands. Table 3-10 lists the previous investigations in the Project Area. Table 3-11 lists the known sites in or near the Project Area.

The primary investigation in the Project Area was the inventory of the Oil Shale Lease Areas Ua and Ub conducted by the Utah Antiquities section in 1975 (Berry and Berry, 1975). This inventory covered an area of 42.5 square miles (27,200 acres), most of which was south of the White River. The remaining investigations in the area have been small cultural resource investigations for well locations, pipelines, access roads, and seismic projects.

The investigations have recorded 17 sites. These sites are primarily prehistoric rock shelters, open lithic sites, and rock art. Known historic sites include the Ignacio stage stop (42UN1002) and a historic artifact scatter. Site density is low to moderate, with the majority of sites occurring near the White River or in locations where sandstone rock shelters and overhangs are located.

A listing of previous cultural resource investigations and previously recorded sites identified in the Class I file search will be presented in the report of cultural resource investigations for the project to be submitted under separate cover to the VFO and the Utah SHPO.

**TABLE 3-10**
**Previous Cultural Resource Investigation in the Vicinity of the OSEC Oil Shale Project**

| SHPO # | Year | Survey Name | Institution |
|---|---|---|---|
| U-05-MQ-1241b,p,s | 2005 | Cultural Resource Inventory of Enduring Resources' Proposed Bonanza Wells (5-20-9-25, 13-20-9-25, 5-30-9-25, 11-30-9-25, & 12-30-9-25) Uintah County Utah | Montgomery Archaeological Consultants, Inc. |
| U-05-SJ-0324b | 2005 | A Cultural Resource Inventory of Houston Exploration Bonanza Wells #4-35 and #9-22. Uintah County, Utah | Rocky Mountain Consulting, Inc. |
| U-05-SJ-0899b | 2005 | A Cultural Resource Inventory of Six Wells for the Houston Exploration Company, bonanza #5-26-9-24, #15-26-9-24, #16-26-9-24, #1-27-9-24, #7-27-9-24, #9-27-9-24, and Their Associated Access Roads and Pipelines, Uintah County Utah | Rocky Mountain Consulting, Inc. |
| U-04-MQ-1385s | 2004 | Cultural Resource Inventory of Westport Oil and Gas Company's Proposed Bonanza Compressor Station in T9S R24E Section 25, Uintah County, Utah | Montgomery Archaeological Consultants, Inc. |
| U-04-SJ-1316b,s | 2004 | A Cultural Resource Inventory of Houston Exploration Bonanza Wells #8-35, #12-35 and Southman Canyon Well #3-5, Uintah County, Utah | Rocky Mountain Consulting, Inc. |
| U-04-SJ-827s | 2004 | A Cultural Resource Inventory of Houston Exploration Wells Bonanza #4-29, 6-20, 12-20, and 14-16, and Their Associated Pipelines and Access Roads, Uintah County, Utah | Rocky Mountain Consulting, Inc. |
| U-02-MQ-0643b,s | 2002 | Cultural Resource Inventories of Retamco Operation’s Proposed Little Joe #1 Hoss #15, and Cartwright #2 Well Locations Uintah County, Utah | Montgomery Archaeological Consultants, Inc. |
| U-98-IQ-0297b | 1998 | Chevron Cathodic Protection Line and Anode Bed at Mile 15.5 of the Bonanza Pipeline, Uintah County, Utah | InterMountain Archaeological Services |
| U-98-ME-0194 | 1998 | A Class III Cultural Resource Inventory for the American Gilsonite Company's Wagon Hound Mine Shaft Numbers 3 and 7, Uintah County, Utah | TRC Mariah Associates Inc. |
| U-97-JB-0543b,i,s | 1997 | Cultural Resource Inventory of 17 Miles of the Questar Main Line 43 Pipeline Replacement, Near Bonanza Uintah County, Utah | JBR Environmental Consultants Inc. |
| U-94-A1-317s,p | 1994 | Cultural Resource Inventory of a Planned Anode Bed and Related Facilities Uintah County, Utah | Alpine Archaeological Consultants, Inc. |

**TABLE 3-10**
**Previous Cultural Resource Investigation in the Vicinity of the OSEC Oil Shale Project**

| SHPO # | Year | Survey Name | Institution |
|---|---|---|---|
| U-92-MM-0154 | 1992 | Colorado Interstate Gas Company Uinta Basin Lateral 20" Pipeline" Class III Cultural Resource Final Report and Treatment Plan Utah, Colorado and Wyoming | Metcalf Archaeological Consultants, Inc. |
| U-92-MM-0130 | 1991 | Colorado Interstate Gas Company Uinta Basin Lateral 20" Pipeline" Class III Cultural Resource Interim Report and Treatment Plan Utah, Colorado and Wyoming | Metcalf Archaeological Consultants, Inc. |
| U-86-AF-418b | 1986 | Hiko Bell Mining and Oil Company: Dirty Devil Units 22-22A, 22-26A, and 42-22A | Archaeological-Environmental Research Corporation |
| U-83-NH-0528b | 1983 | Archaeological Investigation Paraho Project | Nickens and Associates |
| U-82-BL-06076 | 1982 | Test Excavations - White River Dam | BLM Phillips |
| U-82-NH-0576b | 1982 | A Cultural Resource Inventory of Lands for the Proposed Paraho Commercial shale Oil Project, Uintah County Utah | Nickens and Associates |
| U-81-BL-0689b | 1981 | Bonanza - White River Road | BLM Phillips |
| U-81-BL-06906 | 1981 | White River Dam Evaluation-Main | BLM Phillips |
| U-81-BL-0690b | 1981 | White River Dam Inventory - A | BLM Phillips |
| U-81-BL-0690b | 1981 | White River Dam Inventory - B | BLM Phillips |
| U-81-NH-0590b | 1981 | Archaeological Inventory in the Seep ridge Cultural Study Tract, Uintah County, Northeastern Utah | Nickens and Associates |
| U-81-NH-0657b,s | 1981 | Archaeological Survey of the Bonanza-Rangely Transmission Line (Utah Portion), Bonanza Power Plant Project 1981 | Nickens and Associates |
| U-81-UA-0718b | 1981 | Monitoring Report Spread 5 and 5a MAPCO Rocky Mountain Liquid Hydrocarbons Pipeline | Archaeological Center Department of Anthropology University of Utah |
| U-80-CD-431b | 1980 | Archaeological Surveys of Two Proposed Powerline Corridors in Uintah County, Utah | Centuries Research, Inc. |
| U-80-WG-299b,f,n,p,s | 1980 | Cultural Resource Inventory MAPCO's Rocky Mountain Liquid Hydrocarbons Pipeline | Woodward-Clyde Consultants |
| U-75-UC-0034b | 1975 | An Inventory and Evaluation of Cultural Resources in and Around Oil-Shale Lease Areas U-a and U-b | Division of State History, Utah |

**TABLE 3-11**
**Previously Recorded Sites in or near the Proposed OSEC Oil Shale Project**

| State Site Number | Site Type | NRHP Status |
|---|---|---|
| 42UN118 | Rockshelter/ Sheltered Camp | Needs Data |
| 42UN1013 | Fremont petroglyphs | Eligible |
| 42UN1851 | Open Lithic | Not Eligible |
| 42UN356 | Open Lithic | Needs Data |
| 42UN380 | Isolate | Needs Data |
| 42UN381 | Rockshelter/ Sheltered Camp | Needs Data |
| 42UN382 | Rockshelter/ Sheltered Camp | Needs Data |

| TABLE 3-11<br>Previously Recorded Sites in or near the Proposed OSEC Oil Shale Project | | |
|---|---|---|
| **State Site Number** | **Site Type** | **NRHP Status** |
| 42UN449 | Rockshelter/ Sheltered Camp | Needs Data |
| 42UN4778 | Historic Trash Dump | Not Eligible |
| 42UN971 | Rockshelter/ Sheltered Camp | Eligible |
| 42UN1002 | Ignacio Stage Stop | Need Data |
| 42UN1013 | Prehistoric Rock Art | Needs Data |
| 42UN401 | Open Lithic | Needs Data |
| 42UN367 | Rockshelter/ Sheltered Camp | Needs Data |
| 42UN366 | Rockshelter/ Sheltered Camp | Needs Data |
| 42UN355 | Rockshelter/ Sheltered Camp | Needs Data |
| 42UN407 | Rockshelter/ Sheltered Camp | Needs Data |

A Class III cultural resources inventory was conducted on June 19-23, 2006, on approximately 10 miles of the proposed utility corridors north of the White River (Greenberg and Hoefer, 2006). Eight isolated sites were identified (Table 3-12). All are historical and none are eligible for nomination to the National Register of Historic Places (NRHP).

| TABLE 3-12<br>Cultural Resources Located During June 2006 Class III Inventory Within or Near the Proposed Action Utility ROWs North of the White River | | |
|---|---|---|
| **Site** | **Eligibility Status** | **Site Type** |
| OSEC-IF01 | Not eligible | Isolated Duraglass bottle base |
| OSEC-IF02 | Not eligible | Isolate: 3 solder-dot cans, 1 tobacco tin |
| OSEC-IF03 | Not eligible | Isolated historic inscription |
| OSEC-IF04 | Not eligible | Isolated medicine bottle |
| OSEC-IF05 | Not eligible | Isolated solder-dot can |
| OSEC-IF06 | Not eligible | Isolated historic cans |
| OSEC-IF07 | Not eligible | Isolated whole clear glass bottle |
| OSEC-IF08 | Not eligible | Isolated hole-in-cap can, solder-dot can |

### 3.3.16 Paleontological Resources

The BLM places geologic formations into three categories (Paleontological Conditions) according to the likelihood of fossil occurrence (usually vertebrate fossils of scientific interest)(BLM Manual 8270). Condition I formations are known to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils; Condition II formations have high potential to contain vertebrate or noteworthy occurrences of invertebrate or plant fossils; and Condition III formations are very unlikely to produce vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils.

Geological bedrock maps (Cashion, 1973, 1974, and 1986) document two geological formations underlying the proposed 160-acre lease site and utility ROWs which are considered Condition I or II formations. These are the Uinta and Green River Formations of late middle Eocene age. Exposures of bedrock of these formations are intermittent and are overlain by varying thicknesses of Quaternary sediments of Recent age, including alluvium, colluvium, and wind- blown loess. These unconsolidated deposits are considered Condition III formations and are, therefore, not discussed further.

*Uinta Formation*: The Uinta Formation consists primarily of sandstone, siltstone, and claystone that are chiefly fluvial in origin. The formation overlies and interfingers with the Parachute Creek Member of the Green River Formation. Within the Project Area, the Uinta Formation consists entirely of the Wagonhound Member, which includes as much as 900 feet of sedimentary rocks divisible into a lower and an upper unit.

The fossil fauna from the Uinta Formation in western Colorado and northeastern Utah is one of the richest of late middle Eocene in North America and these fossils have played a very prominent role in the understanding of mammalian evolution in North America (Rasmussen et al., 1999b). Its distinctive fossil fauna makes it the type section for the Uintan Land Mammal Age (Wood et al., 1941) and is an historical collecting area for vertebrate fossils of that age. Most of the fossils comprising the Uinta Eocene fauna have been derived from the Myton Member, which overlies the Wagonhound Member.

The best Uinta formation fossil mammal list is one compiled by Gunnell and Bartels (1999) who note the occurrence of 102 species in 12 orders.

In addition to mammalian fossils, which have received the most study, fossil fish, bird, and reptile remains have been discovered at many localities throughout exposures of the Uinta Formation. Vertebrate trackways are also known from nine localities in the Uinta Formation. The tracks range from those of small mammals and birds, to those of large ungulates such as amynodonts and brontotheres (Hamblin et al., 1999).

Surveys of the Wagonhound Member conducted for the White River Shale project in the mid-1970s (VTN, 1977) in areas south of the White River led to the discovery of petrified wood, turtle bone and shell, crocodile, and large mammal (brontotheres) fossils at 13 locations within the study area.

*Green River Formation:* This formation crops out from the north side of the White River and southward. It also crops out as interfingering lenses between rocks of the Uinta Formation east and north of Bonanza along the proposed pipeline ROW and power line right-of-way. Within the Project Area, only outcrops of the Parachute Creek Member of the Green River Formation are found.

Extremely well-preserved fossils, including remains of insects, insect larvae, fish, and plants have been described from the Parachute Creek Member, with most fossil localities occurring in the upper part of the member in the Piceance Creek Basin and Douglas Arch areas of western Colorado (Grande 1984, MacGinnitie 1969, Cashion 1995, Coddington 1995, Dayvault et al., 1995, Perry 1995, EVG 2004a,b,c). Surveys of the member conducted in the mid-1970's by Miller (VTN, 1977) in areas south of the White River led to the discovery of leaves, petrified wood, insect and fish fossils at 6 locations within the Ua-Ub Federal Oil Shale tracts. Abundant and well-preserved fossil plants have also been described from the upper part of this member from the Bonanza area (Johnson and Plumb 1995).

No fossils of scientific significance have been identified specifically from the Mahogany Zone (the oil shale mining zone) of the Parachute Creek Member. However, it is possible that fossils could be present within this zone.

### 3.3.17 Socio-economics

Uintah County has experienced population growth since the early 1900s. It is populated by citizens who place a high value on living in rural and small town environments and who want to maintain that identity. A large portion of the Uintah and Ouray Indian Reservation lies within the county's boundaries. Approximately 81% of the land in Uintah County is managed by state and federal agencies and Reservation authorities (BLM, 2005).

Most people live in unincorporated areas on farms, ranches and in unincorporated communities, many of which are tribal communities. According the BLM's Draft Vernal RMP, 10.3% of Uintah County residents are American Indian. Approximately 80% of the households are family households, and 44.5% have children less than 18 years of age.

Recent growth of the oil and gas industry in Uintah County is placing increased pressure on the local infrastructure and services in this sparsely populated area. In particular, oil and gas-related construction projects are increasing demand for temporary housing depending on the number of temporary employees hired from outside the immediate area. This demand drives up prices for the temporary accommodations but also generates opportunities for new business owners to establish motel or rental properties. Construction workers may have to drive longer distances to locate accommodations. Other demands on local services related to oil and gas development include increased enforcement activities associate with issuing permits for construction and operations vehicles, emergency medical services to treat construction-related injuries, and law enforcement services to respond to traffic violations and accidents, landowner complaints, and criminal activities.

A significant portion of the economy is based on supporting the oil and gas and public land industries. The largest contribution to the county's economy comes from retail trade, private services and government services. The BLM has estimated that there are 795 farms in Uintah County. Agriculture in this area is dependent upon BLM land access for grazing rights and other use (BLM, 2005).

### 3.3.18 Special Designation Areas

***Wild and Scenic Rivers***

The Wild and Scenic Rivers Act established a National Wild and Scenic Rivers System to protect and preserve designated rivers throughout the nation in their free-flowing condition, as well as their immediate environments (BLM 2005). The White River and Evacuation Creek segments were evaluated by the VFO and determined to be eligible for Congressional designation into the National Wild and Scenic Rivers System. All rivers determined to be eligible for Congressional designation are considered further for suitability through the planning process. Those determined to be suitable for Congressional designation are recommended to Congress for such designation.

The BLM normally manages eligible segments according to BLM 8351 Manual, Section 32C to protect the free-flowing nature, outstandingly remarkable values, and tentative classifications to the extent the BLM has the authority to do so. However, until a suitability decision is made, protection of the potentially eligible segments will be done on a case-by-case basis (BLM, 2005). Management that would apply, should any rivers be designated by Congress, is identified in BLM's 8351 Manual, Section 51.

No eligible Wild and Scenic River (WSR) segments are located within the 160-acre lease. However, eligible segments (White River and Evacuation Creek) would be crossed by the proposed utility rights-of-way, as indicated on Table 3-13.

| TABLE 3-13<br>Segments Eligible for National Wild and Scenic River Designation | | | | |
|---|---|---|---|---|
| **Segment Name** | **Segment Description** | **Values** | **Tentative Classification** | **Utility Right-of-way Crossing** |
| Evacuation Creek | Utah State Line to confluence with White River | Historic | Recreational | Power Line |
| White River | From the Colorado State Line to its confluence with Asphalt Wash | Scenic, Fish, Wildlife/ habitat, Recreational, Historic | Scenic | East Pipeline Route Alternative and Power Line |

*White River Scenic Segment*: The proposed power line will cross the White River in the NE¼, Sec. 12, T10S, R24E. The eastern pipeline right-of-way included in Alternative B would cross the river several hundred feet downstream of the power line. At these locations, the White River is tentatively classified as a scenic segment.

The proposed western pipeline right-of-way will cross the White River immediately west of Highway 45.

Under Alternative C of the Draft Vernal RMP, the proposed power line and both the proposed (western) and Alternative B (eastern) pipeline options cross the eligible White River WSR scenic segment. The river itself is within an exclusion zone which extends both east and west of State Highway 45 bridge (it is outside the WSR segment). Under this alternative, WSR scenic segment includes strips of land immediately north and south of the river which are crossed by the power line right-of-way and by both the eastern and western pipeline options. Under Alternative C of the Draft Vernal RMP, the proposed alluvial wells in Section 14, T10S, R24E and associated water and power lines are adjacent to, but not within, the WSR scenic segment..

*Evacuation Creek Recreation Segment*: Evacuation Creek has been tentatively classified as a WSR recreation segment. The proposed power line route will cross Evacuation Creek at two locations that are within the recreation segment (NE¼, Sec. 13, T10S, R24E and NW¼, Sec. 18, T10S, R25E). There are currently no utility lines present at the Section 13 crossing. The Section 18 crossing would be adjacent to an existing power line.

### *Areas of Critical Environmental Concern*

Areas of Critical Environmental Concern (ACEC) are Special Designation areas managed by the VFO. Designated ACECs highlight areas where special management attention is needed to protect important historic, cultural and scenic values; fish and wildlife resources or other natural systems or processes; or to protect human life and safety from natural hazards. ACECs are used by BLM resource specialists as a management tool to address relevant and important values or hazards associated with ACECs and formulate a prescription to manage the Special Designation areas.

No ACECs were designated through the Book Cliffs RMP. The Draft Vernal RMP identifies several potential ACECs that are being considered for inclusion in three of the four alternatives for the final RMP (as noted above, Alternative D would maintain the existing 1985 RMP for this area and thus no new ACECs would be established). None of the potential ACECs are located within or adjacent to the 160-acre lease. However, one of the potential areas, the White River ACEC (under Alternatives A and C), would be crossed by the proposed utility rights-of-way (Table 3-14). Also, the possible alluvial water supply wells would be constructed within the edge of this ACEC. Relative to other potential ACECs, the north end of the proposed power line right-of-way comes within one-quarter mile of the Coyote Basin ACEC under Alternatives A, B, and C.

The boundaries of the potential Coyote Basin ACEC in Alternatives A and B and the potential Coyote Basin Complex ACEC in Alternative C of the Draft Vernal RMP are based on the presence of an important white-tailed prairie dog complex. The proposed Coyote Basin ACEC also contains a reintroduction area of an experimental non-essential black-footed ferret population. It would also be designated as a Research Natural Area for species recovery research by the Vernal Field Office and the Vernal Branch of Utah State University. The proposed utility rights-of-way do not enter the Coyote Basin ACEC or the Coyote Basin Complex ACEC. The potential White River

**TABLE 3-14**
**Location of Utility Rights-of-way Relative to the Potential White River ACEC**

| Draft Vernal RMP Alternatives: White River ACEC Segment A | East Power Line and Alternative B Pipeline (East) Rights-of-way | Proposed West Pipeline Right-of-way | Alluvial Wells Water Supply Right-of-way |
|---|---|---|---|
| Alternative A | Within White River ACEC | Adjacent to White River ACEC | Within White River ACEC |
| Alternative B | N/A | N/A | N/A |
| Alternative C | Within and adjacent to White River ACEC* | Within and adjacent to White River ACEC* | Within White River ACEC |
| Alternative D | N/A | N/A | N/A |

Note:
* An area of the river both upstream and downstream of the Highway 45 Bridge is excluded from the proposed White River ACEC.

ACEC in Alternatives A and C is based on the existence of unique geological formations, high value scenery, significant historical events, and riparian ecosystem.

The potential ACECs would protect historic, cultural, scenic, and wildlife values, but would remain open to oil and gas leasing. The White River also provides critical habitat for the Colorado pikeminnow and other threatened and endangered species.

Under Alternative A of the Draft Vernal RMP, the proposed utility rights-of-way would cross the potential White River ACEC. The water supply right-of-way from alluvial ground water wells to the 160-acre lease is located at the southern edge of the White River ACEC. The alluvial wells, located on private land, are adjacent to the White River in NW¼, Sec. 14, T10S, R24E.

The power line right-of-way and the alternate gas pipeline right-of-way cross the White River ACEC, as described in Alternative A, approximately 1.5 mile upstream of the Bonanza Bridge in NE¼, Sec. 12, T10S, R24E.

The proposed pipeline right-of-way parallels Highway 45 where it crosses the White River. Under Alternative A of the Draft Vernal RMP, this crossing location is within the area excluded from the White River ACEC.

Under Alternative C of the Draft Vernal RMP, all three proposed utility rights-of-way would be located within portions of the proposed White River ACEC. East and west of the Highway 45 bridge, the White River itself is excluded from the ACEC. Therefore, the east and west utility right-of-way river crossings would not be within the White River ACEC. However, both the north and south sides of the river include strips of the White River ACEC which would be crossed by the east and west utility rights-of-way under Alternative C.

# 4.0 ENVIRONMENTAL IMPACTS

## 4.1 Introduction

Potential impacts associated with the proposed RD&D project are discussed in detail below within the context of the resources of concern as described in Section 3. In addition, details on the environmental control and management measures that will be undertaken as an integral part of the Proposed Action are presented and the effectiveness of these measures at eliminating or reducing potential impacts evaluated. Mitigation measures which may be implemented to address the potential impacts are then described along with any recommended monitoring elements, and the remaining environmental impacts after mitigation are evaluated. These are then compared to the eastern gas pipeline alternative and the no action alternative.

The potential impacts from implementing the Proposed Action would vary in duration and magnitude. Impacts are defined as any change or alteration of the pre-existing condition of the environment caused either directly or indirectly by the alternative under discussion. Impacts can be temporary, short-term, or long-term. Temporary impacts generally occur only during the construction or operational phase of the Proposed Action with the resource returning to existing conditions shortly after construction or operations cease. Short-term impacts may continue for a few years following the cessation of operations, while longer term impacts may continue for five years or more after the completion of the Proposed Action.

## 4.2 Direct/Indirect Impacts

Direct and indirect impacts on the affected environment caused by the Proposed Action (White River Mine RD&D program) are identified and analyzed in the following sections. Impacts from each of the alternatives are considered separately and discussed only where the impacts may differ from the Proposed Action. For ease of review, discussion of mitigation measures, residual impacts and resource monitoring directly follows the analysis of impacts.

### 4.2.1 Air Quality

#### Governing Air Quality Regulations

The Environmental Protection Agency (EPA) has promulgated National Ambient Air Quality Standards (NAAQS) as required under the Clean Air Act (CAA) for certain criteria pollutants: nitrogen dioxide ($NO_2$), sulfur dioxide ($SO_2$), particulate matter less than 10 and 2.5 microns in diameter ($PM_{10}$ and $PM_{2.5}$), carbon monoxide (CO), ozone ($O_3$), and lead (Pb). Table 4-1 presents the existing NAAQS.

| TABLE 4-1<br>Applicable Ambient Air Quality Standards | | |
|---|---|---|
| **Pollutant** | **Averaging Period** | **NAAQS ($\mu g/m^3$)** |
| CO | 1-hour[a]<br>8-hour[a] | 40,000<br>10,000 |
| $PM_{10}$ | 24-hour[a]<br>Annual[b] | 150<br>50 |
| $PM_{2.5}$ | 24-hour[a]<br>Annual[b] | 65<br>15 |
| $SO_2$ | 3-hour[a]<br>24-hour[a]<br>Annual[b] | 1,300<br>365<br>80 |
| $NO_2$ | Annual[b] | 100 |
| $O_3$ | 8-hr | 157 |
| Pb | Qtrly. Ave. | 1.5 |

[a] Not to be exceeded more than once per year.

[b] Annual arithmetic mean not to exceed.

Areas in which the ambient pollutant concentrations are either below or above the NAAQS are classified as attainment/unclassified or non-attainment areas, respectively. Sources are required to control air pollution emissions such that the emissions from a project do not cause an exceedance of the NAAQS.

In addition, Prevention of Significant Deterioration (PSD) permitting regulations are designed to preserve the air quality in areas that are in attainment with the NAAQS. Under the PSD regulations, attainment areas are classified into three classes (Class I, Class II, and Class III) based on the amount of air quality degradation that is allowed for proposed projects. PSD Class I areas are public lands such as wilderness areas, national parks, and memorial parks established prior to 1977 that have special protection under the CAA and have the most stringent limitations. Areas where moderate, controlled growth can take place are designated as PSD Class II areas. PSD Class III areas are those in which deterioration is acceptable as long as NAAQS are maintained; however, no PSD Class III areas have been established to date.

If projected emissions from a proposed project in an attainment area exceed certain emission levels, PSD regulations require air dispersion modeling to demonstrate that the ambient air impacts from the project will be within acceptable limits. These limits vary with the Class designation of the area, with the limits for Class I areas being most stringent. PSD regulations limit the incremental increase in ambient concentrations of pollutants associated with a project (PSD currently provides “increments” for $PM_{10}$, $SO_2$ and $NO_2$). These “PSD increments” are intended to limit (or prevent significant) deterioration in clean air (attainment) areas. The PSD increments are a fraction of the

NAAQS and represent the deterioration allowed as measured against historical baseline concentrations[4]. The PSD Class I and Class II Increments are listed in Table 4-2. Projects are also required to demonstrate that they will not adversely impact Class I areas by conducting an "air quality related value" (AQRV) analysis[5].

**TABLE 4-2**
**PSD Class I and II Emissions Increment Standards**

| Pollutant | Averaging Period | Class I Increment ($\mu g/m^3$) | Class II Increment ($\mu g/m^3$) |
|---|---|---|---|
| $PM_{10}$ | 24-hour | 8 | 30 |
| | Annual | 4 | 17 |
| $SO_2$ | 3-hour | 25 | 512 |
| | 24-hour | 5 | 91 |
| | Annual | 2 | 20 |
| $NO_2$ | Annual | 2.5 | 25 |

Projects which emit or have the potential to emit more than 250 tons per year (100 ton/yr for some specific industries) of any criteria pollutant are subject to PSD permitting. To receive a PSD permit, air dispersion modeling to determine ambient impacts from the project (e.g., PSD increment, NAAQS, and Class I AQRVs) and an analysis of the Best Available Control Technology (BACT) are required. For those projects expected to omit no criteria pollutants above the PSD permitting threshold, separate State permits may be required depending on State-specific regulations.

The area where the proposed RD&D project is located has been designated as either attainment or unclassified for all regulated pollutants[6] and is designated as a Class II area with regard to PSD[7]. In addition to PSD requirements, during the operating stages of the project, plant emissions must be within the allowable limits set by the Federal New Source Performance Standards (NSPS) and the National Emission Standards for Hazardous Air Pollutants (NESHAP). It is not anticipated that the White River Mine project will be subject to any NSPS. In addition, emissions of hazardous pollutants are not expected to exceed any applicable NESHAP requirement because

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4 The increment analysis accumulates impacts from all PSD projects in an area, including the proposed project, in response to of implementation of the PSD regulations. Increment can be consumed (e.g., new sources, permit relaxation) or generated (e.g., source shutdown).

5 An AQRV is defined as a resource, as identified by the Federal Land Manager (FLM) for one or more Federal areas, that may be adversely affected by a change in air quality. The resource may include visibility or a specific scenic, cultural, physical, biological, ecological, recreational resource, or other resources identified by the FLM for a particular area.

6 40 CFR 81.453

7 40 CFR 52.21 and 81.430

emissions (including the controls, where applicable) are expected to be below thresholds for these programs.

In general, the primary sources of air pollution in the Uintah area are from unpaved roads (dust), motor vehicles, wood burning stoves and winter sanding of roads and in more recent years, energy development.[8]

**Fugitive Particulate and Dust Emissions**

Fugitive $PM_{10}$ emissions for this project were estimated from available information for each phase (summarized in each section below). Overall, mine blasting will take place underground during Phase 2 and 3 and thus fugitive emissions at the surface will be minimized. OSEC will, as part of the Proposed Action, take environmental control measures to comply with the fugitive emission minimization.

Construction activities during all phases of the project will generate dust. The primary air pollutant will be fugitive dust from traffic (haul trucks, front-end loaders, employee vehicles, etc.), blasting, grading, crushing and spent shale disposal and other construction-related activities.

As stated in Section 2.2.5, the operator will utilize appropriate dust control measures, such as watering, at all construction site roadways, oil shale loading/unloading and stockpiling during all phases of the project and crushing and spent shale handling to meet the required opacity limit (20%).

*Environmental Consequences of Fugitive Dust Emissions*

Provided the dust control measures are fully followed, any visual or air quality impacts from dust are expected to be localized and limited to the area in the immediate vicinity of site operations.

*Mitigation*

In the event that watering and moisture control are not sufficient to minimize dust generation, additional mitigation measures which may be taken include:

- Vehicle traffic will be limited whenever possible.
- Lower speed limits will be enacted to limit dust from vehicle traffic on-site and on the near-by roadways.

[8] Bureau of Land Management (BLM). 2005. Meeker Pipeline and Gas Plant Project.

**Phase 1 Air Emissions**

During Phase 1, fueled vehicles (haul trucks, front-end loaders, etc.) will be used for collecting and transporting about 1,000 tons of stockpiled oil shale to the pilot plant in Calgary, Canada. All diesel fuel needed by the front-end loaders and trucks will be supplied by service truck contractors. Prior to transfer to Canada, the oil shale will be crushed and graded at an offsite gravel pit in Uintah County. The associated contractor will be responsible for fugitive dust control (e.g. water spraying) at their off-site facility used for the crushing and grinding process during Phase 1. In addition, the off-site gravel pit will need to comply with its air permit requirements. No crushing of the oil shale will be performed during Phase 1 within the project area. Sources of air pollutants will consist of the vehicular combustion emissions, and fugitive dust emissions from the handling and truck loading of oil shale and vehicular traffic on unpaved roads.

Air permits are not required for Phase 1 as there are no stationary sources that will be present on the site; however, registration with the UDAQ of the activities that will generate dust (truck loading/unloading, etc.) is necessary. Generation of fugitive emissions from gathering of the oil shale and vehicle emissions will be temporary as the disruption to the oil shale stockpiles will only occur over a short period of time. As discussed in Section 2.2.5, dust control steps will be taken. All vehicles are expected to comply with applicable federal and state mobile source emission standards.

*Environmental Consequences of Phase 1 Air Emissions*

Because of the short-term duration of Phase 1 activities at the mine site and the measures taken to minimize fugitive dust emissions (primarily use of water as a dust suppressant, see Section 2.2.2), activities from this phase would result in minimal short-term impacts on the local and regional air quality. Estimates of Phase 1 emissions are provided in Table 4-3. As this table illustrates, the estimated emissions for Phase 1 are relatively low (total less than 5 tons) and are not expected to contribute to the degradation of air quality in the surrounding area. (Actual concentrations of vehicle exhaust and fugitive dust in the air are not easily estimated due to the dependence on the type of vehicle and level of construction activity, which will vary during Phase 1.) For comparison, major source permitting under EPA regulations would require a permit for a source if the emissions were over 100 tons per year (tpy).

*Phase 1 Mitigation*

Because none of the air emissions are expected to cause exceedances of the NAAQS and will be in compliance with all applicable air quality regulations, no specific mitigation measures will be undertaken.

| TABLE 4-3 Phase 1 Estimated Emissions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Emission Point** | **Estimated Emissions Summary (tons/Phase 1)** | | | | | | |
| | **$NO_x$** | **$SO_2$** | **CO** | **VOC** | **$PM_{10}$** | **$CO_2$** | **HAPs** |
| Diesel Vehicle Emissions[1] | 3.17 | 0.50 | 0.78 | 0.22 | 0.11 | 0.00 | 0.00 |
| Truck Loading/Unloading[2] | -- | -- | -- | -- | 0.000008 | -- | -- |
| Storage Pile[2] | -- | -- | -- | -- | 0.06 | -- | -- |
| **Total** | **3.17** | **0.50** | **0.78** | **0.22** | **0.17** | **0.00** | **0.00** |

1 Emission factors from http://www.aqmd.gov/ceqa/handbook/offroad/offroad.html

2 Emission factors from USEPA AP-42 Chapter 11.19.2, *Crushed Stone Processing and Pulverized Mineral Processing*, August, 2004 for truck unloading of fragmented stone. Assumed controlled emissions using wet suppression. Aggregate storage emission factor from US EPA FIRE 6.25

### Phase 2 Air Emissions

During Phase 2 of this project, a 4 ton/hr ATP retort system will be installed at the White River Mine site to process approximately 10,000 tons of oil shale over the course of the 14 month project (101 days of actual processing). All oil shale will be crushed and screened at the surface within the 160-acre lease site. To process the shale during Phase 2, the following potential air emission sources are identified: the ATP retort, flare, diesel generators to provide electricity, diesel storage tank, shale oil storage tanks, surface primary and secondary crushers, screening device, trucks and front-end loaders.

In addition, a portion of the oil shale processed will be from a fresh shale sample obtained from the reopening of the existing underground White River Mine. Mining activities will include drilling, blasting (with ammonium nitrate/fuel oil (ANFO)) blasting agents, weighing, loading, transferring, and unloading, all of which will generate fugitive emissions and explosive pollutants (CO, $NO_x$, and $SO_2$).

A variety of multi-level regulatory processes exist to ensure that emissions from the proposed project will not incrementally increase above identified thresholds and/or air quality criteria. Because the site is within tribal airshed boundaries, federal permitting requirements will need to be met. As such, the resulting uncontrolled emissions from operation of Phase 2 may result in the need to obtain a major source federal operating permit. OSEC will be required to conduct a best-available control technology (BACT) analysis. The specifics of the types of control devices required will be discussed with the EPA prior to submittal of the application. Although the actual implementation of BACT may not be required to obtain the permit, OSEC will install air pollution control devices for $SO_2$, CO and VOCs on the ATP system during Phase 2 for research purposes as these controls are anticipated to be required for Phase 3 emissions. The estimated emissions in Table 4-4 are based on OSEC's commitment to install in the ATP system a CO and VOC control device, such as a CO boiler, and a $SO_2$ control device, such as an acid gas scrubber, to achieve the desired pollutant destruction efficiency that is agreed upon with the EPA. For purposes of estimating emissions, a control efficiency of 95% was assumed for CO and $SO_2$.

Modeling is also required to receive approval of a major source permit. Due to the estimated generator emissions, either modeling or installation of a $NO_x$ control device on the generator to keep the concentration below this threshold will be required. OSEC will install a $NO_x$ and CO control device with assumed control efficiencies of 85% (the specifics will be worked out with the EPA). A portion of the diesel combustion emissions, however, will actually be associated with stationary mine equipment and diesel vehicles; the specifics of which are not yet known. Therefore, if deemed necessary, modeling will be conducted during preparation of the permit application for the actual size of the generators installed.

OSEC will obtain a permit for regulated air pollution sources through EPA to ensure compliance with all federal air quality standards, and will comply with all county and state permit conditions and stipulations.

To minimize dust from the underground mining activities reaching the surface atmosphere, watering or wetting agents will be used. A mine ventilation system is used to maintain breathable air within the mine. The current design for this system is for a flow rate up to 12 million standard cubic feet per hour (MMscfh). Blast fumes and fugitive dust from the mine will be entrained by this system, and exhausted above the mine surface. It is anticipated that most of the dust will settle out within the mine because of its size distribution, and relatively little will be carried any distance from the mine. In addition, proper maintenance of the vehicles used underground will assist in minimizing the combustion emissions associated with these devices.

*Environmental Consequences of Phase 2 Air Emissions*

Based on the current conceptual design, the estimated emissions from Phase 2 activities are summarized in Table 4-4. The emissions associated with Phase 2 have been estimated based on research conducted with a similar sized ATP plant in Canada; however, the oil shale from the White River Mine may have slightly different properties from what has been used in Canada. Therefore, information gained from Phase 1 will assist in optimizing the ATP system during Phase 2, and thus will potentially improve the accuracy of the emissions profile. The size and amount of mine support equipment and vehicle usage required during Phase 2 is not known at this time. However, in order to estimate total diesel combustion emissions, the total estimated

**TABLE 4-4**
**Phase 2 Estimated Emissions**

| Emission Point | Estimated Emissions Summary (tons/Phase 2) | | | | | |
|---|---|---|---|---|---|---|
| | $NO_x$ | $SO_2$ | CO | VOC | $PM_{10}$ | HAPs |
| ATP System Operation[1] | 0.55 | 1.23 | 8.21 | 0.14 | 0.55 | -- |
| Start-Up Burner[2] | 0.086 | 0.000072 | 0.014 | 0.0023 | 0.0027 | 0.000033 |
| Flaring of flue gas[3] | -- | -- | 0.26 | 5.98 | -- | -- |
| Diesel Generator[4] | 7.73 | 1.44 | 0.86 | 0.91 | 1.44 | 0.27 |
| Diesel Storage Tank[5] | -- | -- | -- | 0.0062 | -- | -- |
| Shale Crushing/Screening[6] | -- | -- | -- | -- | 0.026 | -- |
| Truck Loading/Unloading[6] | -- | -- | -- | -- | 0.00008 | -- |
| Stockpiled Shale[6] | -- | -- | -- | -- | 0.48 | -- |
| ANFO Blasting[7] | 0.032 | 0.004 | 0.126 | -- | -- | -- |
| Shale Oil Storage Tank[8] | -- | -- | -- | 0.73 | -- | -- |
| Unpaved On-site Roads[9] | -- | -- | -- | -- | 0.48 | -- |
| **Total** | **8.40** | **2.67** | **9.47** | **7.77** | **2.98** | **0.27** |

[1] Estimated concentration data provided by UMATAC based on a pilot project in Canada. Emissions assumed a 95% control on CO, VOC, and $SO_2$, and a filter bag for PM control. The $CO_2$ formed during oxidation of CO, assuming 100% conversion, was added to the total amount of $CO_2$. HAP emissions are not known at this time. A portion of these emissions will be due to the start-up burner. To be conservative, assumed the start-up burner emissions are separate.

[2] Assumed a 24 hour start-up period, required 15 times over the course of the phase. Assumed a natural gas burner consuming 48 MMBtu per start-up. A portion of these emissions may be included in the ATP data; however, to be conservative, assumed the start-up burner emissions are separate. Emission factors are from USEPA AP-42, Chapter 1.5, *Liquified Petroleum Gas Combustion*, October 1996; HAP emissions were taken from USEPA AP-42 Chapter 1.4, *Natural Gas Combustion*, July 1998.

[3] Estimated based on flare gas from previous pilot study conducted on similar ATP60 plant. Assumed a 98% destruction efficiency based on USEPA AP-42 Chapter 13.5, *Industrial Flares*, September 1991. The amount of CO converted to $CO_2$ in the flare is included in the $CO_2$ emission value.

[4] Estimated assuming 592,000 gal of diesel will be needed for length of Phase 2. To be conservative, assumed all diesel is used in diesel-fired generators; however, some (~22,000 gal) will be used in the haul trucks and other unknown underground equipment. In order to comply with concentration thresholds, a CO and $NO_x$ APCD device may need to be installed; therefore, a 85% and 90% control efficiencies for $NO_x$ and CO were assumed. Emissions factors were obtained from typical Cummins 1 MW diesel generator specifications; $CO_2$ emission factor was from USEPA AP-42, Chapter 3.3, *Gasoline and Diesel Industrial Engines*, October 1996.

[5] Working and breathing losses for 15,000 gal. tanks with a total throughput of 592,000 gallons (570,000 gal for power generation, 22,000 gal for the mine work) for the Phase, estimated using EPA Tanks4.0 program.

[6] Emission factors from USEPA AP-42 Chapter 11.19.2, *Crushed Stone Processing and Pulverized Mineral Processing*, August, 2004. Assumed controlled emissions using wet suppression. Assumed 2 intermediate conveying transfer points between one primary crusher, one secondary crusher, and one screener. Aggregate storage emission factor from US EPA FIRE 6.25

[7] Emission factors are from USEPA AP-42 Chapter 13.3, *Explosives Detonation*, February 1980.

[8] Working and breathing losses for a 31,500 gal tank used to store the produced shale oil with a total project throughput of 6,400 gal, estimated using EPA Tanks4.0 program.

[9] Estimated $PM_{10}$ emissions from unpaved vehicle traffic on-site using USEPA AP-42, Chapter 13.2.2, *Unpaved Roads*, December 2003; assumed a total of 50 miles traveled during Phase 2 for a 200 ton truck to gather 10,000 tons of shale oil (200 tons at a time) and transport it back to the ATP. Although $PM_{2.5}$ were not modeled due to lack of emission factors, even if all $PM_{10}$ emissions were in the form of $PM_{2.5}$ emissions would be well below the $PM_{2.5}$ NAAQS.

diesel usage (generator, vehicle and mine equipment usage) was assumed to be used in the generators. Emission factors for a typical diesel generator were used to estimate the air emissions for all the diesel usage, as noted above in Table 4-4. The start-up burner on the ATP is expected to contribute minimally to the estimated ATP emissions; however, as a worse-case scenario, these estimated emissions have been included separately.

*Phase 2 Greenhouse Gas Emissions*

Greenhouse gas (GHG) emissions from Phase 2 will be generated from combustion of spent shale in the ATP retort, start-up burner, flare, and generators; in addition, methane will be emitted from the mine opening. Table 4-5 outlines the estimated GHG emissions and the associated carbon equivalence associated with each of these processes. The overall GHG emissions estimated for Phase 2 equate to 0.42 carbon equivalence/barrel of shale oil produced.

*Phase 2 Air Dispersion Modeling Results*

In order to estimate the contribution and thus, level of impact this proposed project will have on the NAAQS, conservative air dispersion modeling was conducted using SCREEN3.® Modeling was conducted for the ATP retort, start-up burner, diesel generator and flare. The other emission sources (storage tanks, dust from on-site activities, etc.) are expected to result in an insignificant contribution to the emission concentrations and thus, were not modeled at this time. Only the diesel fuel expected to be burned in the generators (versus the mobile sources) was modeled. Table 4-6 illustrates the results of this conservative modeling analysis at the point of maximum impact beyond the 160-acre lease boundary. The ambient air concentrations for all pollutants and for all applicable averaging periods are less than 2% of the applicable NAAQS. Based on this modeling, Phase 2 operations will comply with all federal and state air quality rules and regulations and emissions will not cause any exceedances of the NAAQS.

*Phase 2 Mitigation*

Because none of the air emissions are expected to cause exceedances of the NAAQS and will be in compliance with all applicable air quality regulations, no specific mitigation measures will be undertaken.

| TABLE 4-5. Phase 2 Greenhouse Gas Emissions | | | |
|---|---|---|---|
| **Emission Point** | **Phase 2 (tons\Phase 2)** | | |
| | **$CO_2$** | **Methane** | **Carbon Equivalence** |
| ATP System Operation[1] | 2,296.86 | -- | 626.42 |
| Start-Up Burner[2] | 56.56 | -- | 15.42 |
| Flaring of flue gas[3] | 128.16 | -- | 34.95 |
| Diesel Generator[4] | 6,807.48 | -- | 1,856.58 |
| Mine Opening Methane[5] | -- | 10.52 | 7.89 |
| **Total** | **9,289.05** | **10.52** | **2,541.27** |

1 Estimated concentration data provided by UMATAC based on a pilot project in Canada. The $CO_2$ formed during oxidation of CO, assuming 100% conversion, was added to the total amount of $CO_2$. A portion of these emissions will be due to the start-up burner. To be conservative, assumed the start-up burner emissions are separate.

2 Assumed a 24 hour start-up period, required 15 times over the course of the phase. Assumed a natural gas burner consuming 48 MMBtu per start-up. A portion of these emissions may be included in the ATP data; however, to be conservative, assumed the start-up burner emissions are separate.

3 Estimated based on flare gas from previous pilot study conducted on similar ATP60 plant. Assumed a 98% destruction efficiency based on USEPA AP-42 Chapter 13.5, *Industrial Flares*, September 1991. The amount of CO converted to $CO_2$ in the flare is included in the $CO_2$ emission value.

4 Estimated assuming 592,000 gal of diesel will be needed for length of Phase 2. To be conservative, assumed all diesel is used in diesel-fired generators; however, some (~22,000 gal) will be used in the haul trucks and other unknown underground equipment. $CO_2$ emission factor was from USEPA AP-42, Chapter 3.3, *Gasoline and Diesel Industrial Engines*, October 1996.

5 Estimated value provided by OSEC, assumes 5,000 cf $CH_4$/day over the course of the Phase 2.

| TABLE 4-6. Phase 2 Modeling Results | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Point** | **Concentrations (μg/m³)** | | | | | | | |
| | **$NO_2$** | **$SO_2$** | | | **CO** | | **$PM_{10}$** | |
| | **Annual** | **3-hr** | **24-hr** | **Annual** | **1-hr** | **8-hr** | **24-hr** | **Annual** |
| ATP System Operation[1] | 0.03 | 0.99 | 0.44 | 0.09 | 7.32 | 5.12 | 0.20 | 0.04 |
| Start-Up Burner[2] | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 |
| Flaring of flue gas[3] | -- | -- | -- | -- | 0.00 | 0.00 | -- | -- |
| Diesel Generator | 1.85 | 5.15 | 2.29 | 0.46 | 3.43 | 2.40 | 2.29 | 0.46 |
| **Total** | **2** | **6** | **3** | **1** | **11** | **8** | **2** | **0** |
| NAAQS Thresholds | 100 | 1,300 | 365 | 80 | 40,000 | 10,000 | 150 | 50 |
| % Applicable Threshold | 1.88% | 0.47% | 0.75% | 0.68% | 0.03% | 0.08% | 1.66% | 0.99% |

**Phase 3 Air Emissions**

In Phase 3 of the project, a larger ATP retort (250 ton/hr) will be constructed on-site to process an estimated 2.7 million tons of oil shale. All oil shale will be supplied by the open mine (opened in Phase 2), and crushed and screened on-site at the mine surface. As with Phase 2, the ATP has an associated start-up burner and flare. It is anticipated that the ATP off-gases will be consumed in the ATP unit as supplemental fuel or used to generate steam and/or electricity for use in the process. The flaring of the ATP off-gas is only expected for startup and emergency situations. Based on a rough heat and material balance, emissions from combustion of the off-gases in the ATP retort account for these combustions emissions under either scenario. To be conservative, 50% of all of the off-gas was assumed to be burned in the flare for startup and emergency situations.

As with Phase 2, there will be associated fugitive and blast emissions from mine activities. Diesel used in the haul trucks, front-end loaders, and possible standby diesel generator, etc. will be supplied by tanker trucks. The number and type of vehicles and generators that will be used in Phase 3 is not known at this time. Although most diesel fuel is expected to be used in the vehicles, diesel combustion emissions were calculated based on the estimated diesel fuel consumption of the stationary equipment, and using a typical diesel generator emission factors. Actual emissions are expected to be significantly lower due to more stringent vehicle emissions standards than are imposed on stationary generators.

The shale oil produced during Phase 3 will need to be hydrotreated before it can be accepted by a refinery for processing. For estimated worst-case emissions, it is assumed that a hydrotreater and hydrogen plant will be installed at the site. OSEC estimates that the hydrotreater will not require a separate heater, and that a 5.8 MW hydrogen plant using natural gas as a raw feed and fuel will be required. Although the hydrogen plant will normally operate at a much lower capacity, it was assumed that the hydrogen plant would operate at maximum load 100% of the time for conservative emission calculations.

The excess heat and hydrotreater off-gas stream (hydrogen sulfide, ammonia, VOCs) contained within the system will most likely be used as an auxiliary fuel for the ATP retort, and thus the emissions associated with this system are assumed to be contained in the ATP emission estimates. The hydrotreater will remove additional sulfur from the product oil and release $H_2S$ in the hydrotreater off-gas. The amount of this additional $H_2S$, and the resultant $SO_2$ formed from burning the $H_2S$, is not known at this time. However, this incremental $SO_2$ will be reduced by the scrubber on the ATP unit.

OSEC anticipates requiring a maximum of 14 MW of electricity from the power grid for the length of Phase 3. Using 2002-2004 data available on the EPA Clean Air Markets website, the electricity needs of Phase 3 are expected to result in roughly a 3% increase in the power plant energy production (the Bonanza power plant has a rated output of approximately 460 MW). The increase in the power plant emissions for operation of Phase 3 was assumed to be 3% of the historically reported $NO_x$ and $SO_2$ emissions (historical data on CO, VOC, $PM_{10}$ and HAPs is not available at this time).

The uncontrolled emissions are estimated to exceed the PSD 250 ton/yr permitting threshold for CO, VOCs and $SO_2$. Therefore, OSEC anticipates that Phase 3 will require a PSD permit. Obtaining a PSD permit requires air dispersion modeling and BACT analyses in the permit application to demonstrate that the project complies with ambient air quality standards, will not adversely impact air quality, and meet current standards of air pollution controls for the type of equipment being operated. OSEC will comply with PSD permitting requirements and therefore will conduct more detailed air dispersion modeling and BACT analyses during the preparation of the permit application. BACT will be installed that complies with PSD requirements based on the BACT analysis. For purposes of estimating the Phase 3 emissions, air pollution control devices on the ATP retort are assumed to be required for $SO_2$, CO and VOCs under PSD permitting. Therefore, the estimated emissions in Table 4-7 include the assumption that a CO and VOC control device, such as a CO boiler, and a $SO_2$ control device, such as an acid scrubber, will be installed on the ATP. The specifics of the types of control devices and associated destruction efficiency required will be discussed with the EPA prior to submittal of the PSD application. OSEC will comply with all county, state and federal permit conditions and stipulations.

The $NO_x$ and VOC emissions have the potential to impact ambient ozone concentrations. The lease site has been designated as in attainment for the 8-hour ozone NAAQS. The $NO_x$ and VOC emissions from the project will not affect this ozone attainment designation. Even if it is assumed that all the $NO_x$ and VOC emissions equate to $O_3$, the resulting concentration would be only 9.7% of the 8-hour ozone NAAQS.

As discussed under Phase 2, to minimize dust from the underground mining activities reaching the surface atmosphere, watering or wetting agents will be used. A mine ventilation system is used to maintain breathable air within the mine. The current design for this system is for a flow rate up to 18 MMscfh. Blast fumes and fugitive dust from the mine will be entrained by this system, and exhausted above the mine surface. It is anticipated that most of the dust will settle out within the mine because of its size distribution, and relatively little will be carried any distance from the mine. In addition, proper maintenance of the vehicles used underground will assist in minimizing the combustion emissions associated with this equipment. In addition to controlling fugitive dust from the mine, watering and wetting agents will be used to control dust from the handling of the shale and spent shale at the surface and along haul roads.

*Environmental Consequences of Phase 3 Air Emissions*

Table 4-7 outlines the estimated controlled emissions associated with Phase 3. Information gained during Phase 1 and 2 will assist in optimizing the operation of these devices and choosing the appropriate control devices.

*Phase 3 Greenhouse Gas Emissions*

GHG emissions from Phase 3 will be generated from pyrolosis of oil shale and combustion of spent shale in the ATP retort, flare, hydrogen plant, and generators from on-site operations and from the Bonanza Power Plant In addition, methane will be emitted from the mine. Table 4-8 outlines the estimated GHG emissions and the associated carbon equivalence associated with each of these processes. The Phase 3 GHG emissions are estimated to equate to 0.11 carbon equivalence/barrel of shale oil produced.

*Phase 3 Air Dispersion Modeling Results*

As with Phase 2, conservative air dispersion modeling was conducted using SCREEN3® in order to assess the contribution of this phase of emissions will have on the NAAQS. Modeling was conducted for the ATP retort, start-up burner, hydrogen plant, power plant and flare. The other emission sources (storage tanks, dust from on-site activities, etc.) are expected to result in an insignificant contribution to the emission concentrations and thus, were not modeled at this time. In addition, because the diesel combustion emissions are associated with mobile sources and data on the types of mobile sources is not available, the modeling also did not include these sources. Table 4-9 illustrates the results of this conservative modeling analysis at the point of maximum off-site impact. The ambient air concentrations for all pollutants and for all applicable averaging periods would be less than 5% of the applicable NAAQS. Based on the modeling results, Phase 3 emissions will comply with all federal and state air quality rules and regulations and not cause any exceedances of the NAAQS.

*Mitigation*

Because none of the air emissions are expected to cause exceedances of the NAAQS and will be in compliance with all applicable air quality regulations, no specific mitigation measures will be undertaken.

**TABLE 4-7**
**Phase 3 Estimated Emissions**

| Emission Point | Estimated Emissions Summary (tons/Phase 3) | | | | | |
|---|---|---|---|---|---|---|
| | **$NO_x$** | **$SO_2$** | **CO** | **VOC** | **$PM_{10}$** | **HAPs** |
| ATP System Operation[1] | 126.97 | 285.67 | 1,904.49 | 31.74 | 13.34 | -- |
| Start-Up Burner[2] | 17.75 | 0.015 | 2.99 | 0.47 | 0.56 | 0.0068 |
| Electrical Needs (14 MW)[3] | 207.79 | 34.94 | -- | -- | -- | -- |
| Hydrogen Plant Reformer[4] | 5.15 | 0.06 | 8.64 | 0.57 | 0.78 | 0.00 |
| Flaring of flue gas[5] | -- | -- | 8.19 | 186.94 | -- | -- |
| Diesel Storage Tank[6] | -- | -- | -- | 0.024 | -- | -- |
| Shale Crushing/Screening[7] | -- | -- | -- | -- | 7.14 | -- |
| Stockpiled Shale[7] | -- | -- | -- | -- | 132.00 | -- |
| Truck Loading/Unloading[7] | -- | -- | -- | -- | 0.02 | -- |
| ANFO Blasting[8] | 14.88 | 1.75 | 58.63 | -- | -- | -- |
| Diesel Combustion[9] | 870.81 | 24.25 | 145.50 | 15.43 | 24.25 | 4.52 |
| Shale Oil Storage Tank[10] | -- | -- | -- | 9.19 | -- | -- |
| Unpaved On-site Roads[11] | -- | -- | -- | -- | 167.66 | -- |
| **Total** | **1243.34** | **346.69** | **2,128.44** | **244.36** | **345.75** | **4.52** |

1 Estimated concentration data provided by UMATAC based on a pilot project in Canada. Emissions assumed a 95% control on CO, VOC, and $SO_2$, and a filter bag for PM control. The $CO_2$ formed during oxidation of CO, assuming 100% conversion, was added to the total amount of $CO_2$. HAP emissions are not known at this time. A portion of these emissions will be due to the start-up burner. To be conservative, assumed the start-up burner emissions are separate.

2 Assumed a 24 hour start-up period, required 50 times over the course of the phase. Assumed a natural gas burner consuming 3,000 MMBtu per start-up. A portion of these emissions may be included in the ATP data; however, to be conservative, assumed the start-up burner emissions are separate. Emission factors are from USEPA AP-42, Chapter 1.5, *Liquified Petroleum Gas Combustion*, October 1996; HAP emissions were taken from USEPA AP-42 Chapter 1.4, *Natural Gas Combustion*, July 1998.

3 Emissions were estimated based on the average 2000-2005 Bonanza I Power Plant emissions data from the USEPA Clean Air Markets. Between 2000 and 2005, the power plant required on average 4,996 MMBtu/hr. The additional power needed for Phase 3 would result in a maximum increase in usage of 3%. Assumed 3% of the average power plant emissions provided on the Clean Air Markets website would be emitted due to operation of Phase 3. Data on CO, VOC, $PM_{10}$ and HAPs was not provided on the website.

4 Emissions were estimated assuming a 5.8 MW reformer fueled on natural gas and USEPA AP-42 Chapter 1.4, *Natural Gas Combustion*, July 1998. These emissions only account for an estimate of the hydrogen reformer; additional combustion devices that may be needed are not included or known at this time. The hydrotreating process is not anticipated to result in emissions not already accounted for in the ATP emissions estimate.

5 Estimated based on previous test run conducted on similar ATP60 plant scaled up for the 250 ton/yr processor, assuming only 50% of the off-gas is flared. This value is highly conservative given the flaring may only occur during emergency situations and/or the off-gas may be used instead to further fuel the ATP.

6 Working and breathing losses for 15,000 gal. tanks with a total throughput of 10,000,000 gallons for the Phase, estimated using EPA Tanks 4.0 program.

7 Emission factors from USEPA AP-42 Chapter 11.19.2, *Crushed Stone Processing and Pulverized Mineral Processing*, August, 2004. Assumed controlled emissions using wet suppression. Assumed 2 conveying transfer points. Aggregate storage emission factor from US EPA FIRE 6.25

8 Emission factors are from USEPA AP-42 Chapter 13.3, *Explosives Detonation*, February 1980.

9 Diesel fuel will be used mostly in underground haul trucks and other mining equipment. Some surface equipment or standby emergency generator may be used. To be conservative, the estimated 10 million gallons of diesel was assumed to be burned in a generator.

10 Working and breathing losses for shale oil storage tanks with a total project throughput of 75,348,000 gal, estimated using EPA Tanks4.0 program.

| **TABLE 4-7<br>Phase 3 Estimated Emissions** | | | | | | |
|---|---|---|---|---|---|---|
| **Emission Point** | **Estimated Emissions Summary (tons/Phase 3)** | | | | | |
| | **$NO_x$** | **$SO_2$** | **CO** | **VOC** | **$PM_{10}$** | **HAPs** |

[11] Estimated $PM_{10}$ emissions from unpaved vehicle traffic on-site using USEPA AP-42, Chapter 13.2.2, *Unpaved Roads*, December 2003; assumed a total of 18,100 miles traveled during Phase 3 for a 200 ton truck to gather 2.7 million tons of shale oil (200 tons at a time) and transport it back to the ATP. Although $PM_{2.5}$ was not modeled due to lack of emission factors, even if all $PM_{10}$ emissions were in the form of $PM_{2.5}$, emissions would be well below the $PM_{2.5}$ NAAQS.

**TABLE 4-8**
**Phase 3 Greenhouse Gas Emissions**

| **Emission Point** | **Phase 3 (tons\Phase 3)** | | |
|---|---|---|---|
| | **$CO_2$** | **Methane** | **Carbon Equivalence** |
| ATP System Operation[1] | 532,985.79 | -- | 145,359.76 |
| Start-Up Burner[2] | 11,680.33 | -- | 3,185.54 |
| Electrical Needs (14 MW)[3] | 126,049.52 | -- | 34,377.14 |
| Hydrogen Plant Reformer[4] | 12,349.23 | -- | 3,367.97 |
| Flaring of flue gas[5] | 4,004.99 | -- | 1,092.27 |
| Diesel Combustion[6] | 114,991.18 | -- | 31,361.23 |
| Mine Opening Methane[7] | -- | 472.73 | 354.55 |
| **Total** | **802,061.04** | **472.73** | **219,098.46** |

[1] Estimated concentration data provided by UMATAC based on a pilot project in Canada. The $CO_2$ formed during oxidation of CO, assuming 100% conversion, was added to the total amount of $CO_2$. A portion of these emissions will be due to the start-up burner. To be conservative, assumed the start-up burner emissions are separate.

[2] Assumed a 24 hour start-up period, required 50 times over the course of the phase. Assumed a natural gas burner consuming 3,000 MMBtu per start-up. A portion of these emissions may be included in the ATP data; however, to be conservative, assumed the start-up burner emissions are separate.

[3] Emissions were estimated based on the average 2000-2005 Bonanza I Power Plant emissions data from the USEPA Clean Air Markets. Between 2000 and 2005, the power plant required on average 4,996 MMBtu/hr. The additional power needed for Phase 3 would result in a maximum increase in usage of 3%. Assumed 3% of the average power plant emissions provided on the Clean Air Markets website would be emitted due to operation of Phase 3.

[4] Emissions were estimated assuming a 5.8 MW reformer fueled on natural gas and USEPA AP-42 Chapter 1.4, *Natural Gas Combustion*, July 1998. These emissions only account for an estimate of the hydrogen reformer; additional combustion devices that may be needed are not included or known at this time. The hydrotreating process is not anticipated to result in emissions not already accounted for in the ATP emissions estimate.

[5] Estimated based on previous test run conducted on similar ATP60 plant scaled up for the 250 ton/yr processor, assuming only 50% of the off-gas is flared. This value is highly conservative given the flaring may only occur during emergency situations and/or the off-gas may be used instead to further fuel the ATP.

[6] Diesel fuel will be used mostly in underground haul trucks and other mining equipment. Some surface equipment or standby emergency generator may be used. To be conservative, the estimated 10 million gallons of diesel was assumed to be burned in a generator.

[7] Estimated value provided by OSEC, assumes 50,000 cf $CH_4$/day over the course of the Phase 3.

| TABLE 4-9<br>Phase 3 Modeling Results | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Emission Point[9]** | **Concentrations (μg/m³)** | | | | | | | |
| | **$NO_2$** | **$SO_2$** | | | **CO** | | **$PM_{10}$** | |
| | **Annual** | **3-hr** | **24-hr** | **Annual** | **1-hr** | **8-hr** | **24-hr** | **Annual** |
| ATP System Operation | 1.01 | 34.03 | 15.13 | 3.03 | 252.10 | 176.47 | 0.71 | 0.14 |
| Start-Up Burner | 0.14 | 0.00 | 0.00 | 0.00 | 0.40 | 0.28 | 0.03 | 0.01 |
| Electrical Needs (14 MW) | 0.60 | 1.51 | 0.67 | 0.13 | | | | |
| Hydrogen Plant Reformer | 0.05 | 0.01 | 0.00 | 0.00 | 1.29 | 0.90 | 0.05 | 0.01 |
| Flaring of flue gas | -- | -- | -- | -- | 0.00 | 0.00 | -- | -- |
| **Total** | **2** | **36** | **16** | **3** | **254** | **178** | **1** | **0** |
| NAAQS Thresholds | 100 | 1,300 | 365 | 80 | 40,000 | 10,000 | 150 | 50 |
| % Applicable Threshold | 1.79% | 2.73% | 4.33% | 3.95% | 0.63% | 1.78% | 0.52% | 0.31% |

*GHG Emissions Minimization*

Not associated with and separate from the current project, OSEC proposes to research potential opportunities to reduce and/or capture and sequester the $CO_2$ emissions associated with the ATP system. In addition, OSEC plans to continue improving the energy efficiency from phase to phase based on information learned from the previous phase research and hence, attempt to minimize the greenhouse gas emissions. Information gained from this research will be used in the future commercial scale oil shale processing projects and implemented during Phase 3 where possible.

**Alternative B (Eastern Pipeline Right-of-Way)**

The air quality impacts under Alternative B (Surface Retorting with the ATP System with Eastern Gas Pipeline Right-of-Way) would be identical to the impacts described above for the Proposed Action.

**Alternative C (No Action)**

Under the No Action alternative, the Proposed Action would not occur so none of the impacts described above would occur and there would be no change to existing air quality conditions.

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9 As stated in the text, because the diesel combustion emissions are associated with mobile sources and data on the types of mobile sources is not available, the modeling did not include these sources. Calculations assume representative stack parameters. Stack parameters will be refined during the refined modeling phase.

### 4.2.2 Wastes (Hazardous and Solid)

As noted in Section 2.0, no wastes will be generated at the 160-acre lease site during Phase 1 of the RD&D project. Spent shale will be produced, managed and tested at the pilot test site in Calgary, Alberta, Canada. Therefore, no waste-related impacts are expected during Phase 1. Phase 2 and Phase 3 of the RD&D project will generate various wastes that will need to be properly disposed of in an environmentally sound manner to minimize potential impacts to the environment. Wastes that will be generated at the site during Phases 2 and 3 include:

*Solids*

- Spent shale
- Solids produced as part of the mine reopening
- Construction wastes generated during construction of facilities on the lease
- Sulfur and nitrogen wastes from recovery and secondary processing of raw shale oil
- Spent catalysts from shale oil hydrotreatment

*Liquids*

- Mine water
- Product waters from shale oil retorting (connate and retort water)
- Process wash down water
- Waste oils
- Sewage effluent

Environmental control and management measures to be taken as part of the Proposed Action to minimize potential impacts from the generation, handling and disposal of these wastes are described, potential residual impacts are evaluated, and mitigation measures are presented below.

**Spent Shale**

Of the wastes identified above, by far the largest volume of material generated will be the spent shale, which will be managed within the 160-acre lease site by placement in an appropriately designed disposal area. During Phase 2, it is expected that approximately 8,000 tons of spent shale will be produced. This spent shale will be managed in a small, less-than-two acre spent shale disposal area. During Phase 3, approximately 1.2 million tons of spent shale will be generated and managed in an approximately 38-acre disposal area on the northern portion of the lease site.

To properly design and monitor the spent shale disposal areas, testing and evaluation activities will be conducted during Phases 1 and 2 of the RD&D project. The information gained during each phase will be used to aid in finalizing the design and site operating procedures for the following phase of the project. As part of the Phase 1 work, samples of the spent shale processed at the ATP pilot plant in Calgary will be subject to physical testing to verify its engineering properties and chemical analysis leachate tests to evaluate potential leachability concerns. This information will be used to develop compaction and grading plans for the Phase 2 and 3 spent shale disposal areas and to determine appropriate monitoring parameters for the Phase 2 leachate monitoring.

During Phase 2, OSEC will install lysimeters or similar soil moisture/leachate monitoring devices at multiple depths (such as 1, 3 and 5 meters) within the spent shale disposal area. Following rainfall events, the monitoring points will be checked regularly and samples will be collected of any leachate that accumulates in the devices. The samples will be tested for the parameters determined from the Phase 1 analyses. In addition, a storm water monitoring point will be identified to allow sampling of runoff from the Phase 2 spent shale area. This information will allow OSEC to consider the potential for leaching of constituents in designing the Phase 3 spent shale disposal area. Given the low amount of precipitation in the area, the measures described below that will minimize infiltration, and the relatively inert nature of spent shale, significant leaching concerns are not expected. However, the data gathered from this monitoring will be used in insuring the Phase 3 design eliminates to the extent possible any such concerns and will be useful for evaluating full commercial scale oil shale production.

As discussed in Section 2, the following measures will be taken to eliminate or minimize impacts from the spent shale disposal:

- Develop and implement soil erosion/sediment control and site grading plans to minimize and control erosion and prevent pooling.

- Install berms/trenches to direct storm water runoff around and away from the spent shale disposal areas and ensure that all runoff is directed to the off-lease existing retention dam.

- As necessary, place an impermeable barrier under the disposal area to isolate the spent shale from the environment.

- Comply with all permitting requirements of the Utah Department of Environmental Quality and/or USEPA.

- Replace topsoil onto the shale piles and revegetate the piles in accordance with an approved revegetation plan following the completion of Phase 3.

*Environmental Consequences of Spent Shale Disposal*

The above-described measures to be taken by OSEC are designed to address and minimize the following potential impacts from the management of the spent shale on the lease site:

- Increased sediment, heavy metals, residual organic compounds (all or nearly all organics should be combusted in the ATP retort) and major ion (increased salinity) in storm water runoff from site;

- Possible leaching of any residual organic materials, heavy metals, or major ion groups to ground water;

- Dust generation from dried spent shale;

- Visual impacts from the change in landscape;

- Erosion of the spent shale disposal piles; and

- Disturbance of soil areas during the construction of the spent shale impoundments and placement of the spent shale.

With the above-described measures, the environmental impacts from the spent shale disposal are expected to be relatively minor. Given the low precipitation rate in the project area and the measures taken to control infiltration and erosion, adverse impacts to soil or ground water quality above standards are not anticipated. All storm water from the spent shale pile area will be controlled and subject to testing prior to any release. After release from the catchment area near the spent shale pile, the water will drain to the area behind the retention dam where it will evaporate or percolate into the ground surface. As noted in Section 2, water that does not meet water quality standards will not be released to the environment. There is the potential for somewhat increased sedimentation rates behind the dam, but these are not expected to have an overall impact on the environment.

Monitoring is included in the Proposed Action to evaluate if there are any changes to soil or water quality from the spent shale disposal.

There will be no discharges from the dam area to the White River. Therefore, there will not be impacts to water quality in the White River. The dam is subject to regular inspections and was found to be safe in the most recent inspection in 2005. Therefore, the potential for dam failure is considered very low. Further the dam is designed to contain a 100-year rainfall event from the entire catchment area. In such a rainfall event, nearly all of the precipitation would fall on areas outside of the spent shale disposal area and much of the water would be from outside of the 160-acre lease. Therefore, in the event that a major rainfall event caused a catastrophic failure of the dam, the spent shale disposal activities would not affect the overall environmental consequences since the contribution of water from the spent shale disposal area would be such a small percentage of the overall amount of water involved.

There will be residual visual impacts on the landscape from the disposal of the spent shale. As discussed in the Visual Impacts section, such visual impacts are consistent with the VRM classification of the 160-acre lease (Class III and IV).

*Mitigation*

Although no adverse impacts to soil or ground water quality are expected, if monitoring shows adverse impacts to soil quality or the potential for adverse impacts to ground water quality beneath the site from the spent shale disposal during Phase 2, OSEC will take the following mitigation measures:

- In consultation with regulatory agencies, determine if additional measures are necessary and, if necessary develop and implement plans to address any impacts.

**Solids from the Mine Reopening**

During the mine reopening activities in Phase 2, various solid wastes will be produced, primarily consisting of the rock and soil backfill material blocking the mine portal and concrete from the 10-foot thick bulkhead to be removed from the decline below the Birds Nest Aquifer. The rock and soils will be graded on the active portion of the 160-acre lease to be used for Phase 3 shale processing. Concrete and any other “demolition” debris will be taken off-site to a licensed disposal facility. The volume of concrete will be relatively small (< 250 cubic yards). The grading of the rock and soil will have short-term visual impacts prior to the time the materials are covered by Phase 3 processing activities. To minimize potential impacts from the placement of the rock and soil materials, OSEC will undertake, as part of the Proposed Action, measures to minimize invasive, non-native species in disturbed areas. These measures are described in Section 2.2.5 and Section 4.2.12.

*Environmental Consequences of Disposal of Solids from the Mine Reopening*
Given the environmentally inert nature of the materials to be disposed of (rock and, soil) and the fact that they will be managed in the area subsequently to be used for Phase 3 processing activities, no medium or long-term environmental impacts are expected.

**Construction-Related Wastes**
Minor amounts of construction-related wastes will be generated during the rehabilitation of existing structures and the construction of new facilities and structures associated with the Phase 3 250-ton/hour demonstration work. Such wastes could include scrap metal or wood, concrete, and miscellaneous trash from the packaging of the construction materials. These materials will be temporarily staged in rolloffs and trucked to an off-site solid waste facility. To properly manage these materials, OSEC will undertake the following measures as part of the Proposed Action:

- Ensure that there are adequate roll-offs and other waste containers on-site during construction to properly contain all construction related wastes;

- Routinely inspect the construction site to ensure that all construction-related wastes are properly contained; and

- Document the use of licensed haulers and permitted solid waste landfills.

*Environmental Consequences of Construction-Related Wastes*
If poorly managed, there could be impacts from lighter debris becoming wind-borne and transported away from the immediate construction area or from construction debris being left on the 160-acre lease following the completion of construction.

*Mitigation*

If lighter debris becomes wind-borne and is transported away from the construction area, OSEC will implement measures to collect all such debris and to have it properly disposed.

**Sulfur, Nitrogen and Spent Catalyst Wastes from Shale Oil Recovery and/or Hydroprocessing**

Shale oil from the Green River Formation typically contains 0.5-0.75% sulfur and 3– 3.5% nitrogen (AOC Petroleum Support Services 2004). Sulfur compounds generated during the retorting and during secondary processing (hydrotreating) are primarily in the form of $H_2S$, with lesser amounts of mercaptans. Through the treatment train process (i.e., air emissions control devices and/or wastewater treatment), sulfur-bearing solid wastes will be generated. Nitrogen wastes may be generated through the air treatment system for the retort and from the secondary processing (hydrotreatment) of the shale oil. Nitrogen wastes are typically in the form of ammonia and phenols which will be captured in the wastewater treatment system for the project (water from the retort's air treatment system and from the hydrotreatment plant will require treatment prior to re-use for spent shale moisture control or discharge to the environment). In some cases, the ammonia and sulfur compounds can be sold commercially for use as feedstock for other products (e.g., fertilizer). Otherwise, these wastes would need to be disposed of at a properly permitted off-site facility. Spent catalyst is considered a listed RCRA hazardous waste (K071) and consists of aluminum silicate and various metals (typically cobalt, molybdenum, nickel, and/or tungsten). Potential contamination of soil, surface water, or ground water quality could occur if the wastes are not properly managed and a discharge occurs.

As discussed in Section 2.2.5, the Proposed Action includes various measures to prevent impacts from the above wastes. The environmental control and management measures for hazardous wastes that will be undertaken as an integral part of the Proposed Action include:

- Complying will all permitting and other regulatory requirements for the handling and disposal of RCRA hazardous wastes;

- Designing and installing appropriate secondary containment structures (such as bermed concrete pads) for all areas where the wastes will be generated, handled, or stored;

- Developing and implementing standard operating procedures for the waste generation and handling; and

- Identifying, during the design phase, licensed transporters and appropriate disposal facilities for the wastes.

*Environmental Consequences of Generation of Sulfur, Nitrogen, and Spent Catalyst Wastes*

No environmental consequences to the project area are expected from the generation and handling of the sulfur, nitrogen and spent catalyst wastes provided the above-described measures are successful in ensuring that a spill of such waste does not occur. However, despite the measures that will be used, it is possible that a spill could occur and that soil or ground water contamination would result from the spill. Because all drainage from the site is directed to the retention dam, no impacts to water quality in the White River would occur from such a spill.

*Mitigation*

As part of the Proposed Action, OSEC will develop a spill response plan describing mitigation measures to be undertaken to address a spill of the above wastes. In the event of such a spill, the following mitigation measures will be implemented:

- Immediate response actions will be taken to contain the spill and to remove as much of the discharged material from the environment as possible.

- Investigations will be undertaken to determine the extent and magnitude of impacts to the environment following the response measures.

- Working with regulatory agencies, OSEC will develop a remediation plan to cleanup affected media to acceptable levels such that no adverse long-term impacts remain.

**Mine Water**

During Phase 2, the mine will be dewatered as part of the re-opening process. Mine water pooled above the bulkhead should be of good quality and if water quality analyses are favorable it will be discharged to the existing retention dam area. The exact volume of such water is not known, but would be in excess of 2 million gallons if the water is pooled to the top of the Birds Nest Aquifer. Mine water below the bulkhead may contain levels of petroleum-based compounds from contact with the oil shale and the bitumen seep in the lower portion of the mine. This water will likely be trucked off-site for treatment and disposal at an approved facility.  Prior to transportation off-site, this water will be stored in temporary storage tanks on the 160-acre lease. If testing of the water shows that it meets agreed-upon water quality discharge criteria, it will be discharged to an on-lease drainage channel leading to the retention dam area.

During mining operations, mine water which may contain petroleum based compounds will be generated by the continued dewatering of the mine. During Phase 2 operations, this water will be temporarily stored in tanks then, based on testing results, either discharged to an on-lease drainage channel to flow toward the retention dam area (if the test show that it meets the applicable water discharge criteria as outlined in 40 CFR 440) or trucked off-site. The appropriate frequency of testing the water will be stipulated based on the results of the initial testing of mine water conducted prior to the re-opening of the mine.  During Phase 3, mine water which does not meet water quality standards will be treated through the process waste water treatment system, along with wastewaters from the air treatment and hydrotreatment processes.

As part of the Proposed Action, the following measures will be undertaken to prevent or minimize potential impacts from the mine water:

- During Phase 1 or during the design stage of Phase 2, samples of the water trapped above the bulkhead and mine water will be collected and tested to determine water quality and suitability for direct discharge;

- Comply with all permitting and monitoring requirements for the mine water and any discharges; and

- Treat or transport to an approve disposal facility any mine water that is not of suitable quality for surface discharge to the retention dam area. Water quality standards for evaluating if water is suitable for discharge to the retention dam area will be determined in consultation with USEPA and UDEQ during the permitting process.

*Environmental Consequences of Mine Dewatering*

Provided the above-described environmental control measures are followed, no adverse environmental impacts are expected from the mine dewatering activities. Despite the measures that will be employed, there is some possibility of an accidental release of untreated mine water that does not meet applicable water quality standards. Because all surface water discharges from the site are directed to the retention dam, no impacts to water quality in the White River would occur from such an accidental release.

*Mitigation*

As part of the Proposed Action, OSEC will develop a spill response plan describing mitigation measures to be undertaken to address an accidental release of mine water that does not meet water quality standards. In the event of such an accidental release, the following mitigation measures will be implemented:

- Immediate response actions will be taken to contain the spill and to pump up as much of the discharged water into tanks as possible;

- Investigations will be undertaken to determine the extent and magnitude of impacts to the environment following the initial response measures; and

- Working with regulatory agencies, OSEC will develop a remediation plan to cleanup affected media to acceptable levels such that no adverse long-term impacts remain.

**Product Water for Oil Shale Retorting and Process Washdown Water**

As described in Section 2, the retorting process generates two forms of water from the shale—connate water and retort water. Connate water is driven off and condensed during the initial preheating phase while the retort (or "sour") water is produced during the pyrolysis.

Approximately 150 tons (~35,700 gallons) of connate water will be generated during Phase 2 and 40,000 tons (~ 9.5 million gallons) will be generated during Phase 3. The connate water may be suitable for use in remoistening and cooling the spent shale without treatment. Testing of the water during Phase 1 and Phase 2 will be used to determine its characteristics and if it meets agreed on water quality criteria for use in remoistening and cooling the spent shale. If it does not meet appropriate criteria, the connate water will be trucked off-site for treatment and disposal during Phase 2 RD&D activities and will treated in a wastewater treatment system on the 160-acre lease during Phase 3.

Approximately 48,000 gallons of retort water will be generated during Phase 2 and approximately 13.2 million gallons will be generated during Phase 3. Retort water often contains phenols, hydrogen sulfide, or trace levels of petroleum constituents that may require treatment prior to use for cooling and moistening the spent shale or discharge to the existing retention dam. During Phase 2, all retort water will be temporarily stored on lease, tested and, if it meets appropriate water quality criteria, used for cooling the spent shale or trucked off-site for treatment and disposal. During Phase 3, a waste water treatment facility on the 160-acre lease will be used to treat the retort water to remove hydrogen sulfide, ammonia and phenols and other constituents of concern. Following treatment, it is anticipated that nearly all of the water will be used to cool and moisten the spent shale or otherwise reused in the process. Small amounts of water not needed for cooling and moistening of the spent shale may be discharged to a drainage feature leading to the retention dam area.

Process washdown is water regularly used to clean the retort and other site equipment during the on-lease operations. Such water may contain high levels of sediment and may contain oily residues from the equipment.

To prevent environmental impacts from the generation, handling and treatment of the connate water, retort water, and process washdown water, the following measures will be taken as part of the Proposed Action:

- Collect and analyze samples of the connate and retort water during Phase 1 to determine chemical quality and suitability for use for spent shale cooling without treatment or if pre-treatment of the water prior to re-use will be necessary;

- Develop a standard operating program, including routine monitoring of the connate water and retort water quality, to ensure that no water is used for cooling or is discharged without meeting quality limits, such as may be included in a NPDES permit;

- Create a catchment system to contain and control process washdown water and test such water prior to release;

- Apply for and comply with necessary permits for the discharge or treatment of these wastewaters on-site;

- Treat on-lease or transport and dispose any process waters which contain contaminants above permitted limits at an approved disposal site; and

- During Phase 2 and Phase 3, conduct routine monitoring of the connate water and retort water to ensure that all water that requires treatment is properly treated.

*Environmental Consequences of Product Water for Oil Shale Retorting and Process Washdown Water*

Provided the above-described environmental control measures are followed, no adverse environmental impacts are expected from the generation and handling of connate, retort and process washdown water. Despite the measures that will be employed, there is some possibility of an accidental release of untreated water that does not meet agreed-on water quality standards, thus leading to potential soil or ground water contamination. Because all surface water discharges from the site are directed to the retention dam, no impacts to water quality in the White River would occur from such an accidental release.

*Mitigation*

As part of the Proposed Action, OSEC will develop a spill response plan describing mitigation measures to be undertaken to address an accidental release of water generated during retorting or process washdown operations that does not meet water quality standards. In the event of such an accidental release, the following mitigation measures will be implemented:

- Immediate response actions will be taken to contain the spill and to pump up as much of the discharged water into tanks as possible;

- Investigations will be undertaken to determine the extent and magnitude of impacts to the environment following the initial response measures; and

- Working with regulatory agencies, OSEC will develop a remediation plan to cleanup affected media to acceptable levels such that no unacceptable adverse long-term impacts remain.

**Waste Oils and Oily Sludges**

Waste oils will be occasionally generated during Phases 2 and 3 from equipment maintenance activities. In addition, the hydrotreatment process and wastewater treatment of the process waters will produce large volumes of oily sludges (since the exact nature of the hydrotreatment has not been finalized it is not possible to reasonably predict the volume of such materials that will be produced during Phase 3). All such materials will be temporarily stored on the 160-acre lease and trucked off-site to a licensed facility for treatment and disposal.

To prevent impacts from the generation and handling of waste oils and oily sludges, the following measures will be undertaken as part of the Proposed Action:

- Develop standard operating procedures for equipment maintenance and oil changes, including having spill control/spill response plans in place and clean-up materials available on-site at all times;

- Ensure that all areas where waste oil and oily sludges are stored have necessary secondary containment, such as bermed and lined storage areas; and

- To the extent possible, conduct all handling and transfer of waste oils and oily sludges in areas with secondary containment.

*Environmental Consequences of Waste Oil and Oil Sludge*

Provided the above-described environmental control measures are followed, no adverse environmental impacts are expected from the generation and handling of waste oils and oil sludges. Despite the measures that will be employed, there is some possibility of an accidental release of such materials in or near the areas where they are generated and stored. Because all surface water discharges from the site are directed to the retention dam, no impacts to water quality in the White River would occur from such an accidental release.

*Mitigation*

As part of the Proposed Action, OSEC will develop a spill response plan describing mitigation measures to be undertaken to address an accidental release of waste oils or oily sludges. In the event of such an accidental release, the following mitigation measures will be implemented:

- Immediate response actions will be taken to contain the spill and to remove as much of the discharged wastes from the spill area as possible;

- Investigations will be undertaken to determine the extent and magnitude of impacts to the environment following the initial response measures; and

- Working with regulatory agencies, OSEC will develop a remediation plan to cleanup affected media to acceptable levels such that no unacceptable adverse long-term impacts remain.

**Sanitary Sewage Effluent**

During Phase 2 and Phase 3, workers will generate sanitary wastes and other wash waters during routine daily operations. As noted in Section 1, an existing closed sanitary wastewater treatment system is present on the 160-acre lease. During Phase 2, OSEC will test and repair the system as necessary to ensure that it is fully operational and licensed. Any sanitary sewage generated prior to the repair and testing of the on-site system will be collected and trucked to an off-site wastewater treatment plant. During Phase 3 and perhaps near the end of Phase 2, all sanitary wastewaters will be directed to the on-lease treatment plant.

To ensure that all sanitary wastes are appropriately treated prior to discharge, the following measures will be undertaken as part of the Proposed Action:

- Ensure that sufficient portable units are available to workers prior to the start up of the on-lease sanitary wastewater treatment system;

- Apply for and comply with all necessary permits from the USEPA or UDEQ for the operation of the on-lease sanitary wastewater system; and

- Develop standard operating procedures, including maintenance and monitoring, to ensure proper wastewater treatment in the on-lease system.

*Environmental Consequences of Sanitary Sewage Effluent*

Provided the above-described environmental control measures are followed, no adverse environmental impacts are expected from the sanitary sewage effluent. Despite the measures that will be employed, there is some possibility of an accidental release of untreated or partially treated sanitary effluent on the 160-acre lease, thus leading to potential soil or ground water contamination. Because all surface water discharges from the site are directed to the retention dam, no impacts to water quality in the White River would occur from such an accidental release.

*Mitigation*

In the event that a spill of sanitary wastes from a portable unit occurs, the material will be cleaned up and contained as quickly as possible. Given the very small volume of any such spill, no residual environmental impacts are expected.

As part of the standard operating procedures for the sanitary waste water treatment facility, OSEC will develop mitigation procedures to be followed in the event of an accidental discharge of untreated or partially treated effluent. In the event of such an accidental release, the following mitigation measures will be implemented:

- Immediate response actions will be taken to contain the release and to remove as much of the discharged wastes from the spill area as possible;
- Investigations will be undertaken to determine the extent and magnitude of impacts to the environment following the initial response measures; and
- Working with regulatory agencies, OSEC will develop a remediation plan to cleanup affected media to acceptable levels such that no unacceptable adverse long-term impacts remain.

**Alternative B (Eastern Pipeline Right-of-Way)**

The potential impacts from waste generation and handling under Alternative B (Surface Retorting with the ATP System with Eastern Gas Pipeline Right-of-Way) would be identical to the impacts described above for the Proposed Action.

**Alternative C (No Action)**

Under the No Action alternative, the Proposed Action would not be implemented so none of the impacts described above would occur and there would be no change to existing conditions.

### 4.2.3 Water Resources

As described previously, Phase 1 of the RD&D program will only require minimal water for dust control during the shale load out activities and will be trucked to the site by a local commercial water supplier. For Phase 2, all water needs will be provided to the site by truck from local water suppliers. Total water usage over the entire duration of Phase 2 is expected to be less than 3 acre-feet. Therefore, the overall water usage during Phases 1 and 2 will be extremely small compared to the overall available water supply. Only Phase 3 will involve the use of appreciable amounts of water from the study area. Thus, this section focuses on the potential impacts on water resources resulting from Phase 3 activities.

During Phase 3, the make-up water requirement is estimated to be approximately 4.1 million barrels (172.2 million gallons), or approximately 528 acre-feet. The average water demand while the plant is operating will be 220,000 gallons per day, with a peak demand of 380,000 gallons per day. The average demand equates to 0.34 cubic feet/second (cfs) or 247 acre-feet/year while the peak demand is approximately 265 gallons/minute (gpm) (0.59 cfs).

There are three main sources of water that could be used to satisfy the water demand during processor operation: (1) surface water from the White River, (2) ground water from the alluvial aquifer associated with the White River, and (3) ground water from a bedrock aquifer such as the Birds Nest Aquifer or Douglas Creek Member. Based on the flow volume in the White River or hydrogeologic characteristics of the aquifers, any of these water sources should be capable of supplying the needs of the project during Phase 3, although, due to aquifer heterogeneity, there is some question as to whether on-site wells in the Birds Nest Aquifer will be sufficient to fully supply the water demands for Phase 3. It is also possible that a combination of these sources would be used. As part of the White River Shale Project, an agreement was signed in 1983 with the State of Utah for the use of up to 3,000 acre-ft/yr extracted from wells in the White River alluvium. However, this agreement has expired and would need to be reissued. A system with two extraction wells and a pump house designed for 200 gallons per minute (gpm) was constructed in 1983. The wells are currently sealed but the infrastructure remains in place. Ground water from the White River alluvium is a likely source of at least some of the water.

*Environmental Consequences of Water Usage*

Given that the actual source or sources of water to be used during Phase 3 has yet to be determined, this section will evaluate the potential impacts from all three potential water sources. The potential impacts that may occur include:

- Lowering water levels in the ground water aquifers (Birds Nest or White River alluvium).

- Reducing flow rates in the White River or tributary streams.

- Reducing flow in springs that feed Evacuation Creek and other ephemeral streams due to the lowered water levels.

During the 1970s and early 1980s, extensive investigations of the water resources available at the lease site were conducted to determine the feasibility of oil shale development. The analysis presented below is based on those previous field investigations and analyses. In particular, the USGS developed a ground water model of the Uinta Basin described in Holmes and Kimball (1987), which was used to estimate the sources of recharge and discharge to each of the aquifers and to estimate the amount of ground water in storage. The model was developed using all available data to investigate the potential use of ground water resources by the oil shale industry. The evaluation provided herein draws heavily from that modeling work. The following documents are the primary sources relied upon in the preparation of this section:

- Final Environmental Baseline Report, Federal Prototype Oil Shale Leasing Program, Tracts U-a and U-b, Utah, White River Shale Project. VTN Colorado, Inc. October 1977.

- White River Shale Project, Detailed Development Plan, Oil Shale Tracts Ua and Ub. Bechtel Petroleum, Inc. August 1981.

- Ground Water in the Southeastern Uinta Basin, Utah and Colorado. Water Supply Paper 2248, US Geological Survey. W.F. Holmes and B.A. Kimball. 1987.

To complete the evaluation of potential impacts, OSEC conducted comparisons of the average and maximum water withdrawal rates to the range of flows in the Evacuation Creek and the White River; evaluated the water budgets for the White River, the White River alluvium, and the Birds Nest Aquifer; completed modeling of the expected drawdown in wells completed in the White River alluvial system using hydrogeologic data collected during the earlier investigations in the late 1970s and early 1980s; and reviewed and evaluated the ground water flow model developed by the USGS for the ground water in the Birds Nest Aquifer. Detailed descriptions of the water budgets for each water resource and of the calculations used for developing this assessment are provided in Appendix E.

*Environmental Consequences of Surface Water Withdrawals*

In the vicinity of the site, the only surface water body with sufficient flow to satisfy the water demand of Phase 3 RD&D activities is the White River. As described in Section 3.3.3, average monthly flows range from about 425 cfs in the late summer through the winter to approximately 1,300 cfs during spring runoff. As discussed further below, the removal of surface water directly from the White River would not have a significant impact on flows within the White River given the average and maximum water demands of 0.34 cfs and 0.59 cfs for Phase 3.

The direct extraction of surface water from the White River would have an extremely small effect on stream flow.  Based on data recorded at the USGS stream gage on the White River near the Route 45 bridge, over the period from 1927 through 2005, the lowest monthly average flow rate recorded was 73.1 cfs, which occurred in July 2002 (USGS, 2006).  The peak demand requirement of Phase 3 is 0.59 cfs, which is approximately 0.8% of the lowest monthly flow rate on record.  This would represent the worse case impact on flow.   More typically, however, it would be expected that monthly flows will be near average during Phase 3 operations.  Comparing the daily peak water demand of 0.59 cfs to the average monthly flow rate shows that pumping from the White River would be expected to reduce flow by only 0.045% during higher flow periods (June) to 0.14% in months with the lowest average flow rate (December).

Direct withdrawal of surface water from the White River would have a nearly imperceptible impact to the alluvial aquifer.  First, because the peak Phase 3 water demand is very small compared to the White River flow, very little change in stream stage would occur and, therefore, very little, if any, change in the gradient between the water in the river and the ground water in the alluvium would be expected.  Although the exact change in stream stage depends on the river morphology at the withdrawal point, review of the river stage and flow information for the nearby USGS gauge at the Route 45 bridge indicates that any change in stage due to withdrawals less that 1 cfs would be essentially imperceptible (<0.01 foot).  Since the movement of water between the river and the alluvial aquifer is dependent on the gradient due to the stream stage, no significant change in flow between the river and the alluvium is likely to occur.

The direct withdrawal of water from the White River would not significantly impact water levels in the Birds Nest Aquifer because the Birds Nest Aquifer does not receive its recharge from the White River or the associated alluvium.

*Environmental Consequences from Ground Water Withdrawals from the White River Alluvial System*

The alluvium along the White River consists of sands and gravels and is a viable supply for all of the Phase 3 water needs.  Based on its specific yield and the volume of saturated alluvial deposits, the amount of water theoretically recoverable from storage in the White River alluvium is approximately 39,000 acre-ft (Holmes and Kimball 1987).

The major potential impacts of extraction from the White River alluvium are the localized impacts from lower water levels and changes in the water budget.  Under non-pumping conditions, observation wells completed in the White River alluvium show small seasonal fluctuations in the depth to water of between 6 and 9 feet below the ground surface (Holmes and Kimball 1987).  If water is extracted from wells in the White River alluvium, a local drawdown cone would form around the extraction well.  Using the maximum water demand of 380,000 gallons per day (265 gpm), the estimated maximum drawdown is 1.1 feet, based on the reported values of aquifer thickness and hydraulic conductivity given by Holmes and Kimball (1987), and assuming a distance between the well and the river of 250 ft. This change in the water table elevation is within the range of seasonal water table fluctuations and therefore, is not expected to cause any noticeable impacts. Minor and localized short-term impacts to vegetation, such as lower growth rates or death of some individual plants in the immediate vicinity of the wells, would be possible in low water months,

Extraction of water from the alluvium would have a slight effect on flow in the White River since the alluvium is in direct hydraulic contact with the White River. However, given the large volume of water in storage in the alluvium, initially the water drawn from the river into the alluvium would be just a small fraction of the total water demand. Over time, however, as steady state conditions occurred, the reduction in flow in the White River would approximately equal the volume of water withdrawn from the alluvial aquifer. Therefore, reduction in flow in the White River from pumping from the alluvial aquifer would be similar to that from direct surface water withdrawals (0.2% maximum reduction in flow during low water months).

*Environmental Consequences of Ground Water Withdrawals from the Birds Nest Aquifer*

The Birds Nest Aquifer is in the upper part of the Parachute Creek Member of the Green River Formation. The top of the aquifer ranges from about 50 to 125 feet below the top of the Parachute Creek Member. The aquifer's areal extent to the west and north is unknown, but it has been estimated to extend as far as Bitter Creek to the west and several miles beyond the White River to the north. Water levels in the aquifer range from a few feet below the surface where the aquifer crops out in Evacuation Creek to more than 400 feet below the surface a few miles to the west.

Recharge in the aquifer originates primarily from infiltration of stream flow from Evacuation Creek through alluvial deposits overlaying the aquifer and downward leakage from the Uinta Formation. The total long-term recharge is 670 acre-ft/yr. Discharge primarily occurs from upward leakage through the Uinta Formation and alluvial aquifers to Bitter Creek and discharge to the White River. A number of springs also indicate discharge to Evaluation Creek but the amount of discharge is small. Discharge in the form of seeps and springs is also common along the east wall of Hells Hole Canyon.

The extraction of water at the Phase 3 peak demand rate from wells in the Birds Nest Aquifer would lead to a decline in water levels within the aquifer. The pumping is sustainable in the long-run because the extraction rate of 425 acre-ft/yr is less than the long-term recharge rate of 670 acre-feet per year. Given that the Phase 3 pumping will only continue for two years, the extracted water will be removed from aquifer storage with a minimal effect on the long-term water balance. The USGS model predicted a maximum drawdown of over 100 ft from a 900-gpm extraction well after 1 year of pumping (Holmes and Kimball 1987). This extraction rate is approximately 3 times the Phase 3 peak demand, so the approximate maximum drawdown from Phase 3 pumping would be 35 ft.

Extraction from the Birds Nest Aquifer may reduce flows of high TDS water in springs and seeps that discharge into Evacuation Creek and Bitter Creek. Since the major discharge point of the Birds Nest Aquifer is the springs feeding Bitter Creek, there could be a reduction in flow in Bitter Creek depending on where the wells are located. Using the USGS ground water model, the discharge to Bitter Creek was estimated to be 640 ac-ft/yr, or 0.88 cfs (Holmes and Kimball, 1987). Also, since ground water has been estimated to contribute from 10%-40% of the flow in Evacuation Creek (VTN 1977), pumping the Bird's Nest Aquifer could result in a reduction of flow. Based on the above-estimated ground water contribution, the reduction in flow could be as much as 40% if the water table was lowered sufficiently to eliminate all ground water contributions to flow in Evacuation Creek.

Extraction of ground water from the Birds Nest Aquifer would not lead to perceptible impacts on water levels in the White River alluvium. While some upward leakage from the Birds Nest Aquifer to the White River and associated alluvium occur under natural conditions, it is estimated to be approximately 30 acre-ft/yr. If this leakage were reduced as a result of pumping from the Bird's Nest Aquifer, it would be replaced by additional infiltration from the White River into the alluvium. Thus, the net result would be no significant change in the alluvium water levels.

*Water Level Monitoring*

To provide data on water withdrawal from the White River and changes in water levels in the ground water systems, OSEC will establish a water level monitoring program during Phase 3 of the project.

If water is withdrawn from the White River or from the White River alluvium, the monitoring will consist of (1) measuring water withdrawal from the White River and (2) measuring the ground water level in 2 piezometers located in the alluvium near the withdrawal point(s). If ground water is extracted from the Birds Nest Aquifer, the monitoring will also include a piezometer in the Birds Nest Aquifer and a gauging station along Evacuation Creek.

It is anticipated that such monitoring would be daily for the first two weeks of water withdrawals, weekly for the next 6 weeks, and monthly thereafter.

*Mitigation*

Based on the above impact evaluation, no mitigation measures are proposed to address the impacts to water resources from the Proposed Action. If, however, the initial water level monitoring indicates that potential impacts could be materially greater than those described above, OSEC will explore modifying its selected water supply system such that the impacts are consistent with those presented in the above evaluation.

**Alternative B (Eastern Pipeline Right-of-Way)**

The impacts to water resources under Alternative B (Surface Retorting with the ATP System with Eastern Gas Pipeline Right-of-Way) would be identical to the impacts described above for the Proposed Action.

**Alternative C (No Action)**

Under the No Action alternative, the Proposed Action would not be implemented so none of the impacts described above would occur and there would be no change to existing water resource conditions.

### 4.2.4 Soils

Table 3-2 (Soil Types and Properties) identifies each soil mapping unit affected by the proposed project and indicates the environmental and construction-related constraints associated with each soil type.

The Proposed Action would affect approximately 280 acres of soils which have been classified as severely erodible by water where slopes are relatively steep. Clearing, grading, and movement of construction equipment in these areas will remove the protective vegetation cover from these soils, accelerating the erosion process. Water erosion of soils associated with construction is a concern because it results in loss of topsoil. Eroded topsoil and subsoil often wind up contributing to increased sedimentation of streams and wetlands. Sedimentation can adversely affect water quality and aquatic life.

With the exception of the larger stream valley crossings, a large portion of the Proposed Action activities will take place on soils which have a depth to bedrock averaging less than 60 inches. Depending on bedrock hardness and cohesion, blasting may be needed in order to excavate utility trenches or place power poles in these areas. Even if blasting is not required, standard excavation with a trenching machine or excavator can be slowed considerably. Furthermore, there is the potential for mixing broken up rock with the thin layers of topsoil and subsoil.

Nearly all soils which will be affected by the project have a poor revegetation potential. Thus, it will be relatively difficult to achieve revegetation success following construction because of the poor fertility and other limiting factors of these soils.

There are approximately two acres of soils crossed by the Proposed Action which are classified as moderately to highly erodible by wind. Construction in these sandy soils (which occur in riparian areas) tends to disperse the sandy soil into adjacent areas where it can negatively impact vegetation and increase stream sedimentation. Most of these soils would be avoided by spanning them with the power line and use of HDD for the natural gas line.

There are approximately 2 acres of soils affected by the Proposed Action which are subject to frequent flooding and are characterized by a high water table for at least part of the year. As a result, there is an increased risk to water quality from spills of petroleum products in these areas. Furthermore, ground conditions can bog down equipment and hamper construction activities. These soils would largely be avoided by spanning them with the power line and use of HDD for the natural gas line.

Throughout the project area, there will be the potential for accidental spills or leaks of petroleum products and hazardous materials during construction. These events, if they occur, could cause soil contamination and an associated decrease in soil fertility and revegetation potential.

The applicant is committed to the following measures under the Proposed Action in order to reduce the impacts noted above:

- OSEC will develop soil erosion and sediment control and soil management plans for the project to stipulate appropriate structural and mechanical methods for minimizing soil erosion and sedimentation; practices for the handling, staging, and re-use of topsoil; and soil reclamation activities to be conducted following construction.

- In construction areas, topsoil will be stripped to a depth of 6 to 12 inches depending on its thickness. Trench spoil and other subsoil stripped during grading will be stored separately from topsoil to prevent mixing. During reclamation, topsoils would be respread prior to seeding.

- Temporary erosion and sediment controls such as silt fences will be installed immediately following clearing and grading of construction sites. These structures will be maintained and will be removed during or after reclamation as appropriate.

- Effects of leaks and spills of petroleum products and hazardous materials will be minimized by implementation of the project Spill Prevention, Control and Countermeasures Plan.

- Following construction, any compacted soils will be loosened using a tractor-pulled ripper or similar device. The construction sites will be returned to their pre-construction contours, so far as practical. All disturbed areas will be seeded with seed mixes approved by BLM. Permanent erosion control measures such as slope breakers (water bars), mulch, and erosion-control netting will be installed where needed.

*Mitigation*

Application of the above listed applicant-committed environmental control and management measures both during construction and operation will reduce project effects on soils. However, construction-related disturbance will inevitably result in some acceleration of soil erosion by both water and wind. Environmental inspection of areas disturbed by the Proposed Action, both during construction and operation, will aid in determining the effectiveness of the above measures. Results of inspections may lead to application of the following mitigation measures:

- Additional soil erosion and sediment control measures and remediation of damaged site soils may be necessary if the applicant-committed measures are found to be inadequate.

- Reseeding may be necessary if the initial application is unsuccessful.

Even with application of these mitigation measures, some damage to and loss of soils associated with construction will be unavoidable.

**Alternative B (Eastern Gas Pipeline Right-of-Way)**

Effects to soils under Alternative B would be similar to the Proposed Action. There are minor differences in acreages of sensitive soil areas because of the different gas pipeline route followed by Alternative B. Following is a listing of these minor differences:

- Approximately 282 acres of soils classified as severely erodible by water where slopes are relatively steep would be affected by Alternative B as opposed to 280 acres under the Proposed Action.

- Approximately 3 acres of soils classified as moderately to highly erodible by wind would be affected by Alternative B as opposed to 2 acres under the Proposed Action. These soils would largely be avoided by spanning them with the power line and use of HDD for the natural gas line.

- Approximately 4 acres of soils which are subject to frequent flooding and are characterized by a high water table would be affected by Alternative B as opposed to 2 acres under the Proposed Action. These soils would largely be avoided by spanning them with the power line and use of HDD for the natural gas line.

**Alternative C (No Action)**
Under the No Action alternative, the Proposed Action would not be implemented so none of the impacts described above would occur and there would be no change to existing conditions.

### 4.2.5 Geology/Mineral Resources/Energy Production

*Geologic Hazards*: OSEC will conduct geotechnical studies prior to reopening the mine to determine mine safety risks.

Pipeline damage can result from earthquake-related seismic wave propagation. For an Intensity VII earthquake (the largest predicted for the project area), less than 0.0001 repairs per 1,000 feet are predicted for steel pipe with arc-welded joints (O'Rourke and Liu, 1999). This translates to less than a one percent chance of a repair being needed for a pipeline located near the epicenter of an Intensity VII earthquake. Seismic risks for power lines, the surface water runoff impoundment, and the mine workings associated with the proposed project are also projected to be minimal.

There appear to be no geologically unstable slopes associated with the proposed mine site or utility corridors. Thus, the risk of landslides and other mass wasting hazards appear to be minimal.

Flash flooding presents potential hazards to buried and above ground utility lines. These hazards are discussed in the Floodplains section (Section 4.2.6).

*Mineral Resources*: There is an existing oil and gas lease that overlaps the 160-acre lease area. In addition, there are various oil and gas leases along the proposed utility rights-of-way. As part of the Proposed Action, and in consultation with BLM, OSEC will coordinate its activities with oil and gas lessees to avoid multiple mineral development conflicts. OSEC will petition the Utah Division of Oil, Gas & Mining (DOGM) to include the 160-acre lease and the entire preferential lease area with a "Designated Oil Shale Area". Such designated areas have special mandated oil and gas drilling and completion requirements listed in the General Rules and Regulations of the Utah Board of Oil, Gas and Mining, as amended. These requirements are intended to minimize conflicts between the oil and gas lessee and the oil shale lessee and assure the ability of both to safely produce their respective resource. Therefore, the Proposed Action is not expected to have any impact on the ability to develop oil or gas resources in the Project Area.

Gilsonite veins would be crossed by the proposed gas pipeline. OSEC will coordinate construction of utility lines with American Gilsonite Company, the operator of gilsonite mines crossed by the proposed utility line ROWs. The Proposed Action is not expected to have any negative impact on extraction of gilsonite ore.

The proposed project will not affect any other areas where other mineral resources are being actively exploited at present or that will be within the reasonably foreseeable future (Doelling, 1983).

**Alternative B (Eastern Gas Pipeline Right-of-Way)**

Minor impacts to geology, mineral resources, and energy production would be similar to those associated with the Proposed Action. It appears that the natural gas pipeline associated with Alternative B would cross one less gilsonite vein than would be crossed by the Proposed Action pipeline.

**Alternative C (No Action)**

Under the No Action alternative, the Proposed Action would not be implemented so none of the impacts described above would occur and there would be no change to existing conditions.

### 4.2.6 Flood Plains

As described in Section 3.0, there are no floodplains within the 160-acre lease, so floodplains would not be impacted by RD&D facilities.

Under the Proposed Action, floodplains located adjacent to the White River are to be crossed by a new power line and gas pipeline. The applicant would construct the power line so as to span floodplains with poles located in upland areas. The gas line will be installed beneath the White River channel by the use of horizontal directional drilling (HDD) and will be installed a minimum of three meters beneath the river bottom. Every effort will be undertaken to conduct all drilling activities associated with the White River crossing within the already disturbed areas of the floodplain near the Highway 45 bridge crossing. This area has been disturbed by both past and on-going activities, including remnants of a former bridge, truck traffic and other activities associated with the withdrawal of water from the White River at this location, existing Gilsonite mine wells, and as an access point to the White River for recreational uses. There will be short-term impacts to the floodplains during and immediately following construction activities due to soil disturbances, minor visual impacts, and potential impacts on access for other uses. Following construction and reclamation activities, disturbed areas will be restored to pre-construction conditions to the extent possible. Thus, power line and pipeline crossings are expected to have minimal residual impacts on floodplains.

The water wells and pumps located within the White River floodplain and the associated power line and access road could be subject to scour of alluvium and other damage during a major flood event.

During construction and operation of the RD&D facility and utility lines, flash floods in ephemeral streams could cause damage to pipelines and access roads which cross these drainages. For example, there is a low possibility that flash floods could cause scour of alluvium in areas of active erosion exposing the gas line and subjecting it to damage from cobbles and boulders being carried by the flood event.

*Mitigation*

Following a major flood in the White River or a flash flood in an ephemeral stream, damaged utility lines, access roads, and equipment would be repaired and exposed pipe would be reburied. These measures would minimize residual project-related impacts from flooding.

**Alternative B (Eastern Gas Pipeline Right-of-Way)**

The natural gas pipeline crossing location of the White River floodplain for Alternative B will be approximately two miles upstream of the crossing location for the Proposed Action. The targeted area is already disturbed by an existing natural gas pipeline crossing, a suspended gilsonite pipeline, and access roads associated with these pipelines. Similar to the Proposed Action, every effort would be made to conduct all HDD activities in these already disturbed areas of the floodplain. The potential impacts to floodplains associated with this alternative would be very similar to those associated with the Proposed Action.

**Alternative C (No Action)**

Under the No Action alternative, the Proposed Action would not be implemented so none of the impacts described above would occur and there would be no change to existing conditions.

### 4.2.7 Wetlands/Riparian Zones

As described in Section 3.3.7, there are some wetland areas located along the White River and Evacuation Creek. In addition, utility rights-of-way associated with the Proposed Action cross riparian zones. The applicant is committed to the following measures to minimize impacts to wetlands and riparian zones along the White River and Evacuation Creek:

- Surveys will be conducted prior to utility construction to establish the presence or absence of wetlands or riparian zones. If wetlands or riparian zones are present, they will be avoided to the extent practicable.

- Wetlands will not be permanently filled or drained as a result of the proposed gas pipeline construction, power line construction, or by installation and use of alluvial wells in the White River riparian zone.

- Construction activities will not result in any alteration of wetland or riparian vegetation or a loss of high quality wildlife habitat because HDD activities to install the gas pipeline will be set up outside of any wetland areas and every effort will be made to conduct all such activities in the already disturbed areas of the floodplain adjacent to the Highway 45 bridge crossing. The proposed power line will be strung over the White River and Evacuation Creek with poles located outside of wetlands and riparian zones.

- Accidental spills or leaks of hazardous materials and/or petroleum products during construction and operation could impact soils and water quality within wetlands and riparian zones. The applicant is committed to prepare a Spill Prevention, Control, and Countermeasures (SPCC) plan for the Proposed Action prior to the start of construction. Implementation of this plan will greatly reduce residual impacts of spills and leaks on wetlands and riparian zones.

- Drilling alluvial wells will impact the riparian zone adjacent to the White River but wetlands will be avoided. Existing roads and 2-tracks will be used for access to the alluvial well site along the White River.

- The alluvial well site will be revegetated with an approved seed mix as soon as possible following well drilling and completion. Erosion and sediment control measures will be used while vegetation is being reestablished and an appropriate certified weed free seed mix will be used.

No wetlands or riparian areas were observed in any of the ephemeral stream tributaries to the White River and Evacuation Creek and therefore, there would be no wetland impacts in these areas.

Alluvial aquifer drawdown from pumping the proposed alluvial wells or surface water withdrawal is not expected to impact riparian vegetation since the amount of water to be withdrawn is such a small percentage of the water in the river/alluvial system and the percent change is well within the range of natural variation. No wetlands or riparian zones were observed in any of the ephemeral streams which are tributary to the White River and Evacuation Creek.

*Mitigation*

Although wetlands and riparian areas will be largely avoided by horizontal directional drilling and spanning by power lines, any impacts to wetlands and riparian areas would be minimized by implementing measures to reduce the soil disturbance and enhance restoration of vegetation within wetlands and riparian areas.  These mitigation measures may include:

- Limit construction equipment working in wetlands and riparian zones to that essential for clearing, trench excavation, pipe fabrication and installation, backfilling, and restoration.

- Limit stump removal, grading, topsoil segregation, and excavation in wetlands and riparian zones to the area immediately over the trench line to avoid excessive disruption of soils and the native seed and rootstock within the soils.

- Prohibit storage of hazardous materials, chemicals, fuels, lubricating oils, concrete coating, and refueling activities within 200 feet of any wetland or riparian area.

- Equipment working in wetlands and riparian zones will be cleaned of any possible weed seeds prior to bringing it into these areas.

- Implement measures to control introduction and spread of invasive, non-native species into wetlands and riparian areas as discussed in Section 4.2.12.

Implementation of these mitigation measures will minimize but not totally eliminate residual impacts to wetlands and riparian zones if project-related work takes place within these areas.

**Alternative B (Eastern Gas Pipeline Right-of-Way)**

Under this alternative, the natural gas pipeline would cross White River riparian zones approximately 2 miles upstream of the Proposed Action crossing.  As with the Proposed Action, impacts to riparian areas and associated wetlands would be largely avoided by use of HDD with every effort to conduct these activities in already disturbed areas of the floodplain.  Other potential impacts, applicant-committed measures, and possible mitigation would be the same as for the Proposed Action.

**Alternative C (No Action)**
Under the No Action alternative, the Proposed Action would not be implemented so none of the impacts described above would occur and there would be no change to existing conditions.

### 4.2.8 Threatened/Endangered (T&E) Wildlife Species

Bald Eagles: Bald Eagles are winter residents in most areas of Utah (Sibley, 2000). Areas of concentrated use are closely associated with larger bodies of water as they mainly feed on fish and waterfowl (NatureServe 2006). However, other habitats may be used if food resources, such as rabbit or deer carrion, are readily available. Bald eagles tend to use traditional communal roosts located in mature trees. The proposed ROWs cross only a few areas near rivers or streams where large trees such as cottonwood (*Populus spp*.) would be encountered. There is a low possibility that foraging habitat would be impacted by water withdrawals from the White River by reducing habitat for fish spawning and wetland areas that support waterfowl. This could result in smaller numbers of fish and waterfowl available for bald eagle to consume, increasing their reliance on carrion. However, during the winter, carrion is a highly utilized food source.

Bald eagles may be impacted by the construction of new power lines. Impacts could include electrocution and collision with power lines resulting in injury or death.

Impacts of the Proposed Action on bald eagles have been determined through consultation with the USFWS to be “may affect not likely to adversely affect” because eagles typically utilize carrion in addition to fish and waterfowl in the winter. Furthermore, there are few nesting pairs in the entire state of Utah (only eight identified in 2006). No bald eagles or their nests were observed within 0.5 mile of the 160-acre site or the utility rights-of-way during raptor surveys conducted in the spring of 2006.

The applicant is committed to comply with stipulations for bald eagles as called for by the BLM VFO and in the applicable resource management plan (RMP). In addition, the applicant will comply with the requirements resulting from consultation with the USFWS for bald eagles.

There are no raptor prescriptions in the Book Cliffs RMP (1985). On a site-specific basis, conditions of approval have been developed for Proposed Actions that are similar to those found in the Diamond Mountain RMP (1994).

Pre-construction clearance surveys will be conducted in the spring prior to construction to identify active bald eagle nests within 1.0 mile of the project site and ROW and in winter to identify active bald eagle roosts within 0.5 mile of the project site and ROW. BLM-approved biologists will be required to meet with BLM biologists prior to initiating surveys, and will conduct surveys using BLM protocols. Construction activities will not occur within a 1.0 mile of any active bald eagle nest without further consultation with the USFWS. Construction activities will not occur within 0.5 mile of any active roosting sites from November 1 through March 31.

By complying with the BLM VFO prescriptions, the project effects to bald eagles are considered to have a “may affect not likely to adversely affect” as a result of the Proposed Action.

*Fish*: Activities on the 160-acre lease site will have no direct impact on T&E fish species since there are no permanent streams or rivers on the lease site.

Construction of the western natural gas pipeline under the White River would not directly affect the four Colorado River basin T&E fish species. The applicant is committed to use horizontal directional drilling (HDD) to install pipe beneath the White River channel. In addition, the proposed power line will span the river, thereby avoiding any potential impacts.

The surface water or ground water withdrawals associated with Phase 3 of the proposed project (whether through surface water withdrawals, or wells in the Birds Nest Aquifer or the White River alluvium) will result in very slight reduction (less than 0.3%) of total flow volume in the White River. However, any reduction in flow is considered a depletion of water from the Colorado River Basin as defined by the USFWS. Any depletion is automatically deemed by the USFWS to “likely…jeopardize the continued existence of the Colorado pikeminnow, humpback chub, bonytail chub, and razorback sucker and result in destruction or adverse modification of their critical habitat” (“may affect”). Therefore, all proposed activities on BLM-managed lands that result in water depletion, trigger a formal Endangered Species Act, Section 7 consultation with the USFWS (Chart, 2006). Phase 3 of the Proposed Action will use an average of 220,000 gallons of water per day (gpd) for 2 years (with an estimated peak usage of 380,000 gallons per day). Based on a 365 day per year operating schedule, this would result in a depletion of approximately 247 acre feet per year. All depletions that exceed 100 acre-feet per year are subject to a one-time contribution to the 1987 Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (Recovery Program).

The applicant is committed to minimize impacts to Colorado River basin T&E fish species in accordance with USFWS requirements. The Biological Opinion on the Proposed Action provides “Reasonable and Prudent Alternatives” that the USFWS gives for all projects that deplete water. The reasonable and prudent alternative which allows the project proponent to offset the impacts caused by the depletion is a one-time monetary contribution to the Recovery Program for these species.

If alluvial wells are installed within the 100-year floodplain, there may be additional effects to the four T&E fish species. Impacts could include increased sedimentation while drilling the wells and constructing ancillary facilities (roads, pipelines, etc.). Increased sedimentation could reduce the quality of spawning beds for fish and the quality of areas, such as springs, that are important for the macroinvertebrates that fish feed upon to reproduce. The applicant is committed to implementation of erosion and sediment control measures and the project SPCC Plan to limit any affects of alluvial well installation and operation on T&E fish species in consultation with the BLM and USFWS.

If direct surface water withdrawal is chosen for supplying some or all of the Phase 3 water requirements, impacts could include sucking juvenile fish into the water intake resulting in death. Measures taken to eliminate impacts will include using intake screens to keep juvenile fish from being sucked into the intake and placing the intake in active water where juveniles do not congregate.

Even though the applicant will comply with USFWS requirements, the Proposed Action will have a "may affect, likely to adversely affect" impact on Colorado River basin T&E fish species.

**Alternative B (Eastern Gas Pipeline Right-of-Way)**

Possible impacts of Alternative B to threatened/endangered wildlife species are expected to be similar to those associated with the Proposed Action. The same applicant-committed measures as those described above for the Proposed Action would be applied for Alternative B.

**Alternative C (No Action)**

Under the No Action alternative, the Proposed Action would not be implemented so none of the impacts described above would occur and there would be no change to existing conditions.

### 4.2.9 Fish and Wildlife Including Special Status Species other than USFWS Candidate or Listed Endangered or Threatened Species

The following discussion of potential impacts to species includes only those species which may occur in the project area.

**Ferruginous hawks** prefer open grasslands and shrub steppe areas. Their habitat includes sagebrush, greasewood-saltbrush shrub lands, often on the periphery of pinyon-juniper habitat (NatureServe 2006). Ferruginous hawks will nest on the ground, usually far from human activity. They will also utilize lone trees in grassland communities for nesting. Suitable habitat for the ferruginous hawk does exist within ½ mile of some portions of the utility rights-of-way associated with the Proposed Action. Potential impacts to ferruginous hawks include temporary displacement during construction and prior to successful reclamation. Impacts can also include long term displacement by construction of facilities such as power lines which remain in place for several years. Potential impacts from power lines include electrocution and collisions resulting in injury or death.

**Townsend's big-eared bat** maternity and hibernation colonies typically are located in caves and mine tunnels (NatureServe, 2006). The bat prefers relatively cold places for hibernation, often near entrances and in well-ventilated areas. Throughout much of the known range, it commonly occurs in mesic habitats characterized by coniferous and deciduous forests, but occupies a broad range of habitats. In Utah, day roosts are associated with sagebrush steppe, juniper woodlands and mountain brush vegetation at lower available elevations (4,400-8,000 feet). Suitable habitat for the Townsend's big-eared bat could exist in the White River Mine or along large rocky cliffs above the White River and Evacuation Creek. Potential impacts to Townsend's big-eared bats could include direct mortality from re-opening the mine and temporary displacement during construction, operation, and prior to successful reclamation of utility line crossings at the White River and Evacuation Creek. Impacts could also include long-term displacement by construction of facilities such as power lines which remain in place for several years. Potential impacts from power lines include electrocution and collisions resulting in injury or death. Impacts to bats from the utility corridors should be minimal as the utility lines would be located adjacent to existing utility lines, especially where the corridors cross cliffs.

**Pronghorn antelope** prefer grasslands, sagebrush plains, deserts, and foothills (NatureServe, 2006). Their need for free water varies with the succulence of vegetation in the diet. Pronghorn birth and fawn bedding sites are located in dense shrub cover in sagebrush-steppe communities. Suitable year-long habitat for the pronghorn does exist within the project area along northern portions of the utility rights-of-way associated with the Proposed Action. Potential impacts include temporary displacement during construction and prior to successful reclamation. Potential impacts also include long term displacement by construction of facilities which remain in place for several years. However, the Proposed Action should have minimal impact on pronghorn, as there is abundant year-long habitat adjacent to the project area that could be utilized by the pronghorn.

**Mule deer** prefer coniferous forests, desert shrub, chaparral, and grasslands with shrubs (NatureServe, 2006). They are often associated with successional vegetation especially near agricultural lands and are often found on warmer slopes in winter. Mule deer browse on a wide variety of woody plants and graze on grasses and forbs. Suitable year-long habitat and winter range for the mule deer does exist at the 160-acre site and along portions of the proposed utility ROWs south of the White River. However, no crucial winter range exists. Potential impacts include temporary displacement during construction and prior to successful reclamation. Potential impacts also include long term displacement by construction of facilities which remain in place for several years. However, the Proposed Action should have minimal impact on mule deer, as there is abundant habitat adjacent to the project area and no crucial winter range exists.

**Mourning doves** prefer open woodland, forest edge, cultivated lands with scattered trees and bushes, parks and suburban areas, and arid and desert country (generally near water). They usually nest in trees or shrubs; sometimes on stumps, rocks or buildings; or even on the ground (NatureServe 2006). During 2006 surveys, individual morning doves were observed in upland areas near the White River and Evacuation Creek. However, no nests were observed. Potential impacts from the Proposed Action include temporary to long term displacement depending on the length of time to successful reclamation. The Proposed Action should have minimal impacts on mourning doves as there is abundant similar habitat in adjacent areas.

**Migratory Birds** occupy a variety of habitat types and may be impacted by construction of this project. Potential impacts include temporary to long-term displacement depending on the length of time prior to reclamation. Potential impacts also include long-term displacement by construction of facilities which remain in-place for several years. However, the project should have minimal impact on migratory birds because they have abundant similar habitat adjacent to the 160-acre site and utility rights-of-way.

Construction will temporarily remove foraging habitat for the ferruginous hawk, Townsend's big-eared bat, pronghorn antelope, mule deer, mourning dove, and other migratory birds. Impacts will be temporary to long-term until re-vegetation efforts are successful and native vegetation is restored.

To minimize impacts to special status species, the following applicant-committed measures will be implemented:

- Conduct clearance surveys, each spring prior to construction, to identify active raptor nests within 0.5 mile of the construction ROW. BLM-approved biologists will be required to meet with BLM biologists prior to initiating surveys, and will conduct the surveys using BLM protocols. There are no raptor prescriptions in the Book Cliffs RMP (1985). On a site-specific basis, conditions of approval have been developed for Proposed Actions that are similar to those found in the Diamond Mountain RMP (1994). Construction activities will not occur within 0.5 mile of active raptor nests between February 1 and August 31 depending on the species or until fledging and dispersal of the young.

- In accordance with BLM VFO timing stipulations for big game crucial winter range, no construction will take place in these areas between November 1 and March 31 (Faircloth, 2005).

- Raptor guards will be installed on power lines to prevent perching/electrocution of raptors (required if individual wires are close together) consistent with BLM guidelines.

- The White River mine shaft is not expected to be suitable bat habitat because of the presence of methane in the mine. However, if bats are found in the White River Mine, OSEC will install one-way doors or other suitable mitigation at the mine shaft entrances allowing sufficient time prior to re-opening the mine for bats to leave but not to re-enter the mine shafts.

- Once the mine is permanently closed, the mine shaft(s) should also be closed permanently to bats unless it can be demonstrated that methane no longer poses a danger to them.

The preceding applicant-committed measures will minimize residual impacts to special status species.

**Alternative B (Eastern Gas Pipeline Right-of-Way)**
Any impacts to special status species will be similar to those associated with the Proposed Action. Applicant-committed mitigation measures for special status species will be the same under either alternative.

**Alternative C (No Action)**
Under the No Action alternative, the Proposed Action would not be implemented so none of the impacts described above would occur and there would be no change to existing conditions.

#### 4.2.10 Threatened/Endangered (T&E) Plant Species

Construction of the utility lines under the Proposed Action may affect the following plant species:  Graham's beardtongue (*Penstemon grahamii*), Uinta Basin hookless cactus (*Sclerocactus glaucus*), Ute ladies'-tresses (*Spiranthes diluvialis*), and White River beardtongue (*Penstemon scariosus var. albifluvis*).  The BLM has analyzed the 160-acre lease site and found no evidence of populations or habitat for these plant species (Green River formation outcrops or riparian/wetland areas).  Similarly, BLM survey data indicate that the proposed utility rights-of-way do not currently contain known populations of T&E plant species.

Because plants can migrate into new areas, the applicant is committed to conduct field surveys for each of the four Federally-listed threatened and endangered plant species that has potential habitat along the proposed utility rights-of-way.  Following consultation with BLM VFO personnel, these surveys will be conducted during the appropriate survey windows prior to construction.  They will be carried out no more than one year prior to the commencement of construction in a particular area to determine their presence or absence. If populations are found, consultations with the BLM/USFWS will be conducted to determine an appropriate alternative route.

If T&E species are found along the utility line ROWs, construction impacts could include injury to, or destruction of, the plants and habitat and/or seed displacement during clearing, pipeline trenching, pole placement, or general vehicle and equipment movement along the ROWs.  Populations located adjacent to the ROWs could be impacted by erosion, accidental deposition of materials during grading and trenching, and changes in surface runoff patterns.  Existing plants could be killed or injured, new plants could be prevented from germinating, and the soil seed bank could be buried or removed.  Permanent habitat loss could occur due to construction in previously undisturbed areas.  Utility rights-of-way can contribute to habitat fragmentation which could result in pollinator and seed dispersal disruptions.  Vehicle traffic and construction activities could create dust that can affect plants by reducing their vigor and reproduction capabilities.  Noxious weed infestations resulting from construction could out-compete populations of T&E plants.  Therefore, the applicant is committed to avoid construction through populations of T&E plant species unless topographic or other environmental constraints make it impossible to avoid them.

The applicant is committed to install the proposed natural gas pipeline beneath the White River using HDD techniques.  Every effort will be made to conduct all drilling activities associated with the pipeline installation in the already disturbed areas of the floodplain adjacent to the Highway 45 bridge crossing.  The power line will span the river and floodplain with poles located in upland areas.  Thus, construction will avoid impacts to any potential habitat for the Ute-ladies' tresses.  Although no wetland habitat will be directly destroyed by project activities, withdrawal of water, either from the river itself or from the

White River alluvium could slightly reduce water levels in the river. However, the potential reduction in water levels is very low and within the range of natural-occurring variations, therefore, no impacts to potential habitat for this orchid are expected.

Following the completion of utility line construction and alluvial well drilling, disturbed areas will be restored and seeded in a timely manner following procedures outlined in the invasive, non-native species, vegetation, and wetland/riparian zone sections of this EA.

With implementation of the preceding applicant-committed measures, construction and operation of the Proposed Action was determined to **"**may affect, not likely to adversely affect" Uinta Basin hookless cactus. The Proposed Action may affect but is "not likely to lead to federal listing" of Graham's beardtongue and White River beardtongue. In addition, the Proposed Action was determined to "may affect, not likely to adversely affect" Ute ladies' tresses.

**Alternative B (Eastern Gas Pipeline Right-of-Way)**

The same species of T&E plants identified for the Proposed Action natural gas pipeline rights-of-way could potentially occur in upland areas of the Alternative B gas pipeline right-of-way, although Graham's beardtongue is more likely to be found in association with the Alternative B pipeline ROW. Applicant-committed measures for identification and protection of these plants would be the same for Alternative B as for the Proposed Action. Residual impacts would be similar.

**Alternative C (No Action)**

Under the No Action alternative, the Proposed Action would not be implemented so none of the impacts described above would occur and there would be no change to existing conditions.

### 4.2.11 Vegetation Including Special Status Species other than USFWS Candidate or Listed Species

As discussed in Section 3.3.11, eleven ecological systems were identified that would likely be crossed or disturbed during construction activities. The geographic distribution and description of the ecological systems were obtained from the Southwest Regional Gap Analysis Project or SWReGAP (USGS, 2004). The SWReGAP drew their classifications and descriptions from NatureServe's Ecological System concept (Comer et al., 2003). Calculations related to these ecological systems and their predicted disturbance during project construction activities were generated using ArcGIS.

In examining the possible impacts of the OSEC project on vegetative communities, a set of standards was developed to facilitate the analysis. These guidelines are as follows:

- Within the 160-acre lease site, there are currently structures (roads, buildings, mine shafts, shale piles, etc.) in place. As much as is possible, these existing structures will be improved for use for the Proposed Action but the improvements may result in temporary disturbance of vegetation nearby. Additional disturbance (mining, shale piles, sewage treatment plant, human activity, etc.) will result in vegetative disturbance as a result of this project. Temporarily disturbed areas will be reclaimed as soon as possible. Structures built within the site boundary will result in long-term effects on vegetation. The approximate area of this disturbance is indicated on the site plan (Figure 1-1).

- The access road associated with the dam impoundment north of the 160-acre site will likely need to be regraded to improve passability. A buffer of 20 feet was used in calculating the vegetative disturbance associated with that improvement.

- Alluvial wells in the NW¼ NW¼, Section 14, T10S, R24E may be used to acquire water for project activities. Water will be transported to the 160-acre site by truck or through a water pipeline. A 100-foot buffer was used in calculating the vegetative disturbance likely to result from construction of a water line, improvement of the existing access road, and construction of a power line to the well site.

- A buffer of 50 feet was used in calculating disturbance likely to result from the construction of the power line associated with the Proposed Action.

- A buffer of 75 feet was used in calculating the disturbance likely to result from the construction of the natural gas pipeline associated with the Proposed Action.

Table 4-10 shows predicted vegetative disturbance for utility rights-of-way associated with the Proposed Action.

Construction would result in cutting, clearing, and/or removal of existing vegetation within the construction workspace. The degree of impact would depend on the type and amount of vegetation affected, the length of time of disturbance, and the rate at which the vegetation would regenerate after reclamation. Disturbances to vegetation could also increase soil erosion, increase potential for the introduction and infestation of invasive, non-native species, and reduce wildlife habitat. Impacts to vegetation would vary by vegetative community, ecological site type, and revegetation success and would be short- to long-term. Herbaceous vegetation would likely reestablish within 1 to 2 years and big sagebrush dominated communities would likely return to their pre-construction condition within 20 to

75 years. Disturbed soil sites have a higher probability of being invaded by invasive, non-native species. The success (or failure) of revegetation will affect other resources including soils, surface water quality, wildlife, and visual resources. Construction and operation of the pipeline and associated facilities will result in a loss of some vegetation for the life of the project. Other vegetation types, mainly grasses and small shrub species, will reestablish on the pipeline ROW.

**TABLE 4-10**
**Associated Vegetative Disturbance for the OSEC Utility Rights-of-way Under the Proposed Action**

| Ecological System Disturbed | Total Predicted Acres Disturbed | Total Predicted Miles Crossed | Percent of Disturbed Area |
|---|---|---|---|
| Colorado Plateau Mixed Bedrock Canyon and Tableland | 3.02 | 0.44 | 2.26% |
| Colorado Plateau Pinyon-Juniper Shrubland | 1.71 | 0.18 | 1.28% |
| Inter-Mountain Basins Big Sagebrush Shrubland | 84.32 | 10.50 | 63.02% |
| Colorado Plateau Mixed Low Sagebrush Shrubland | 16.92 | 2.16 | 12.65% |
| Inter-Mountain Basins Mixed Salt Desert Scrub | 12.90 | 1.69 | 9.64% |
| Inter-Mountain Basins Semi-Desert Shrub Steppe | 3.65 | 0.40 | 2.73% |
| Inter-Mountain Basins Greasewood Flat | 5.07 | 0.64 | 3.79% |
| Invasive Annual Grassland | 1.02 | 0.17 | 0.76% |
| Inter-Mountain Basins Shale Badland | 0.26 | 0.04 | 0.19% |
| Inter-Mountain Basins Mat Saltbush Shrubland | 3.29 | 0.54 | 2.46% |
| Rocky Mountain Lower Montane Riparian Woodland & Shrubland | 1.64 | 0.16 | 1.23% |
| **TOTAL** | **133.80** | **16.92** | **100%** |

To reduce impacts to vegetation, the applicant is committed to carrying out the following measures:

- Conduct field surveys along the utility line rights-of-way during the appropriate survey windows for the Huber pepperweed. These surveys will be conducted following consultation with BLM VFO personnel. They will be carried out no more than one year prior to the commencement of construction to determine the presence or absence of this plant species.

- Minimize vegetation removal to the extent necessary to allow for safe and efficient construction activities.

- Leave stumps and root balls in place except over the pipeline trench line, areas requiring topsoil, or as necessary to create a safe and level workspace.

- Salvage and replace topsoil, as discussed in Section 4.2.4 (Soils), to preserve and replace existing seed banks and return organic matter needed for seed establishment.

- Prepare a seedbed (scarifying, tilling, harrowing, or roughening) prior to seeding where needed to improve revegetation potential.

- Restore pre-construction contours, drainage patterns, and topsoil.

- Install and maintain erosion and sediment control structures until vegetation becomes established, as discussed in Section 4.2.4 (Soils).

- Control noxious weeds as discussed in the Invasive, Non-native Species section of this EA (Section 4.2.12).

- Restore and seed disturbed areas in a timely manner.

- Seed disturbed areas with the goals of replacing suitable wildlife habitat and browse and providing a vegetative cover that stabilizes soils to control erosion and sedimentation. Typical seed mixes will reflect environmental conditions and ecological range sites emphasizing use of native species. Use certified weed-free seed purchased from and blended by qualified producers and dealers. Only approved seed mixes will be used.

- Employ drill or broadcast seed methods to ensure proper seed placement. Drill seeding is preferred and will be used wherever soil characteristics and slope allow effective operation of a rangeland seed drill. Drill seeding will be performed perpendicular to (across) the slope. Seed will be placed in direct contact with the soil at an average depth of 0.5 inches, covered with soil, and firmed to eliminate air pockets around the seeds. Broadcast seeding will be employed only in areas where drill seeding is unsafe or physically impossible. Seed will be applied uniformly over disturbed areas with manually operated cyclone-bucket spreaders, mechanical spreaders, or blowers. Broadcast application rates will be twice that of drill rates. The seed will be uniformly raked, chained, dragged, or cultipacked to incorporate seed to a sufficient seeding depth.

- Complete drill and/or broadcast seeding prior to redistribution of woody material.

- Disperse materials over the portion of the ROW from which the brush was originally removed to provide wildlife habitat, seedling protection, and a deterrent to vehicular traffic. Woody materials dispersed across the ROW will not exceed 3 to 5 tons/acre.

The preceding applicant-committed measures will reduce but not eliminate impacts to vegetation affected by the Proposed Action. These measures will reduce the time between project disturbance and recovery of native vegetation within disturbed areas.

**Alternative B (Eastern Gas Pipeline Right-of-Way)**
This alternative would result in an additional 3.3 acres disturbance to vegetation in utility rights-of-way than is predicted for the Proposed Action (Table 4-11). This negligible increase in disturbance is insignificant. Impacts to vegetation and applicant-committed mitigation measures would be similar under either alternative.

**TABLE 4-11**
**Associated Vegetative Disturbance for the OSEC Utility Rights-of-way Under Alternative B**

| Ecological System Disturbed | Total Predicted Acres Disturbed | Total Predicted Miles Crossed | Percent of Disturbed Area |
|---|---|---|---|
| Invasive Annual Grassland | 2.53 | 0.33 | 1.85% |
| Colorado Plateau Mixed Bedrock Canyon and Tableland | 2.08 | 0.34 | 1.52% |
| Inter-Mountain Basins Shale Badland | 2.79 | 0.32 | 2.03% |
| Inter-Mountain Basins Mat Saltbush Shrubland | 7.60 | 1.02 | 5.54% |
| Inter-Mountain Basins Big Sagebrush Shrubland | 85.78 | 10.66 | 62.56% |
| Colorado Plateau Mixed Low Sagebrush Shrubland | 14.48 | 1.89 | 10.56% |
| Inter-Mountain Basins Mixed Salt Desert Scrub | 11.96 | 1.59 | 8.72% |
| Inter-Mountain Basins Semi-Desert Shrub Steppe | 1.95 | 0.22 | 1.42% |
| Rocky Mountain Lower Montane Riparian Woodland & Shrubland | 2.85 | 0.29 | 2.08% |
| Inter-Mountain Basins Greasewood Flat | 3.57 | 0.48 | 2.60% |
| CO Plateau Pinyon-Juniper Shrubland | 1.53 | 0.16 | 1.12% |
| **TOTAL** | **137.12** | **17.30** | **100%** |

**Alternative C (No Action)**
Under the No Action alternative, the Proposed Action would not be implemented so none of the impacts described above would occur and there would be no change to existing conditions.

#### 4.2.12 Invasive, Non-native Species

A survey was conducted for invasive, non-native plant species in May and June 2006. Tamarisk (salt cedar) and russian olive are common along the banks of the White River. They are found at all proposed utility line crossings as well as the proposed alluvial well sites. Individual tamarisk plants are also found in upland areas of the lease area. Large infestations of cheatgrass as well as some halogeton were found along the utility rights-of-way.

The removal of vegetation and the disturbance of soils during construction would create conditions suitable for the growth and propagation of invasive, non-native species that could continue for many years after the initial disturbance. Such impacts are possible both in disturbed portions of the 160-acre lease site and in the disturbed areas along the utility rights-of-way.

In addition to the disturbed areas becoming suitable for invasive, non-native species, construction equipment traveling from weed-infested areas to weed-free areas could facilitate the dispersal of invasive, non-native seeds and propagules and could result in the establishment of invasive, non-native plants in previously weed-free areas. The establishment of invasive, non-native plants could result in the reduction in the overall visual character of the area; competition with, or elimination of, native plants; reduction or fragmentation of wildlife habitats; increased soil erosion; and loss of forage for livestock and wildlife.

The applicant is committed to adoption of a management plan for invasive, non-native species which will reduce the effects of these species on the project area as a result of construction and operation of the Proposed Action. This management plan will describe measures to treat existing infestations, prevent introduction/ expansion of infestations during construction, and monitor and treat infestations after construction is complete. These measures include:

- Conduct pre-construction field surveys, each spring prior to construction, to identify existing noxious weed infestations within the project area.

- Consult with BLM and local weed agencies to determine pre-treatment for noxious weed infestations identified during spring surveys and apply in accordance with the required pesticide use permit for application of herbicides.

- Require vehicles and equipment from areas outside of the Uinta Basin to arrive at the work site clean, power-washed, and free of soil and vegetative debris capable of transporting weed seeds or other propagules. Contractors will be required to wash all equipment or show proof of equipment washing before entering any of the project sites.

- Install wash stations at designated infestation areas, if necessary. Equipment would be power-washed to remove soil and propagules prior to leaving the infested areas. Wash station locations would be determined in conjunction with the BLM and local weed agencies after spring surveys have been completed.

- Seed disturbed areas with seed certified to be free of weed-seed as discussed in the Vegetation section of this EA (Section 4.2.11).

- Use certified weed-free erosion control and reclamation materials (i.e., straw bales and seed mixes).

- Monitor the distribution and density of noxious weeds on the ROWs, and control and/or eradicate any new or expanded populations for the life of the pipelines, power lines, and aboveground facilities. Control methods may include physical or chemical treatments, and/or native species competition.

- If herbicides are used, it will only be after BLM approval. Herbicide application will be on a plant by plant basis by hand application with backpack sprayers to avoid over-spray to non-target species in adjacent plant communities. Broadcast spraying will not be conducted, and hand spraying will only take place when wind speeds are less than 8 miles per hour. This limits the use of herbicides to isolated stands of plants when individual plants are relatively small in size. To the extent possible, herbicides would be target-specific and have a short residue time in the environment. Application of all herbicides would be performed by a licensed and certified applicator. Herbicides will not be used within 100 feet of any wetland area or waterbody unless they are of a type that specifically can be safely used in or near wetlands or near special status plant species.

- The use of native plants species to out-compete noxious and invasive species is an effective, long-term weed control method. Noxious weeds will usually grow in disturbed areas reseeded with native vegetation. Therefore, pre-emergent treatments will need to be considered to reduce the success of noxious weeds. In areas where noxious weeds have been allowed to flourish, the weeds may likely out-compete the native grasses (BLM 1998). In these areas, a more vigorous approach will be needed to rid the area of the noxious weeds. The use of Pure Live Seed (PLS) mixes determined by the authorized officer will help ensure a healthy and strong revegetated site.

*Mitigation*

It is possible for weed species to be introduced into the project area despite prevention measures. The applicant-committed monitoring program will enable project personnel to determine the effectiveness of the management plan. Appropriate mitigation measures based on monitoring results will be developed to correct any deficiencies in the management plan.

On BLM land, a pesticide use permit for the application of herbicides would be submitted to and approved by BLM prior to implementation of weed control.

*Residual Impacts*

Complete eradication of weeds in large areas where infestations are already established may not be possible, as the area is likely to be re-invaded from adjacent lands, unless there are physical barriers that isolate the area. Eradication is most likely possible when the species has just begun to invade and establish itself in a new area, which highlights the importance of early detection and the post-construction monitoring program.

**Alternative B (Eastern Gas Pipeline Right-of-Way)**

Impacts of invasive, non-native species under Alternative B are expected to be similar to those described for the Proposed Action. Applicant-committed measures and possible mitigation will be the same for Alternative B as for the Proposed Action.

**Alternative C (No Action)**

Under the No Action alternative, the Proposed Action would not be implemented so none of the impacts described above would occur and there would be no change to existing conditions.

### 4.2.13 Recreation

Under the Book Cliffs RMP (BLM, 1985), the entire Book Cliffs Management Area is managed as an ERMA. The ERMA provides limited developed recreation facilities but abounds with dispersed recreation opportunities. The most popular dispersed activities include hunting, ORV travel, sightseeing, and river floating. Based on the Book Cliffs RMP, one geologic feature, Duck Rock, is located adjacent to the proposed natural gas pipeline and power line rights-of-way associated with the Proposed Action (BLM, 1985).

The Proposed Action would result in increased traffic past this landmark; however, there is already heavy traffic related to oil and gas field operations along that road.

The proposed utility rights-of-way are located adjacent to or cross the White River. The White River offers many recreation opportunities including sightseeing, viewing wildlife, rafting, and dispersed camping. However, recreation areas along the White River currently protected under the Book Cliffs RMP are located west of the proposed utility rights-of-way. Furthermore, there are no camp sites (developed or primitive), overlooks, or scenic roads that are within or adjacent to these rights-of-way.

There would be minor impacts to ERMA access by the Proposed Action. During construction of the utility rights-of-way, the public would temporarily lose some dispersed recreation potential. Traffic, noise, human activity, and dust would temporarily increase and could affect the quality of some users' recreational experiences. Increased contact between recreationists and construction crews, the sights and sounds of construction activities, and a less naturally appearing environment near the ROW would be temporary, due to the constantly moving nature of linear construction activities. During construction, the public would most likely not recreate near the utility ROWs and would disperse elsewhere. Construction activities during big game hunting seasons would be likely to temporarily displace wildlife to habitat away from the utility rights-of-way. Since hunting relies on the presence of game species and hunters generally prefer relatively quiet settings, it is likely that construction activities could disrupt hunting in localized areas within approximately one mile of active construction.

Under the Book Cliffs RMP (BLM, 1985), no existing SRMAs would be impacted by the proposed activities at the RD&D site. Potential impacts to SRMAs proposed under the Draft Vernal RMP have been evaluated in the context of the Draft Vernal RMP which may or may not be approved by the time construction starts under the Proposed Action.

Under Alternative A of the Draft Vernal RMP, the White River SRMA will be crossed or located adjacent to the utility rights-of-way associated with the Proposed Action. The new power line would cross the eastern segment of the proposed White River SRMA, including the White River. Impacts would be minimal to the SRMA since the power line would be located adjacent to an existing power line and, it would not affect the primary water-based recreational opportunities that the proposed White River SRMA seeks to protect. The pipeline route associated with the Proposed Action is located within the State Highway 45 right-of-way which is exempted from inclusion in the White River SRMA. The proposed power line and water pipeline to alluvial wells located at the edge of the White River floodplain would cross the proposed White River SRMA. An existing access road to the alluvial wells would require minor upgrading which could provide new, unmanaged recreation access to the White River.

Under Alternative C of the Draft Vernal RMP, the White River SRMA would be crossed or located adjacent to the three utility rights-of-way associated with the Proposed Action—there are no exclusion areas. Construction activities would generate temporary disturbances within this SRMA, but all activities would be located within existing, previously disturbed rights-of-way or on private land (the alluvial wells).

To minimize potential impacts to recreational resources, the applicant is committed to the following measures to reduce impacts to recreation:

- Use of HDD for pipeline construction beneath the White River will protect the recreational values of the river.

- At the proposed 160-acre RD&D site, light pollution will be reduced by limiting the height of light poles and using light shields provided that such shields comply with worker health and safety requirements.

- Utility line ROWs will be restored immediately after completion of construction. Measures could include leaving the ROW in a roughened state and scattering vegetative debris across the surface, placing dirt berms, rock, or vegetative barriers at intersections with existing roads, and randomly placing boulders, logs, and stumps across the ROW.

- Minimize sound pollution at the White River shoreline using best available technology to direct noise away from sensitive areas such as the White River to reduce impacts to recreational experiences.

These applicant-committed measures will reduce but not eliminate impacts to recreational opportunities and experiences within the Book Cliffs ERMA and proposed White River SRMA. Residual impacts will be minor during both the construction and operation phases of the Proposed Action.

**Alternative B (Eastern Gas Pipeline Right-of-Way)**

Impacts to recreation under Alternative B would be similar to those resulting from implementation of the Proposed Action. The natural gas pipeline would cross the White River approximately two miles upstream of the Proposed Action crossing location. Under Alternative A of the Draft Vernal RMP, this crossing will go through the White River SRMA which is avoided by the Proposed Action gas pipeline. However, impacts to the SRMA from the Alternative B pipeline crossing would be minimal since this utility line would be located within an existing utility right-of-way. Use of HDD for this crossing would avoid impacts to primary water-based recreational opportunities that the proposed White River SRMA seeks to protect.

Under Alternative C of the Draft Vernal RMP, there are no exclusion areas for the White River SRMA. Therefore, the gas pipeline to be constructed under either the Proposed Action or Alternative B would cross the White River SRMA. Again, use of HDD for the pipeline crossing would largely avoid impacts to recreation under either project alternative.

Alternative B avoids temporary disturbance caused by the Proposed Action at the raft "put-in" site at the Bonanza Bridge.

In general, the applicant-committed measures for either the Proposed Action or Alternative B are the same, so residual impacts to recreation under Alternative B would also be minimal.

**Alternative C (No Action)**

Under the No Action alternative, the Proposed Action would not be implemented so none of the impacts described above would occur and there would be no change to existing conditions.

### 4.2.14 Visual Resources

Under the Book Cliffs RMP (BLM, 1985) and all the alternatives in the Draft Vernal RMP, no Visual Resource Management (VRM) Class I areas would be impacted by the proposed RD&D site and associated utility ROWs. Furthermore, under the Book Cliffs RMP and all Draft Vernal RMP alternatives, the proposed RD&D site is located within VRM Class III and IV areas. Class IV areas allows the most modification to the existing landscape character. The majority of the Proposed Action utility rights-of-way cross VRM Class IV areas under the Book Cliffs RMP. Under the Draft Vernal RMP, the majority of the rights-of-way cross VRM Class III areas under RMP Alternatives A and C, and the majority cross VRM Class IV areas under RMP Alternatives B and D (Table 4-12). VRM Class III areas allow a moderate level change to the characteristic landscape.

| TABLE 4-12<br>VRM Classes Associated with the Proposed Pipeline ROW | | | |
|---|---|---|---|
| | **VRM Class** | **Linear ROW Miles Crossed** | **Comments** |
| Book Cliffs RMP & Draft Vernal RMP Alternative D | I | None | None |
| | II | 3.87 | White River: proposed pipeline right-of-way, power line, and water pipeline and wells |
| | III | 1.33 | Small area south of White River |
| | IV | 12.79 | 160-acre lease, proposed pipeline right-of-way and remaining utility ROWs |
| Draft Vernal RMP Alternative A | I | None | None |
| | II | 3.87 | White River: proposed pipeline right-of-way, power line, and water pipeline and wells |
| | III | 11.36 | Proposed pipeline right-of-way and powerline |
| | IV | 2.76 | 160-acre lease and remaining utility ROWs |
| Draft Vernal RMP Alternative B | I | None | Same as Book Cliffs RMP |
| | II | 3.87 | Same as Book Cliffs RMP |
| | III | 1.33 | Same as Book Cliffs RMP |
| | IV | 12.79 | Same as Book Cliffs RMP |
| Draft Vernal RMP Alternative C | I | None | Same as Draft Vernal RMP Alternative A |
| | II | 3.87 | Same as Draft Vernal RMP Alternative A |
| | III | 11.36 | Same as Draft Vernal RMP Alternative A |
| | IV | 2.76 | Same as Draft Vernal RMP Alternative A |

Under the Book Cliffs RMP and all Draft Vernal RMP alternatives, the Proposed Action utility rights-of-way cross roughly the same lengths of VRM Class II areas in the vicinity of the White River. VRM Class II objectives are to ensure that the level of change to the characteristic landscape is low where the authorized activity may be seen and should not attract the attention of the casual observer. The degree of visibility will depend on the type of vegetation affected. Within the VRM Class II areas, the proposed utility ROWs cross a combination of sagebrush steppe and desert scrub communities, where the visual impacts will be noticeable if disturbances occur within new areas. Because the Proposed Action utility rights-of-way are located along existing, previously disturbed rights-of-way, visual impacts in VRM Class II areas will be a minor, incremental increase to those already existing.

The proposed power line will cross a portion of VRM Class II areas at the White River. Construction of the power line will occur along an existing right-of-way, adjacent to an existing power line. Nevertheless, a new power line will add to the present visual impacts at this river crossing.

The water pipeline and power line associated with the existing alluvial wells will also be located within VRM Class II areas next to an existing road which will be improved.

These lines will terminate adjacent to the White River and will be partially screened from view by vegetation. The existing alluvial wells are located on private land.

Construction of the RD&D facilities at the 160-acre site would create visual impacts for the life of the project. The facility would introduce man-made structures and forms in the landscape that would draw attention to their size, color, and shape. However, this visual effect would be consistent with the management objectives (VRM class) for the area. Nighttime lighting could create minor changes in the visual character of the VRM Class II area along the White River, but impacts would be reduced by the shielding effect of the surrounding landscape.

The applicant is committed to minimizing visual impacts of the Proposed Action using the following measures:

- Surface-disturbing activities and facilities will be designed to minimize their visual impacts and conform to the area's assigned VRM Class objective, so far as possible. Construction within VRM Class II areas, especially at the White River crossings, will require this review to ensure that the VRM Class II objectives are met.

- Within all VRM Class II areas, OSEC will construct utility lines parallel to existing utility ROWs, if possible.

- Pipeline construction across the White River (within a VRM Class II area) will be accomplished by HDD which will result in no post-construction visual impacts to the river. The construction foot print associated with HDD will be reclaimed to pre-construction conditions.

- Use camouflage coloring, facility design, placement, and/or topographic screening for facilities within or near sensitive visual resource areas.

- The proposed RD&D facilities will be located less than one mile from VRM Class II areas. Careful consideration of visual impacts will be taken when planning these facilities.

- During construction, water trucks will sprinkle the disturbed work areas to minimize dust on an as-needed basis.

- Restore the ROWs to their original contours to the degree possible and restore natural drainage and runoff patterns.

- Scatter salvaged vegetative debris randomly across the ROWs to break up straight line visual intrusions.

- Restore the appearance of naturally rocky slopes and areas that have a natural gravel, cobble, or boulder veneer on the surface by layering or scattering rock across the ROW.

- Seed disturbed areas as soon as possible.

- Paint all aboveground facilities in accordance with BLM-recommended color schemes.

- Minimize nighttime lighting at the proposed RD&D facilities to essential work areas; have lighting facing downward to minimize nighttime glow effect.

- Power poles should be placed to minimize their visual impact along the river corridor.

- The water pipeline, which would be laid on the surface next to the access road, will be concealed with vegetation and painted with an approved paint scheme to reduce its visibility from the river.

Implementation of applicant-committed measures will reduce but will not eliminate visual impacts of the Proposed Action. Some visual impacts will remain for the life of the project. Most visual impacts will be minimal after completion of the project, removal of facilities, and reclamation of disturbed areas.

**Alternative B (Eastern Gas Pipeline Right-of-Way)**

Under Alternative B, impacts to visual resources will be essentially the same as for the Proposed Action when evaluated against either the Book Cliffs RMP or the Draft Vernal RMP alternatives, with minor changes in miles crossed by Alternative B (Table 4-13). The applicant-committed measures to reduce visual impacts would be the same regardless of which project alternative is chosen.

**TABLE 4-13**
**VRM Classes Associated with the Alternative B Pipeline Route**

| | VRM Class | Linear ROW Miles Crossed | Comments |
|---|---|---|---|
| Book Cliffs RMP & Draft Vernal RMP Alternative D | I | None | None |
| | II | 3.92 | White River: eastern alternative pipeline right-of-way, power line, and water pipeline and wells |
| | III | 1.33 | Small area south of White River |
| | IV | 13.13 | 160-acre lease, eastern alternative pipeline, and remaining utility ROWs |
| Draft Vernal RMP Alternative A | I | None | None |
| | II | 3.92 | White River: eastern alternative pipeline right-of-way, power line, and water pipeline and wells |
| | III | 11.69 | Eastern alternative right-of-way and power line |
| | IV | 2.76 | 160-acre lease and remaining utility ROWs |
| Draft Vernal RMP Alternative B | I | None | Same as Book Cliffs RMP |
| | II | 3.92 | Same as Book Cliffs RMP |
| | III | 1.33 | Same as Book Cliffs RMP |
| | IV | 13.13 | Same as Book Cliffs RMP |
| Draft Vernal RMP Alternative C | I | None | Same as Draft Vernal RMP Alternative A |
| | II | 3.92 | Same as Draft Vernal RMP Alternative A |
| | III | 11.69 | Same as Draft Vernal RMP Alternative A |
| | IV | 2.76 | Same as Draft Vernal RMP Alternative A |

**Alternative C (No Action)**

Under the No Action alternative, the Proposed Action would not be implemented so none of the impacts described above would occur and there would be no change to existing conditions.

### 4.2.15 Cultural Resources

The Class III cultural resources inventory conducted in June 2006 in the proposed utility rights-of-way north of the White River (Greenberg and Hoefer, 2006) supplemented data from previous Class III inventories in the area. The inventories resulted in the documentation of ten prehistoric and historic sites and seven isolated (insignificant) finds associated with the Proposed Action (Table 4-14). These sites included rock shelters, rock art, historic artifact scatters, and a stone circle. The seven isolated finds included historic cans and bottles and a small historic inscription and are not eligible. Of the ten prehistoric and historic sites, only two (42UN5374 and 42UN5378) were considered eligible for nomination to the National Register of Historic Places (NRHP).

**TABLE 4-14**
**Cultural resources located during Class III Inventories within or near the Proposed Action utility ROWs north of the White River**

| Site | Eligibility Status | Site Type |
|---|---|---|
| 42UN449 | Needs Data | Prehistoric and Historic Rockshelter |
| 42UN5369 | Needs Data | Cairns |
| 42UN5370 | Not Eligible | Historic Camp Site/ Artifact Scatter |
| 42UN5371 | Not Eligible | Historic Camp Site/ Artifact Scatter |
| 42UN5372 | Needs Data | Cairn |
| 42UN5373 | Needs Data | Cairn Alignment |
| 42UN5374 | Eligible | Prehistoric Rockshelter |
| 42UN5375 | Not Eligible | Historic Trash Scatter |
| 42UN5377 | Not Eligible | Historic Camp Site/Artifact Scatter |
| 42UN5378 | Eligible | Prehistoric Stone Circle |
| OSEC-IF01 | Not eligible | Isolated Duraglass bottle base |
| OSEC-IF02 | Not eligible | Isolate: 3 solder-dot cans, 1 tobacco tin |
| OSEC-IF03 | Not eligible | Isolated historic inscription |
| OSEC-IF04 | Not eligible | Isolated medicine bottle |
| OSEC-IF05 | Not eligible | Isolated solder-dot can |
| OSEC-IF07 | Not eligible | Isolated whole clear glass bottle |
| OSEC-IF08 | Not eligible | Isolated hole-in-cap can, solder-dot can |

Four of these sites are north of the White River and require further information to formulate an NRHP evaluation, and the remaining four are recommended as not eligible for nomination to the NRHP.

Of the six sites identified as eligible or in need of further data, three sites (42UN5369, 42UN5372, 42UN5373) were located outside of the archaeological survey rights-of-way and will not be impacted by the Proposed Action as presently configured. The remaining three sites identified as eligible or in need of further data (42UN449, 42UN5374, and 42UN5378) could potentially be affected by construction of the proposed utility lines. The applicant has committed to avoid these sites during construction, if possible.

South of the White River, six sites will be potentially affected by the Proposed Action (Table 4-15). These areas were not subject to a recent Class III inventory because the previous inventory (Berry and Berry 1975) was considered adequate for the EA according to BLM personnel during the April 17, 2006 Interdisciplinary Team Analysis meeting. Prior to construction, the applicant has committed to direct qualified archaeologists to examine and reevaluate these sites in the field to determine their current NRHP eligibility status and potential project impacts.  Any sites found to be eligible, will be avoided during construction, if possible.

In addition, the applicant has committed to prepare and follow a project-specific cultural resources protection plan which will be prepared in accordance with BLM and SHPO requirements.  This plan will require the applicant to inform all persons associated with the project that they will be subject to prosecution for knowingly disturbing historic or archaeological sites, or for collecting artifacts.  It will also include mitigation measures to be followed if historic or archaeological materials are accidentally uncovered during any project or construction activities.

**TABLE 4-15**
**Sites previously recorded south of the White River within or near areas affected by the Proposed Action**

| Site | Eligibility Status | Site Type |
|---|---|---|
| 42UN365 | Need Data | Prehistoric Rock Shelter |
| 42UN366 | Need Data | Prehistoric Rock Shelter/Pictograph |
| 42UN367 | Need Data | Prehistoric Rock Shelter |
| 42UN401 | Need Data | Prehistoric Open Lithic and Ceramic Scatter |
| 42UN407 | Need Data | Prehistoric Rock Shelter |
| 42UN1002 | Need Data | Ignacio Stage Stop |

*Mitigation*

Even with the implementation of the applicant-committed protection measures described above, impacts to cultural resources are still possible.  The following mitigation measures will reduce these impacts:

- If any eligible site cannot be avoided by construction, additional work will be conducted to mitigate any adverse impacts as directed by the BLM.  This work may include data recovery by qualified archaeologists prior to construction disturbance or other measures deemed appropriate by the BLM.

- Even if all eligible surface sites are avoided, it is possible that cultural resources not visible on the surface may be encountered during construction or other project-related activities.  In this case, the following measures will be implemented in accordance with the project-specific cultural resources protection plan:

  - Activities will stop in the immediate area of the find, and the BLM Authorized Officer will be immediately contacted. Within five working days, the BLM

Authorized Officer will inform OSEC as to (1) whether the materials appear eligible for the NRHP; (2) the mitigation measures OSEC will likely have to undertake before the site can be used (assuming in situ preservation is not practicable); and (3) a timeframe for the BLM Authorized Officer to complete an expedited review under 36CFR 800.11 to confirm, through the SHPO, that the findings of the BLM Authorized Officer are correct and that mitigation was appropriate.

- The BLM Authorized Officer will be notified immediately by telephone and with written confirmation, upon discovery of human remains, funerary items, sacred objects, or objects of cultural patrimony. Activities would stop in the immediate area of the find, and the discovery will be protected for 30 days or until notification in writing by the BLM Authorized Officer to proceed.

These mitigation measures are unlikely to completely eliminate all possible impacts to cultural resources. However, residual impacts are expected to be minor.

**Alternative B (Eastern Gas Pipeline Right-of-Way)**
The natural gas pipeline which would be constructed under Alternative B has two associated sites which would not be impacted under the Proposed Action (Table 4-16).

**TABLE 4-16**
**Cultural resources located during Class III Inventories within or near the Alternative B natural gas pipeline ROW north of the White River which would not be Affected by the Proposed Action**

| Site | Eligibility Status | Site Type |
|---|---|---|
| 42UN5376 | Needs Data | Historic Structure/Artifact Scatter |
| OSEC-IF06 | Not eligible | Isolated historic cans |

Site 42UN5376 could potentially be affected by construction of the proposed western natural gas pipeline. The applicant has committed to avoid this site during construction, if possible. Otherwise, the mitigation measures noted above would be implemented.

The Alternative B natural gas pipeline would avoid 4 sites north of the White River which are within or near the Proposed Action gas pipeline. Of these, 2 are not eligible and 2 need additional data.

The Alternative B natural gas pipeline would avoid 5 of the 6 sites south of the White River which were previously recorded within or near areas affected by the Proposed Action.

Thus, only one site south of the White River would need additional data under Alternative B.

It appears that fewer eligible and potentially eligible sites could be affected by Alternative B in comparison with the Proposed Action. However, the applicant-committed resource protection measures and mitigation measures associated with either alternative are the same. Thus, potential residual impacts under either alternative would be minimal.

**Alternative C (No Action)**

Under the No Action alternative, the Proposed Action would not be implemented so none of the impacts described above would occur and there would be no change to existing conditions.

### 4.2.16 Paleontology Resources

Results of a literature and field survey of paleontological resources documented the presence of sedimentary bedrock of the Uinta and Green River Formations of middle Eocene age along the proposed utility line rights-of-way that could contain fossils of scientific importance (i.e. fossils that provide specific information that furthers the understanding of paleontology or geology). The Green River Formation is also exposed at the proposed 160-acre RD&D site. The Uinta Formation (Wagonhound Member) and Green River Formation (Parachute Creek Member) have been categorized as BLM Condition 1 (highly sensitive) areas.

Although no fossils have been previously discovered in existing shale ore stockpiles at the 160-acre site, it is possible that excavation at the site could impact scientifically important fossils in the Mahogany Zone of the Parachute Creek Member. It is less likely that fossils of scientific importance will be impacted by construction of the power line, because of the limited ground disturbance associated with pole emplacement. It is unlikely that fossils of scientific importance will be impacted by ground disturbance associated with pipeline construction because it will closely parallel Utah Highway 45 and will only affect limited areas of bedrock.

Direct impacts to fossils could include damage or destruction of important fossils during construction, with subsequent loss of scientific information. Adverse indirect impacts could include fossil damage or destruction by accelerated erosion due to surface disturbance or as a result of unauthorized collection or vandalism resulting from improved access and increased visibility.

Beneficial impacts could occur if excavation reveals fossils of scientific importance that would otherwise have remained undiscovered and unavailable for scientific study. To have beneficial impacts, newly discovered fossils must be properly collected and catalogued into the collections of a museum repository so that associated geologic data is preserved and the fossils are available for future scientific study. The unanticipated discovery of previously undiscovered scientifically important fossils, are possible anywhere in the project area.

The applicant is committed to implementation of the following measures to reduce or avoid negative impacts to scientifically important paleontological resources. In consultation with the BLM, the applicant will direct a qualified paleontologist to prepare a project-specific unanticipated discovery and monitoring plan for paleontological resources. This plan will require the applicant to inform all persons associated with the project that collection or excavation of fossil materials from federal land without a federal permit is illegal. Ground disturbance within BLM Condition 1 or 2 areas will be evaluated periodically by a qualified paleontologist to determine if fossils of scientific importance are being impacted. Spot inspection of shale ore stockpiles will also be addressed by the plan. The plan will also include mitigation measures to be followed if paleontological materials are accidentally uncovered during any project or construction activities.

*Mitigation*

Following applicant-committed measures for protection of paleontological resources will reduce potential impacts to these resources. Any residual negative impacts can be further reduced by implementation of the following mitigation measures:

- If suspected fossil materials are uncovered during construction or project operations, the operator should stop work immediately and the BLM must be contacted. Activities will not resume until the BLM can assess the situation and advise whether additional mitigation is needed.

- Fossil specimens, if any, recovered during the project that are considered of scientific importance will be curated into the collections of a museum repository acceptable to the BLM.

These mitigation measures will not completely eliminate all possible impacts to paleontological resources. However, residual impacts are expected to be minor.

**Alternative B (Eastern Gas Pipeline Right-of-Way)**

Ground disturbance associated with natural gas pipeline construction under Alternative B has a greater chance of impacting fossils of scientific importance in BLM Condition 1 (highly sensitive) areas. Unlike the pipeline right-of-way which parallels Highway 45 under the Proposed Action, the Alternative B pipeline would require excavation through potentially shallow bedrock areas which have not been previously disturbed. If Alternative B is chosen, the applicant commits to have a qualified paleontologist monitor surface disturbance during construction of this pipeline. Monitoring will include a periodic examination of bedrock trench spoils in excavation areas where no fossils were documented during the field survey. If and when appropriate bedrock spoils are located, these spoils will be visually examined. If monitoring reveals the presence of fossils of scientific importance, as directed by the BLM, a representative sample of these fossils may be collected and the data (including standard geologic descriptions) recorded for each locality.

Other applicant-committed resource protection measures associated with the Proposed Action as well as mitigation measures will also apply to Alternative B. As a result, residual impacts associated with Alternative B are expected to be minor.

**Alternative C (No Action)**

Under the No Action alternative, the Proposed Action would not be implemented so none of the impacts described above would occur and there would be no change to existing conditions.

### 4.2.17 Socio-economics

The proposed project would have minor, temporary, positive effects on the economies of Vernal, Utah and Rangely, Colorado, the two towns closest to the RD&D site. It has been estimated that the operational workforce for the project will reach 120 individuals during Phase 3 operations. Additional temporary employment will be generated by construction of the RD&D facility, natural gas pipeline, power line, and other associated facilities. Construction crews and the operational workforce would likely increase local revenue through expenditures for lodging, meals, and supplies.

There will also be minor, temporary, negative effects of the proposed project on the socioeconomics of the local communities. Construction crews will slightly increase the pressure on temporary lodging accommodations. Assuming some members of the operational workforce move to local communities from outside the area, they will slightly increase demand for medium-term housing, education, medical facilities, and other services. Because of current demands on these facilities and services created by other oil and gas projects in the area, local communities are having some difficulty meeting these needs.

**Alternative B (Eastern Gas Pipeline Right-of-Way)**

Socio-economic impacts under Alternative B would be identical to those described for the Proposed Action.

**Alternative C (No Action)**

Under the No Action alternative, the Proposed Action would not be implemented so none of the impacts described above would occur and there would be no change to existing conditions. The short-term positive effects on the economies of Vernal, Utah and Rangely, Colorado would not occur.

### 4.2.18 Special Designation Areas

Based on the Book Cliffs RMP (BLM, 1985), there are currently no Wild and Scenic River (WSR) segments, ACECs, wilderness areas, wilderness study areas or other special designation areas within or adjacent to the 160-acre lease area or utility rights-of-way associated with the Proposed Action. However, under certain alternatives contained in the Draft Vernal RMP, segments of the White River and Evacuation Creek would be designated for inclusion in the Wild and Scenic River system and portions of the White River and adjacent lands would be designated an ACEC. Thus, potential impacts to these potential special designation areas have been evaluated in the context of the Draft Vernal RMP which may or may not be approved by the time construction starts under the Proposed Action.

***Wild and Scenic Rivers***

No eligible Wild and Scenic River (WSR) segments will be impacted by the activities at the 160-acre lease site.

Under the Proposed Action, the power line crossing of the White River would have minor impacts to the eligible WSR White River segment, which has been tentatively classified as scenic. The power line will consist of spanning electric cable(s) over the river which will connect to power poles located in upland areas on either side of the river. The proposed power line is within an existing utility corridor and will parallel an existing line at the White River crossing location thereby reducing its visual impact.

Under the Proposed Action, the natural gas pipeline will cross under the White River adjacent to the Bonanza Bridge (State Highway 45 right-of-way) which is located within the eligible White River WSR segment under Alternative A of the Draft Vernal RMP. The natural gas pipeline is within an existing utility corridor, thereby minimizing potential impacts to the outstanding remarkable values and tentative WSR scenic classification.

The upgraded access road, water pipeline, and power line associated with the proposed alluvial wells would be located in part within an eligible White River WSR segment under the Draft Vernal RMP. Impacts would include those visual impacts discussed under Visual Resources (Section 4.2.14).

The power line right-of-way associated with the Proposed Action will cross the White River and Evacuation Creek WSR segments under Alternative C of the Draft Vernal RMP. The natural gas pipeline associated with the Proposed Action will cross the White River WSR segment.

Under Alternative C of the Draft Vernal RMP, the Evacuation Creek WSR segment, tentatively classified as recreational, would be crossed by the proposed power line in two locations.  A ROW would be required at one Evacuation Creek crossing where no existing utility lines are present.  Installation of the power line at this location would be a new visual distraction.  However, this is consistent with the management objectives for a recreational segment and would not impact the outstanding remarkable values (historic). After the power line has been installed, the power poles and power line spanning Evacuation Creek would be visible.  There is an existing power line at the other Excavation Creek WSR crossing.  The new line would parallel the existing power line at this crossing location.

The applicant is committed to the following measures to reduce or eliminate impacts of the Proposed Action on the proposed WSR segments:

- OSEC's proposal to use HDD and to make every effort to conduct drilling activities in already disturbed areas near the Highway 45 bridge crossing for the natural gas pipeline crossing of the White River will protect the Outstanding Remarkable Values and scenic classification of the eligible WSR.  To minimize the adverse consequences of a frac-out (escape of drilling fluid into the river or on to the surface of riparian areas), OSEC will develop a monitoring and contingency plan for the proposed river crossing.  The plan will outline steps to be taken in the event of a frac-out and monitoring necessary to detect and correct frac-outs.

- Power poles will be located to minimize their view from WSR areas.  Visual impacts of poles will be reduced by painting them to blend in with the surrounding landscape.

- Upon completion of construction, disturbed areas will be restored to preconstruction conditions.

Implementation of the above applicant-committed measures will reduce but not eliminate impacts to WSR segments under the Draft Vernal RMP.  Residual impacts of the Proposed Action will remain for the life of the project but will be substantially eliminated with completion of the project, removal of facilities, and reclamation of the 160-acre site and utility rights-of-way.  The proposed power line crossing of the eligible segment of the White River would be located within an existing utility corridor.  Impacts would be incremental, but minor.  The two power line crossings associated with Evacuation Creek would be located along the northern portion of the eligible river segment and therefore away from the historic protected values of the creek (narrow gauge railroad, towns of Watson and Rainbow).  The Proposed Action and alternatives would not be precluded because the values for which the WSR was considered would not be impacted.

***Areas of Critical Environmental Concern***

Based on the Book Cliffs RMP (BLM, 1985), there are currently no ACECs within or adjacent to the 160-acre lease area or utility rights-of-way associated with the Proposed Action. However, two potential ACECs – the Coyote Basin ACEC and the White River ACEC – would be established in the project area under Alternatives A, B, and C of the Draft Vernal RMP. Thus, potential impacts to the potential ACECs have been evaluated in the context of the Draft Vernal RMP which may or may not be approved by the time construction starts under the Proposed Action.

Neither the potential Coyote Basin ACEC described in Alternatives A and B of the Draft Vernal RMP nor the potential Coyote Basin Complex ACEC described in Alternative C would be affected by the proposed utility rights-of-way. The natural gas pipeline would come within ¼ mile of the southern boundaries of these potential ACECs, but the 2006 wildlife surveys determined that no prairie dogs towns are located within or adjacent to this pipeline ROW.

The potential White River ACEC as described in Alternative A of the Draft Vernal RMP could be affected by two of the three proposed utility rights-of-way. Water required for operations at the RD&D site would be withdrawn from ground water wells located near the White River within the ACEC. The northern portions of the improved access road, water line, and power line from these wells to the 160-acre RD&D site would be located within previously disturbed areas of the potential White River ACEC. The wells are located on private land. Construction of the power line and water line and improvements to the existing access road would have short-term, direct impacts to the visual and riparian components of this potential ACEC.

The natural gas pipeline to be constructed in conjunction with the Proposed Action parallels State Highway 45 and connects to an existing pipeline located south of Bonanza, Utah. It would cross the White River through an exclusion zone between the east and west portions of the potential White River ACEC as described in Alternative A of the Draft Vernal RMP. This exclusion zone covers the existing right-of-way for the Highway 45 right-of-way where it crosses the White River.

Under the Proposed Action, a new power line will be constructed parallel to an existing line. It would cross the potential White River ACEC and White River in the NE¼, Section 12, T10S, R24E. The power line crossing would span the potential ACEC with poles located in upland areas. The new power line would be noticeable to river users, although it would be located immediately adjacent to existing power lines.

Under Alternative C of the Draft Vernal RMP, the utility rights-of-way would have similar impacts to the potential White River ACEC as those described for Alternative A of the Draft Vernal RMP. However, under Alternative C, the White River itself is excluded from this potential ACEC as explained in Section 3.3.18.

The applicant-committed measures to be adopted for protection of riparian areas (Section 2.2.5 and 4.2.7) will substantially reduce impacts to the potential White River ACEC. The Proposed Action would not impact the historic or geological values associated with the potential ACECs.

**Alternative B (Eastern Gas Pipeline Right-of-Way)**

Under Alternative B, the White River crossing location for the natural gas pipeline could have minor indirect impacts to the proposed White River WSR scenic segment. However, the proposed pipeline crossing of the eligible segment of the White River would be located within a utility corridor. The HDD technique which would be used for the pipeline crossing would reduce these potential impacts. Other potential impacts of Alternative B on the proposed WSR would be similar to those associated with the Proposed Action. Applicant-committed measures to reduce impacts of either project alternative would be the same. Residual impacts of Alternative B will be essentially the same as those associated with the Proposed Action.

Potential impacts to potential ACECs under Alternative B would be similar to impacts under the Proposed Action. The natural gas pipeline White River crossing under Alternative B passes through the proposed White River ACEC whereas the Proposed Action passes through an exclusion zone. However, horizontal directional drilling (HDD) techniques to install the line under the river would avoid impacts to the potential ACEC. Applicant-committed mitigation measures for ACECs would be the same under either alternative.

**Alternative C (No Action)**

Under the No Action alternative, the Proposed Action would not be implemented so none of the impacts described above would occur and there would be no change to existing conditions.

## 4.3 Cumulative Impacts Analysis

This section provides an analysis of the cumulative impacts of past, present, or reasonably foreseeable future projects on various natural and human resources. “Cumulative impacts” are those impacts resulting from the incremental impact of an action when added to other past, present, or reasonably foreseeable actions regardless of what agency or person undertakes such other actions which affect the same components of the environment as those affected by the Proposed Action. Although the individual impact of each separate project might not be significant, it is possible that the additive impacts of multiple projects might be significant. For purposes of this EA, the information considered for the cumulative impacts analysis pertains to the Vernal Planning Area, which covers lands in Daggett, Duchesne, Uintah and a portion of Grand Counties in northeastern Utah. The primary sources of this information are the 2005 Draft

Vernal RMP and the Final Mineral Report for the Vernal Planning Area (BLM, 2002). Described below are the past, present, and reasonably foreseeable actions which may impact the same resources as the Proposed Action.

### 4.3.1 Past and Present Actions

The primary past or ongoing actions in the vicinity of the project area include oil and gas production, gilsonite mining, tar sand mining, phosphate production, mining of mineral materials, and power generation (BLM, 2005). Impacts from other activities in the area such as grazing or recreational uses have minor impacts and are not expected to contribute significantly to any cumulative impacts. Details on past and present activities relative to mineral extraction are provided below.

One of the primary activities in the Vernal Planning Area is oil and gas exploration and production, which has been ongoing throughout the area since the early 1900s (BLM 2005). Since that time, a total of approximately 5,000 production wells have been drilled in the Uintah Basin. As of April 2007, there were approximately 26,360 acres of total disturbance associated with oil and gas production in the Vernal Planning Area. This includes acreage disturbed from oil or gas wells (9,750 acres), access roads (12,300 acres), pipeline gathering and transportation pipeline systems (4,200 acres), compressors stations (76 acres), and power lines (34 acres).

Gilsonite is currently mined in vein-type deposits occurring mainly in Tertiary Duchesne River and Green River Formations. Mining of gilsonite has proved feasible in the veins at least 17-18 inches thick. It has been mined since the late 1800s. Since the 1990s, approximately 60,000 tons per year of gilsonite have been mined (BLM, 2005), primarily from the area around the Bonanza mining camp located about seven miles north of the 160-acre lease site. The bulk of the production was from private and state leases, rather than BLM lands. As of 1997, there were 122 acres of disturbance related to gilsonite production.

There has not been any commercial-scale oil shale extraction and shale oil production to date in the Vernal Planning Area. However, multiple pilot plants have been tested in the Vernal Planning Area in the last few years. Currently two other pilot plants are being constructed and tested for the production of oil shale in addition to the plans set forth by OSEC.

Tar sands have been used in Utah for road construction and repair purposes since the 1920s. In 2001, four operations in Uintah County were permitted for the mining of tar sands. Currently no operations are underway in the area to extract oil from tar sands (BLM, 2005).

Phosphate in the Uintah basin is found within the Meade Peak Member of the Permian Park City Formation. There are currently two designated phosphate fields within the Vernal Planning Area: the Vernal field and the Flaming Gorge/Manila field. Both of these fields are located north of Vernal. In the past, prospecting and leasing for phosphate have occurred, but no mines have been established on public lands. Only one active mine permit, for mining on private land, had been issued for phosphate as of 2001, with two other permits pending. This permit was issued to SF Phosphates near Ashley Creek. They have mined over 45 million tons of phosphate for use in fertilizer production since 1985 (BLM, 2005). As of 1997, the company reported 160 acres of unreclaimed land disturbances associated with their mining.

Mineral materials, such as sand, gravel and building stone exist within the Vernal Planning Area. Fine sand deposits are found on the northern edge of the Ashley Valley. Sand and gravel deposits are found in the Precambrian Uinta Mountain Group and terrace deposits in streams draining the Uinta Mountains. Suitable building stone materials are found in the Parachute Creek Member of the Tertiary Green River Formation, mainly as float material eroded from outcrops along steep cliffs. The Forest Service has issued approximately 100 free use permits for mineral materials in the Vernal Planning Area. On average, each permit accounts for less than one ton of material. Only one commercial stone permit is issued by the Forest Service every three years. Limestone, clay and sandstone, which are regulated by the state, are covered under three active mineral materials permits in the Vernal Planning Area. Limestone mining on Forest Service lands has resulted in the extraction of over 30,000 tons of limestone a year, which have been used for smokestack scrubbers at the Bonanza power plant (BLM, 2005).

As to power generation, the Deseret Generation and Transmission Company owns and operates the Bonanza power plant, with an operating capacity of 460 MW via one coal fired unit.

Total surface water usage within the Vernal Planning Area is approximately 814,000 acre-feet/year with nearly all of this (800,000 acre-feet) being used for agricultural irrigation. Total ground water usage in the Vernal Planning Area is approximately 21,000 acre-feet/year.

### 4.3.2 Reasonably Foreseeable Future Actions

Over the next 15 years, between 45 and 75 oil and gas seismic exploration projects are anticipated by the Vernal BLM. Following these explorations, the continued construction and development of oil and gas wells in the Vernal area is expected following cyclical patterns similar to historical development. Expected future oil and gas activity over the next 15 years is estimated to result in the disturbance of an additional 21,250 acres, with the largest development activity (15,615 acres) occurring in the Monument Butte - Red Wash area in the east-central portion of the Vernal Planning Area.

Gilsonite is used as an additive to oil well drilling mud and cements and will therefore continue to be of economic value as oil well installations continue globally. The Vernal

BLM predicts that approximately 60,000 tons per year of gilsonite will continue to be mined over the next 15 years (BLM, 2005) and that additional land disturbances of approximately 2% per year will occur. By 2010, the total acreage disturbed by gilsonite mining is expected to be 180 acres.

Oil shale mining is predicted by the Vernal BLM to increase over the next 15 years as more environmentally and economically sound methods of shale oil extraction are developed. Multiple shale oil production and oil shale mining permits are expected to be issued by the BLM throughout the Vernal area (BLM, 2005). Most of this activity would likely be in the known oil shale lease areas in the vicinity of the White River Mine site. However, until RD&D projects such as the Proposed Action are completed, it is difficult to reasonably predict the extent of additional disturbances from oil shale activities.

Tar sand mining for use in road construction and repair is expected to continue at approximately the current rate for the next 15 years. The Vernal BLM does not expect that tar sands will begin to be mined for the extraction of oil due to the high cost of oil production from tar sands. Further, the Vernal BLM has not issued any approvals for continued mining and development of tar sands for oil extraction purposes (BLM, 2005).

Phosphate production in the area north of Vernal is expected to continue at approximately the same rate as is currently ongoing. Based on ongoing reclamation of mined lands, it is not anticipated that there will be any increase in the total disturbed acreage (160 acres) over the next 15 years.

There is a moderate demand for sand and gravel in the Vernal area and the Green River and Wild Mountain community pits will continue to be active into the near future. The VFO also predicts that a third public pit may be opened. No more than six new pit applications are anticipated over the BLM's planning period. Fine sands collected from the weathering of the Navajo Sandstone have been bought in the past and it is anticipated that the demand for this sand will continue. Small amounts of stone for non-commercial use will also continue over the next 15 years at an estimated rate of 60 tons per year (BLM 2005).

### 4.3.3 Cumulative Impacts

***Air Quality***

Air quality in the vicinity of the project will be impacted by emissions from the project as well as emissions from other projects currently in operation and planned for the area. The BLM conducted a cumulative impacts analysis in the Draft Vernal RMP accounting for background air quality, existing projects permitted since acquisition of the background air quality data, and assumed development. The majority of the activity predicted for this area is oil and gas development. Modeled air quality impacts were below the NAAQS as well as PSD increments.

As described above, activities associated with Phase 1 of the RD&D project, including transportation of the shale from the site to the off-site crusher and to Calgary, are expected to be insignificant in comparison to other sources in the surrounding area. Phase 2 and Phase 3 activities will require the use of appropriate emission control devices and permitting. The modeling conducted as part of this EA has shown that, with control devices, the emissions from Phase 2 and Phase 3 will be well below the NAAQS and that emissions would comply with all Federal and State air quality requirements.

Based on the estimated emission rates provided in previous sections of this EA and the conservative modeling tool, SCREEN3, cumulative air quality impacts from Phase 2 and Phase 3 are also expected to be well below the NAAQS and PSD increments. To predict the cumulative impacts of the proposed project, including increase in power plant emissions based on the additional electricity usage required for the project, modeling results outlined in previous sections of this EA were compared to the existing criteria pollutant background concentrations. Impacts from the project were added to the cumulative impacts modeled in the Draft Vernal RMP for background air quality, existing projects permitted since acquisition of the background air quality data, and assumed development. These results are shown in Table 4-17[10] As shown in Table 4-17, the cumulative impacts of Phase 2 and 3 of the RD&D project combined with other emission sources are well below the NAAQS.

As discussed in previous sections of this EA, a PSD Increment is the maximum increase in ambient concentrations that is allowed to occur above a baseline concentration for a pollutant. The concentration results of Phase 3 were compared to the PSD Increment standards for Class II areas.[11] The comparison to PSD Class II increments was intended to evaluate a threshold of concern for potential impacts and does not represent a true regulatory PSD Increment Consumption Analysis. This type of regulatory analysis would be conducted during PSD permitting. As shown in Table 4-18, the cumulative impacts of Phase 3 do not exceed the PSD increments for any pollutant or averaging period.

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[10] It should be noted that the results provided in Table 1 are conservative (high) since "cumulative impacts" are the sum of the Background, Modified, and Future impacts (Draft Vernal RMP TSD) and the project's modeled contribution. The modeled maximum impact will vary in time (date and time) and location (latitude and longitude). Therefore, depending on the locations of the Modified and Future sources relative to the project's location, the maximum impact at a given location will likely be less.

[11] The Class I increment comparison modeled in the Draft Vernal RMP shows insignificant impacts from the assumed development activities on sensitive areas (Class I and other Class II areas). Because of the project's location relative to the modeled sensitive areas and the anticipated emission characteristics (emission rates, stack parameters, etc.), the Class I increment comparison is anticipated to also show insignificant impacts.

| TABLE 4-17<br>NAAQS Analysis Results for Cumulative Sources | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Pollutant** | **Averaging Period** | **NAAQS ($\mu g/m^3$)** | **Background ($\mu g/m^3$)[1]** | **Background, Modified, and Future ($\mu g/m^3$)[2]** | **Phase 2 Contribution ($\mu g/m^3$)** | **Cumulative % of NAAQS** | **Phase 3 Contribution ($\mu g/m^3$)** | **Cumulative % of NAAQS** |
| CO | 1-hour | 40,000 | 6,984 | 7,028 | 11 | 17.6 | 254 | 18.2 |
| | 8-hour | 10,000 | 4,236 | 4,246 | 8 | 42.5 | 178 | 44.2 |
| $PM_{10}$ | 24-hour | 150 | 28 | 31.5 | 2 | 22.7 | 1 | 21.5 |
| | Annual | 50 | 10 | 10.4 | 0 | 21.8 | 0 | 21.1 |
| $SO_2$ | 3-hour | 1,300 | 20 | 34.9 | 6 | 3.2 | 36 | 5.4 |
| | 24-hour | 365 | 10 | 13.1 | 3 | 4.3 | 16 | 7.9 |
| | Annual | 80 | 5 | 5.2 | 1 | 7.2 | 3 | 10.5 |
| $NO_2$ | Annual | 100 | 10 | 10.7 | 2 | 12.6 | 2 | 12.5 |

[1] Background data obtained from the Vernal draft RMP Technical Support Document.

[2] Includes the background concentrations, modeled sources that have been modified or commenced operations after the date the background concentrations were obtained, and potential future projects modeled in the Vernal draft RMP. Data provided in the Technical Support Document.

| TABLE 4-18<br>Comparison to Class II PSD Increment Standards | | | |
|---|---|---|---|
| **Pollutant** | **Averaging Period** | **Class II Increment ($\mu g/m^3$)** | **Total Cumulative for Phase 3 ($\mu g/m^3$)** |
| $PM_{10}$ | 24-hour | 30 | 4.4 |
| | Annual | 17 | 0.6 |
| $SO_2$ | 3-hour | 512 | 50.5 |
| | 24-hour | 91 | 18.9 |
| | Annual | 20 | 3.4 |
| $NO_2$ | Annual | 25 | 2.5 |

***Wastes***

The on-site disposal of spent shale will incrementally add to cumulative impacts of soil disturbance areas in the planning area. Solid wastes disposed of off-site will have a minor incremental impact on the cumulative amount of wastes generated in the Vernal Planning Area as they would be taken to approved landfills. Liquid wastes that do not meet water quality standards will have a minor incremental impact to the cumulative effects of the wastewater treatment as they would be taken to approved disposal facilities. There are no hazardous waste treatment storage or disposal (TSD) facilities in the planning area, so any hazardous wastes will be disposed of in approved facilities outside of the Vernal Planning Area and will not have a cumulative impact beyond that already considered by the licensing agency.

***Water Resources***

Water usage during the RD&D project will not have any discernible incremental impact on the cumulative effects of water usage in the Vernal Planning Area. The total estimated water usage (~ 530 acre-feet over the entire project) is negligible compared to the current water usage rates, which are approximately 800,000 acre-ft/year for surface water and 21,000 acre-feet/year from ground water (BLM 2005).

***Soils***

The proposed project would add incrementally to impacts on soils in the project area. These impacts would be localized and limited to the period of construction, operation, and reclamation.

***Geology/Mineral Resources/Energy Production***

Operation of the proposed RD&D project will result in the removal of a small amount of mined oil shale. No other oil shale is currently being mined in the Uinta Basin on a commercial scale, and there are no known plans to do so during Phases 1, 2, and 3 of the proposed RD&D project. Therefore, there will be no cumulative impacts to Uinta Basin oil shale reserves. Any minor effects resulting from the Proposed Action would produce no discernable increase in cumulative impacts to geological or other mineral resources in the Uinta Basin. There would be a very slight positive effect on the available energy resources produced in the area.

***Floodplains***

Increases in cumulative impacts to floodplains will be minor. New pipeline and power line crossings will be located parallel to existing utility line disturbances. There will be one power line crossing at Evacuation Creek which does not parallel an existing line, but the floodplain will be spanned with poles located in upland areas.

***Wetlands and Riparian Areas***

Construction of the utility lines associated with the Proposed Action would result in a negligible, temporary increase to cumulative impacts on wetlands and riparian areas.

***Threatened, Endangered, and Sensitive Species***

Withdrawal of water from the White River (either directly or through alluvial wells) would marginally add to the cumulative effects from Colorado River basin-wide water extraction on four T&E fish species. No other increases in cumulative impacts on T&E animal species would result from the proposed project.

The proposed project and associated utility corridors could remove potential habitat for the Townsend's big-eared bat, ferruginous hawk, sensitive fish species, pronghorn antelope, mule deer, mourning dove, and migratory birds. This impact would add to the cumulative decrease and fragmentation in available habitat for these species resulting from energy development in the Uinta Basin. Cumulative impacts to T&E plant species could include habitat loss and fragmentation as well as loss of individuals. Construction of the utility corridors associated with the proposed project may impact several T&E plant species. The project could contribute to cumulative impacts to these plants from past and foreseeable energy development throughout the Uinta Basin.

Cumulative impacts to T&E plant species could include habitat loss and fragmentation as well as loss of individuals. Construction of the utility rights-of-way associated with the proposed project may impact several T&E plant species. Although no T&E species have been found in the Project Area, site-specific field surveys for these plants will be conducted prior to construction to determine any effects on species which have dispersed into the Project Area. If impacts to any T&E plant species cannot be avoided, the project could contribute to cumulative impacts to these plants from past and foreseeable energy development throughout the Uinta Basin.

Water withdrawals from the White River or adjacent alluvium could cumulatively impact habitat by diminishing flow downstream of the proposed water withdrawal point. However, the incremental impact from the Proposed Action is expected to be minimal.

***Vegetation and Invasive, Non-Native Species***

The proposed R&D project and associated utility corridors would cumulatively contribute to disturbance and loss of vegetation in the Uinta Basin from numerous energy projects. Removal of vegetation and disturbance of soils creates optimal conditions for invasion and establishment of invasive, non-native species that could continue long after the project is completed. However, the incremental increase in impacts to native vegetation and invasive, non-native species basin-wide would be negligible given the large area of vegetation disturbance from past, present, and foreseeable energy projects.

***Recreation***

Any minor effects to recreation areas resulting from the proposed project would produce no discernable increase in cumulative impacts to existing or proposed SRMAs and ERMAs, since construction activities would be temporary and facilities would be located within existing utility rights-of-way.

### *Visual Resources*

There will be no addition to cumulative effects on VRM Class I areas. Class II areas which would be affected by the Proposed Action have already been disturbed. However, the proposed power line and pipeline would increase cumulative impacts to VRM Class II areas. At the White River crossing, the proposed power line would alter the existing visual setting by increasing the number of power lines from one to two. In addition, the proposed power line to the alluvial wells in the White River floodplain would be visible from a VRM Class II area along the river. These power lines would visually impact Class II areas along the White River for the life of the project and potentially longer.

Cumulative effects to VRM Class III and IV areas resulting from the Proposed Action would be minor, as the disturbances in Class III and IV areas would be within management objectives.

### *Cultural Resources*

Past disturbances to cultural resources in the Uinta Basin have been related to prior archaeological collection activities; disturbance by ORV users; intentional destruction or vandalism; and construction associated with roads, utilities, mineral exploration, and extraction of mineral resources (including oil and gas). Construction of the proposed project could affect several known cultural sites. Each of the proposed reasonably foreseeable future projects would include mitigation measures designed to avoid or minimize additional direct impacts to cultural resources. Where direct disturbance cannot be avoided, mitigation such as data recovery would be carried out prior to ground disturbance. Pressure on nearby sites would likely continue and would be slightly exacerbated by addition of more cleared rights-of-way in the area. Increased access would increase potential for trespass or vandalism at previously inaccessible sites. Thus, the proposed project would add incrementally to impacts on cultural resources in the Uinta Basin.

### *Paleontological Resources*

The proposed project could add to the damage or destruction of scientifically important fossils within the Condition 1 Uinta and Green River Formations which outcrop in the Uinta Basin. These formations have been previously impacted by extensive extraction of hydrocarbon resources and will continue to be affected by foreseeable development of these resources. While there are negative impacts associated with proposed facilities construction and resource extraction, the proposed project could add to the recovery of paleontological resources in the basin which would have otherwise remained buried.

***Special Designation Areas***

*Wild and Scenic Rivers*: Any temporary effects to Wild and Scenic Rivers (WSRs) resulting from the Proposed Action would produce no discernable increase in cumulative impacts to existing or proposed eligible WSRs since utility ROWs are located within existing utility rights-of-way. Also, the proposed White River pipeline crossing will be accomplished using HDD techniques which would cause no discernable effects to the river.

The proposed power line would produce discernable increases in cumulative impacts to the eligible White River WSR. At one Evacuation Creek crossing, the proposed power line would alter the existing visual setting, since there are no existing power lines currently located there. The remaining eligible WSR crossings would increase the number of power lines from one to two. The power line would remain in place for the life of the project and potentially longer.

The improved access road, water pipeline, and power line associated with the proposed alluvial wells could potentially increase cumulative impacts to the White River WSR for the life of the project.

*Areas of Critical Environmental Concern*: No existing Areas of Critical Environmental Concern (ACECs) would be cumulatively affected by the Proposed Action. Project activities affecting potential ACECs would be located within existing road or utility rights-of-way or areas with previous disturbance. An exception is a proposed power line crossing at Evacuation Creek which would span the creek and proposed ACEC with poles located in upland areas outside the ACEC.

# 5.0 CONSULTATION AND COORDINATION

## 5.1 Introduction

Potential impacts to resources of concern and any cumulative affects were described in detail in the preceding sections of this document. The individuals involved in the preparation of this EA and agencies consulted regarding same are provided below.

## 5.2 Agency Consultation

Eighteen Agencies or Tribes were identified as being consulted during the preparation of the Public Draft EA. Consultation was not conducted with all eighteen agencies or tribes. The result of the consultation or coordination that did occur is included below. If the agency or tribe was not consulted as anticipated, an explanation of why they were not consulted is also included below.

*U.S. Army Corps of Engineers* – Discussions were held between the Applicant and the U.S. Army Corps of Engineers regarding the stream and river crossings. Appropriate permits will be obtained by the Applicant prior to construction of the rights-of-way stream and river crossings.

*U.S. Fish and Wildlife Service* – The U.S. Fish and Wildlife Service was involved throughout the preparation of this EA through phone calls and meetings. The Public Draft EA was also provided to the Service during the public comment period. Formal consultation was initiated on December 19, 2006.

In the Biological Opinion dated December 20, 2006 (see Appendix H), the USFWS concurred with the "may affect, not likely to adversely affect" determinations for the Uinta Basin hookless cactus and Ute ladies'-tresses. The USFWS also concurred with the "not likely to lead to federal listing" of Graham's beardtongue and White River beardtongue. These species have not been found to occur, nor are they known to occur within the project area or the rights-of-way. In addition, the applicant has committed to surveying for these species along the rights-of-way prior to construction, during the appropriate survey times, and will reinitiate consultation should these plants be found.

Bald eagles are not known to nest within or near the project area; however, they do use the area for winter roosting and foraging. Based on a USFWS recommendation, bald eagle surveys will be conducted within 1.0 mile of new surface disturbance, and any documented nests will be avoided with a 1.0 mile buffer without further consultation with the USFWS. This has been included in the Conditions of Approval section of the Decision Record. The applicant has also committed to surveying for and avoiding active roost sites from November 1 though March 31 that occur within 0.5 miles of the disturbance areas. Based on the applicant-committed measures, USFWS concurred with the "may affect, not likely to adversely affect" determination for the bald eagle.

Due to water depletions, a determination was made that the project "may affect, is likely to adversely affect" the four endangered Colorado River fish species; Colorado pikeminnow, bonytail, humpback chub, and razorback sucker. A one-time monetary contribution will be paid to the USFWS by the proponents, in accordance with the provisions of the 1987 Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin.

Regarding wildlife, including migratory bird species, the USFWS recommended that fencing, flagging, or floatation balls should be thoroughly considered at water disposal sites if necessary to reduce potential adverse affects on wildlife if monitoring results conclude that the water may be toxic. This measure is included in the Conditions of Approval section of the Decision Record. An additional measure recommended the testing and analysis of water quality with regards to effects levels to wildlife, including migratory birds. However, specifics such as type of test, frequency of tests, and water quality standards were not provided. Therefore, as stated in the EA, the water quality standards set by the EPA will be met for all water released to the surface. Water not meeting those standards will be tanked and trucked to an approved disposal site.

Based on the above, consultation is closed. If circumstances change, or threatened or endangered species are found in the project area, additional analysis and re-initiation of consultation will occur as necessary.

*Utah Division of Air Quality* – Formal consultation was not initiated due to the project being within the restored Uintah and Ouray Reservation Boundary. However, comments were received from the State of Utah Resource Development Coordinating Committee, which included comments from the Division of Air Quality. Those comments are addressed in the comment responses section of the Final EA (Appendix F).

*U.S. Environmental Protection Agency Region 8* – Formal consultation was not initiated. However, comments were received from the U.S. EPA, and those comments and concerns were addressed in the comment responses section of the Final EA (Appendix F).

*Utah State Historic Preservation Office* - Consultation was initiated on December 19, 2006. BLM recommended a No Adverse Effect determination. On December 20, 2006 a concurrence letter with that determination was received from that office (Appendix H). Consultation will be reinitiated, as necessary, prior to surface disturbing activities.

*13 Tribes having ties to the Uinta Basin* – Formal consultation was determined to not be necessary due to 1) the lack of sites eligible for the National Register of Historic Places in the 160-acre lease area; 2) avoidance of the two eligible sites by the proposed rights-of-way: and 3) consultation was completed for the White River Shale Project Site in association with the Federal Prototype Oil Shale Leasing Program in 1973. Additional consultation will be completed during the processing of the rights-of-way associated with the Proposed Action.

| | |
|---|---|
| Ute Mountain Ute Tribe | Hopi Tribal Council |
| White Mesa Ute Council | Navajo Nation |
| Southern Ute Tribal Council | Eastern Shoshone Business Council |
| Confederated Tribes the Goshute Res. | Zia Pueblo |
| Laguna Pueblo | Northwestern Band of Shoshone Nation |
| Santa Clara Pueblo | Paiute Indian Tribe of Utah |
| Ute Indian Tribe | |

The Interdisciplinary Review Team from the BLM's Vernal, Utah field office is listed on the Interdisciplinary Team Analysis Record Checklist provided in Appendix A.

## 5.3 List of Preparers

The following were involved in the preparation of this document:

| **Bureau of Land Management<br>Vernal Field Office<br>170 South 500 East<br>Vernal, Utah 84078** | | |
|---|---|---|
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| Karl Wright | Natural Resource Specialist | Water Resources, Floodplains, Riparian |
| Stan Olmstead | Natural Resource Specialist | Water Resources, Floodplains, Riparian, Soils |
| Charlie Sharp | Natural Resource Specialist | Vegetation, T&E plant species |
| Amy Torres | Wildlife Biologist | Wildlife, T&E wildlife species |
| John Mayers | Geologist / Paleontologist | Paleontology / Ground Water |
| Blaine Phillips | Archaeologist | Cultural Resources |
| Kyle Smith | GIS, Cartographer | GIS, Maps |
| Marc Stavropoulos | Rangeland Management Specialist | Rangeland Management, Livestock grazing |

| | | |
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| Dylan Tucker | Natural Resource Specialist | Soils |
| Kim Bartel | Recreation Specialist | Recreation, Wilderness/wilderness characteristics, VRM, Wild and Scenic Rivers |
| Delbert Clark | Wild Horse Specialist | Wild Horses, Invasive Species |
| John Mayers | Geologist | Geology, Ground Water, Paleontology |
| Marilyn Wegweiser | Geologist | Geology, Ground Water, Paleontology |
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| Pete Sokolosky | Geologist | Geology, Mineral Resources, Energy Production |
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| Chris Hines | Natural Resource Specialist | Vegetation, Wild Horses, Mapping |
| Patty Pipas | Biologist | Noxious Weeds, Wetlands & Riparian Areas, T&E and Sensitive Species |
| Daniel Padilla | Project Scientist | ACECs/ SRMAs, Recreation, Visual Resources, Wild & Scenic Rivers |
| Julie Oscarson | GIS Specialist | GIS, Graphics |
| Gus Winterfeld | Paleontologist, Erathem-Vanir Geological Consultants | Paleontology |
| Ted Hoefer | Archaeologist, Cultural Resource Analysts, Inc. | Cultural Resources, Native American Religious Concerns |

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| Howard Earnest | Geologist | Technical Coordination |

### 5.4 Summary of Public Participation

The EA scoping included the preparation and submittal of the EA workplan dated February 17, 2006, the April 3 and 4, 2006, site visit and meeting with BLM, and a subsequent April 17,2006, scoping meeting with BLM. The project was posted to the BLM's Environmental Notification Bulletin Board on April 7, 2006. A public information session was held by BLM and OSEC on May 17, 2006 in Vernal Utah. Through this scoping process, the public had an opportunity to identify potential elements of concern as specified by NEPA guidance.

Following the public information session in Vernal, Utah, the White River Mine Oil Shale RD&D Environmental Assessment (EA) was prepared and the official public comment period opened upon publication of the draft document on September 18, 2006. The EA was available for public comment through October 18, 2006.

The BLM distributed the draft document via first-class mail to contacts on the mailing list. The mailing list included federal, state, and local elected officials and interested members of the public. The EA was mailed out to approximately 68 individuals, groups, and agencies. In addition, it was provided for public review by CD-ROM or bound paper format upon request, and was posted for review or downloading on the Vernal Field Office web site. Availability of the EA was also announced by publishing notices in local newspapers, as well as posting on the Utah BLM Environmental Notification Bulletin Board.

A total of 9 individuals, groups or agencies submitted comments by letter, fax and Internet response. All comment letters were reviewed, and most comments fell within general topics or 'themes'. Eleven themes were identified that encompassed the majority of the comments, as follows:

<u>NEPA process</u>
<u>Regulatory/Permitting</u>
<u>Air Emissions</u>
<u>Spent Shale Handling and Disposal</u>
<u>Water Resources</u>

Wildlife/Ecology
Floodplains/Wetlands/Wild & Scenic Rivers
Socio-economics
Cumulative Impacts
ATP System/Viability of Technology
General Miscellaneous

A summary of the comments is provided in Appendix F. The person, organization, or agency that provided the individual comment is also identified. Responses follow the comments. In most cases, responses are provided for each specific comment. In other instances, a response is provided for a group of comments. Based on the comments provided, certain clarifying language was also added to the text of the EA. A summary of changes to the EA is provided in Appendix G.

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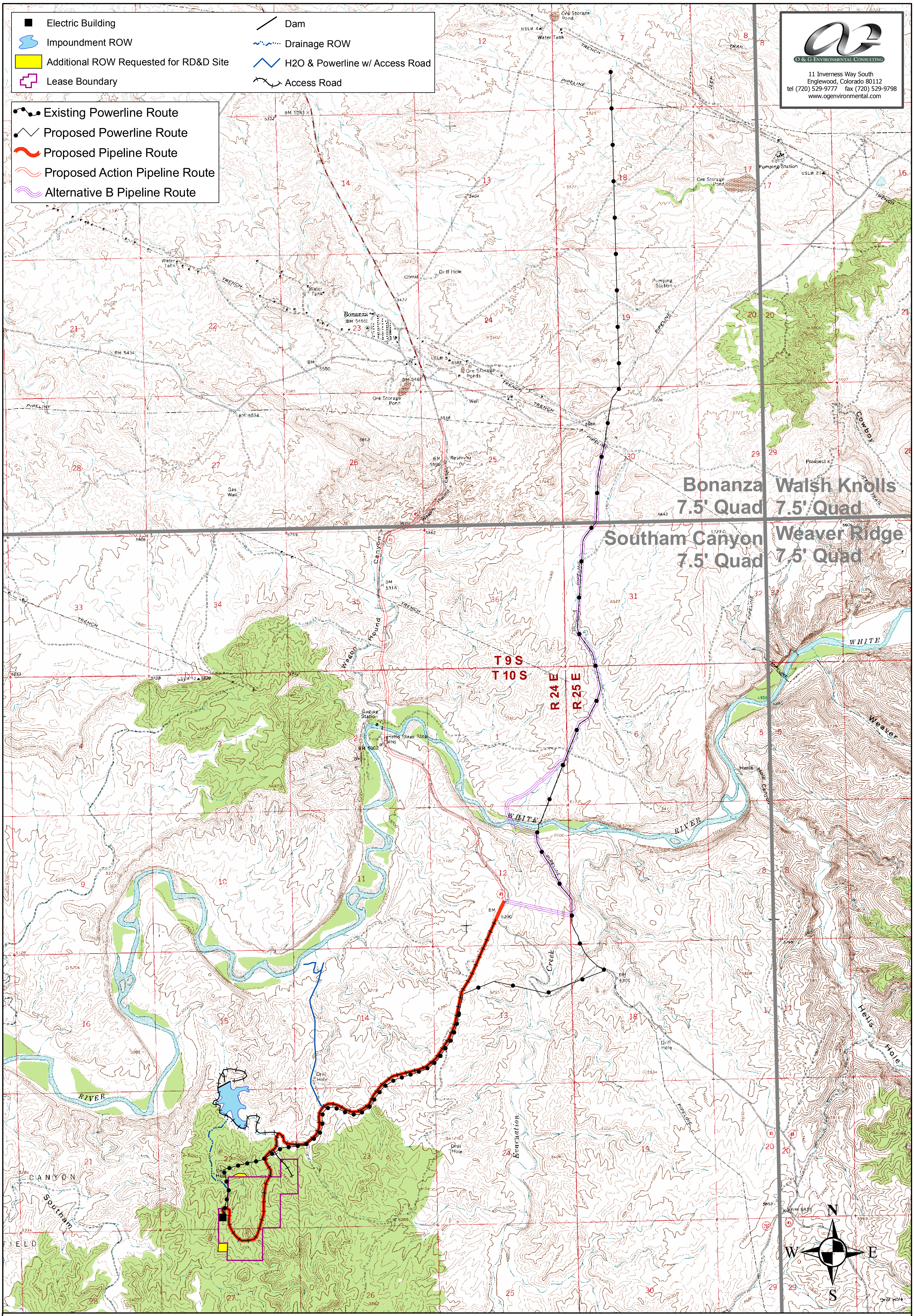
# FIGURES

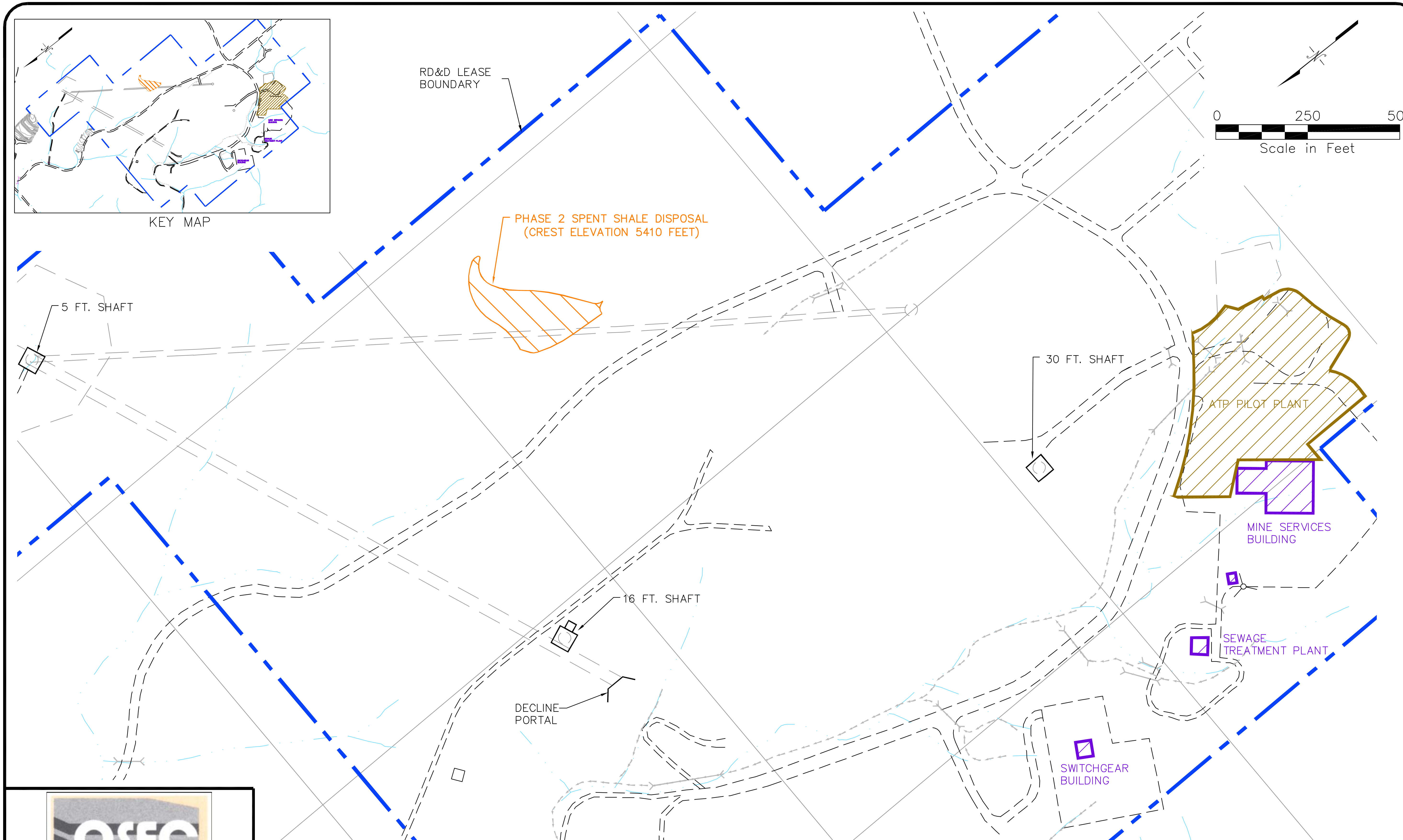



# OSEC Oil Shale Project
# Uintah County, Utah

Figure 1-1 Site Location Map

Miles: 0, 0.5, 1, 1.5, 2

OSEC LLC




OSEC LLC
OIL SHALE EXPLORATION COMPANY

DRAFTED BY: CRP/TSP DATE: 8/11/06

SITE LAYOUT
PHASE 2 DEVELOPMENT
WHITE RIVER LEASE AREA, UINTAH COUNTY, UTAH

FIGURE 2-1

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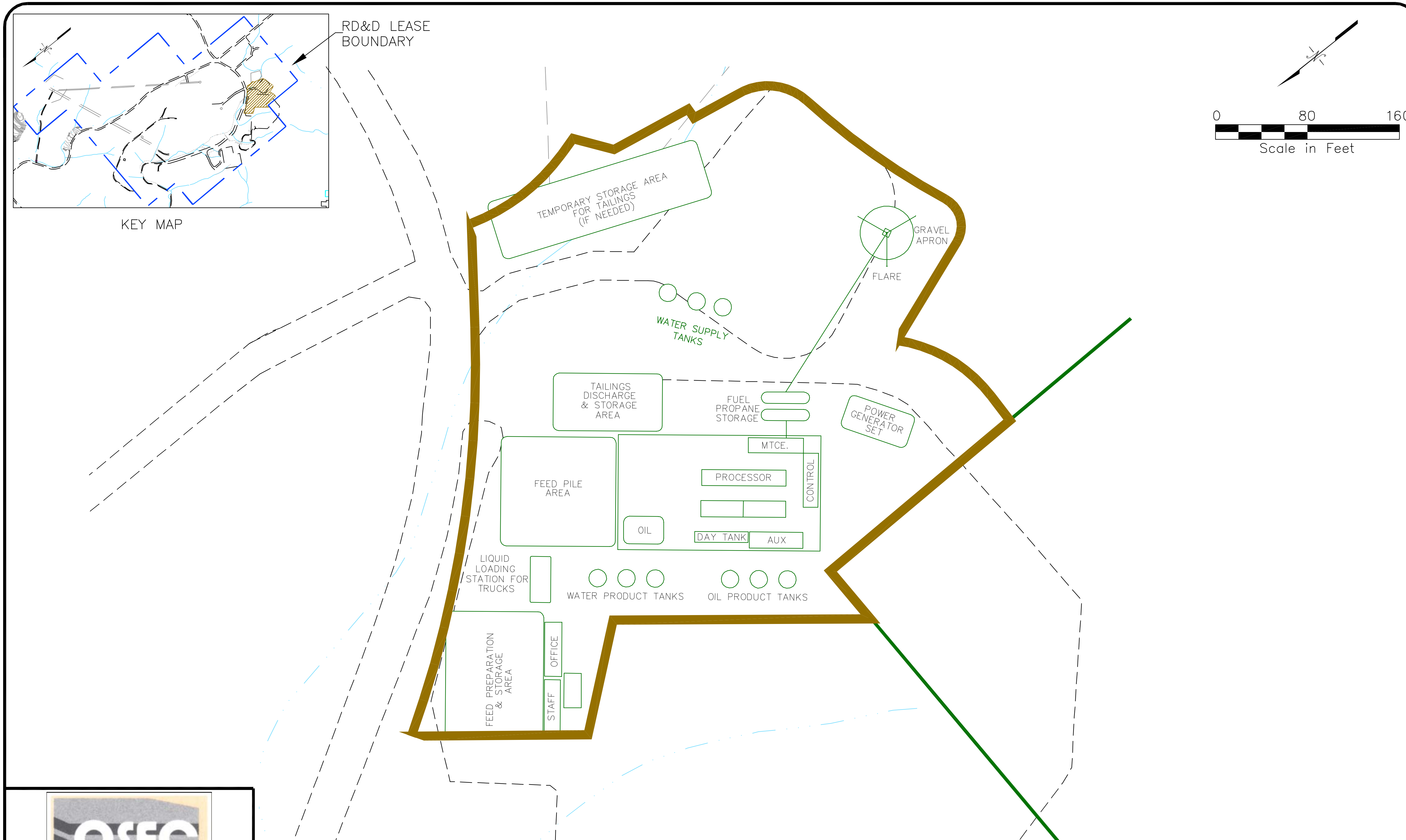



OSEC LLC
OIL SHALE EXPLORATION COMPANY

DRAFTED BY: CRP/TSP | DATE: 4/11/06

SITE LAYOUT

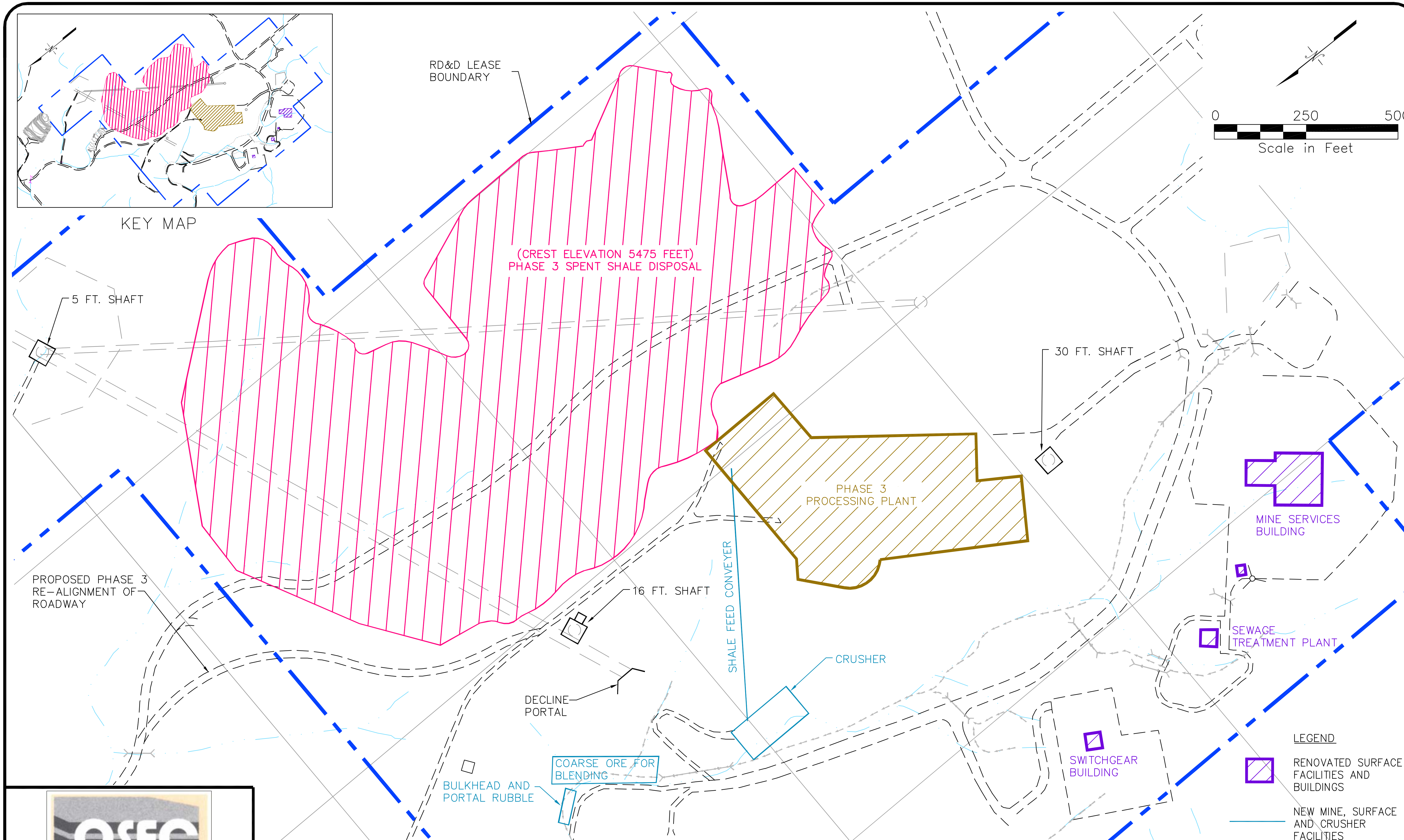
GENERAL ARRANGEMENT PHASE 2 PROCESSING PLANT

WHITE RIVER LEASE AREA, UINTAH COUNTY, UTAH

FIGURE

2-2

0215763A/215763AB01



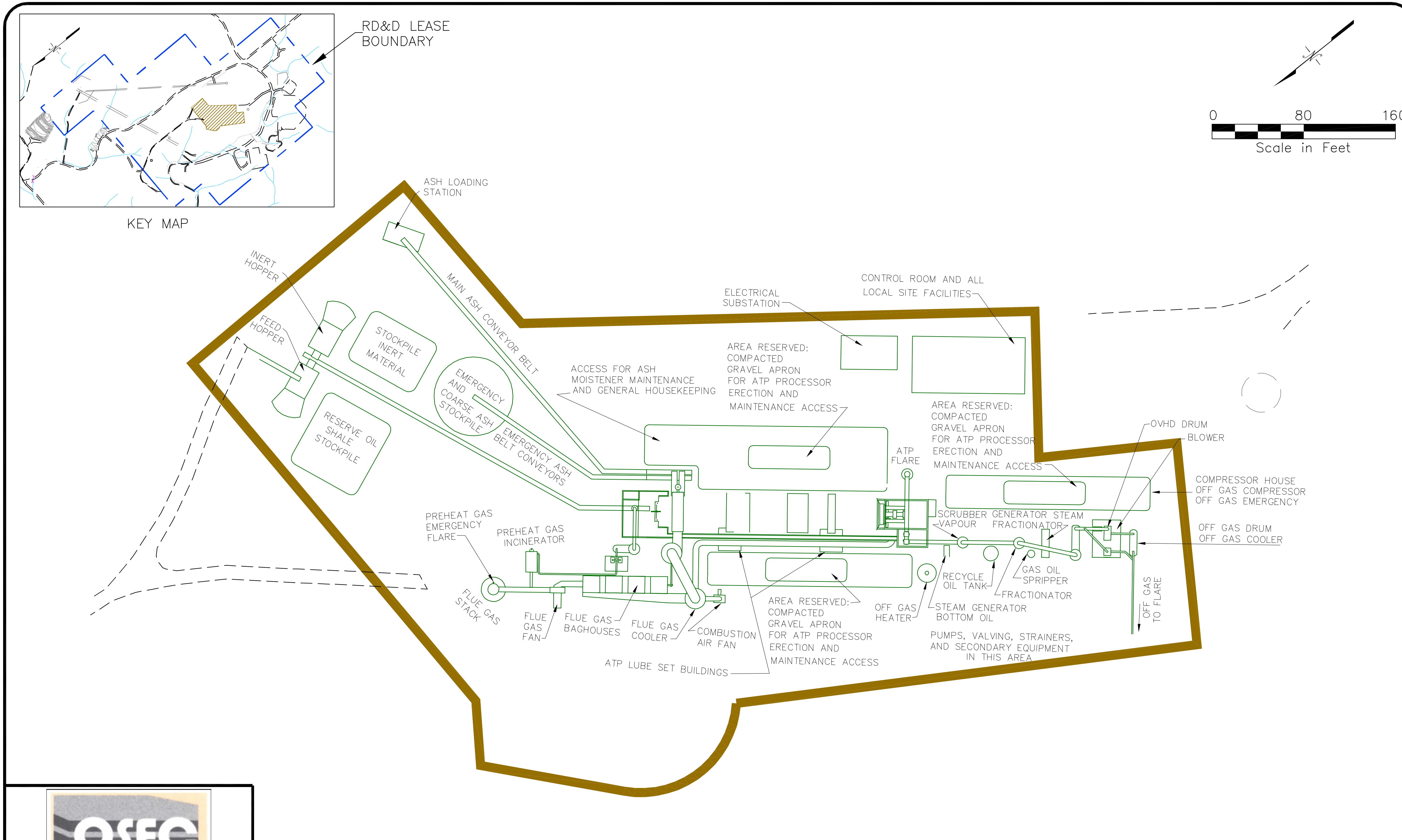

OSEC LLC
OIL SHALE EXPLORATION COMPANY

DRAFTED BY: CRP/TSP
DATE: 1/9/07

SITE LAYOUT
PHASE 3 DEVELOPMENT
WHITE RIVER LEASE AREA, UINTAH COUNTY, UTAH

FIGURE
2-3

15763AB01




# SITE LAYOUT

GENERAL ARRANGEMENT PHASE 3 PROCESSING PLANT
WHITE RIVER LEASE AREA, UINTAH COUNTY, UTAH

FIGURE
2-4

DRAFTED BY: CRP/TSP
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# A P P E N D I X  A

## Interdisciplinary Team Analysis Record Checklist

# INTERDISCIPLINARY TEAM ANALYSIS RECORD CHECKLIST

**Project Title**: White River Oil Shale Mine RD&D

**NEPA Log Number**: UT-080-06-280

**File/Serial Number**: UTU84087

**Project Leader**: Stephanie Howard / Pete Sokolosky

**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 significant impact analyzed in detail in the EA; or identified in a DNA as requiring further analysis
NC = DNAs only) actions and impacts not changed from those disclosed in the existing NEPA documents cited in Section C of the DNA form.

| Determi-nation | Resource | Rationale for Determination* | Signature | Date |
|---|---|---|---|---|
| **CRITICAL ELEMENTS** | | | | |
| PI | Air Quality | Possible impact, more details necessary to determine extent. | Stephanie Howard | 4/17/06 |
| NI | Areas of Critical Environmental Concern | No existing ACEC's are present.<br><br>Under Alternative C of the draft RMP, this White River segment is proposed as an Area of Critical Environmental Concern to protect unique geologic formations with spectacular vistas and high-value river riparian ecosystems as well as other recreational uses. | Kim A Bartel | 4-17-06 |
| PI | Cultural Resources | Inventory was completed in the late 70's. No sites were found in the 160 acre area.<br>Class III survey of routes required before determination of impact can be made for the utility ROWs. | Blaine Phillips | 7/10/06 |
| NP | Environmental Justice | According to the EPA Region VIII, State of Utah, Environmental Justice Map, the region has been categorized as a minority population area of 10-20% and a poverty population area of 10-20%. No minority or economically disadvantaged communities or populations are present which could be affected by the proposed action or alternatives. (http://www.epa.gov/enviro/ej, 8/25/05) | Stephanie Howard | 4/17/06 |

| Determi-nation | Resource | Rationale for Determination* | Signature | Date |
|---|---|---|---|---|
| NP | Farmlands (Prime or Unique) | No prime or unique farmlands are present in the Vernal Field Office Area. | Stephanie Howard | 4/17/06 |
| PI | Floodplains | No 100year floodplains are present in the 160 acre area. Corridors will cross the 100-year floodplain of White River and Evacuation Creek.<br><br>If ROW to river is required to access the water source, then impact to floodplain of the river will occur. | Karl Wright | 7/10/06 |
| PI | Invasive, Non-native Species | Potential for invasive and noxious weeds to occur or increase in density. A noxious weed inventory of the project area will be needed – use the state list.<br><br>Power-washing vehicles would help reduce the impacts. | Delbert Clark | 4/17/06 |
| NI | Native American Religious Concerns | No sites identified during the initial consultation for the EIS. Class III survey of routes required before determination of impact can be made for the utility ROWs. | Blaine Phillips | 7/10/06 |
| PI | Threatened, Endangered or Candidate Plant Species | Very low potential for Spiranthes diluvialis to occur in project area within canyons where hydric soils or moist conditions exist; standard surveys are unnecessary if field inspection determines that no suitable habitat is present. Penstemon grahamii potential habitat, Penstemon scariosus var. albifluvious potential habitat. Low potential for Sclerocactus glaucus. | Charlie Sharp | 7/10/06 |
| PI | Threatened, Endangered or Candidate Animal Species | Water Depletion will need to be determined for T&E fish impacts. Also access to river edge could impact water. Bald Eagle winter foraging habitat. Utility ROWs cross roosting habitat. | Amy Torres | 7/10/06 |
| PI<br>PI | Wastes (hazardous or solid) | Hazardous: Some existing hazardous wastes are present (transformers). Reportable quantities of hazardous material will need to be determined.<br>Solid: The project will result in spent shales. Sour water and connate water will occur. Need to know contents as wells as treatment or disposal. | Hazardous: Merlin Sinfield<br>Solid: Stephanie Howard | 4/17/06<br><br>7/10/06 |
| PI Surface<br>PI Ground | Water Quality (surface/ground) | Surface: Runoff with salts sediments or chemicals could be monitored or mitigated at the existing dam. Need know if contamination will occur to water in the dam. Ground: Potential exists for contamination in unconfined aquifers (percolation down and flow down dip) and shallow bedrock aquifers in the Uinta formation (known to contain useable water).<br>Need to know quality of water and will it be released to the surface or will it be trucked or treated. Water will be drawn out of Birds Nest Aquifer as well as white river alluvium for later stages of the project | Surface: Karl Wright<br>Ground: John Mayers | 7/10/06<br>7/10/06 |
| PI | Wetlands/Riparian Zones | No riparian areas in the 160 acre project area. Corridors will cross the White River riparian zones.<br><br>Potential for invasive or noxious plant species to be carried down drainage to riparian areas along the river. Could be monitored from the dam site up drainage. | Stan Olmstead<br>Karl Wright | 4/17/06<br>7/10/06 |

| Determi-nation | Resource | Rationale for Determination* | Signature | Date |
|---|---|---|---|---|
| PI | Wild and Scenic Rivers | No federally designated Wild and Scenic Rivers. The White River (scenic) and Evacuation creek (recreational) segments are eligible and are being evaluated for suitability for inclusion in the Wild & Scenic River system . The potential WSRs are not within the 160 acre project boundary but will be crossed by utility ROWs. | Kim A Bartel | 7/10/06 |
| NP | Wilderness | No designated wilderness within the Vernal field Office. No WSA's identified in the project area. | Kim A Bartel | 4-17-06 |
| **OTHER RESOURCES / CONCERNS**** | | | | |
| NI | Rangeland Health Standards and Guidelines | Not managed as rangeland due to the existing mine site. | Marc Stavropoulos | 4/17/06 |
| NI | Livestock Grazing | Grazing agreement allows access through the area for water (trailing permit). | Marc Stavropoulos | 4/17/06 |
| NP | Woodland / Forestry | No woodlands or forests present in the project area. | Steve Strong | 4/17/06 |
| PI (Veg.)<br><br>PI (SSP) | Vegetation including Special Status Plant Species other than FWS candidate or listed species | Disturbance of general vegetation, predominantly juniper-pinyon community<br><br>Potential habitat for huber's pepper plant in corridors. No known occurrences of special status plants in lease area or immediate vicinity; lease area contains no potential habitat for these species | Charlie Sharp | 7/10/06 |
| PI | Fish and Wildlife Including Special Status Species other than FWS candidate or listed species e.g. Migratory birds. | Big game habitat (DWR crucial winter deer habitat). Raptor habitat. | Amy Torres | 4/17/06 |
| PI | Soils | Sedimentation would occur, but it would be captured at the dam. | Stan Olmstead | 4/17/06 |
| PI | Recreation | Diesel generation of power for processing of shale could produce long term noise to the White River corridor. Access of work site by both motorized and non-motorized users who enter site from un-fenced portions, could pose safety threat to workers as well as those recreationists. Under Alternative C of the draft RMP, this White River segment is proposed as a SRMA to define recreational uses. | Kim A Bartel | 4/17/06 |
| NI | Visual Resources | VRM IV classification. Proposed action would not diminish the objectives. Facilities should be painted in flat earth tones and screened from views of the White River corridor. VRM II along the river. Facilities should not be seen by the causal observer. | Kim A Bartel | 7/10/06 |
| PI | Geology / Mineral Resources/Energy Production | Formation citation needed. Oil shale lessee and oil and gas lessee would need to coordinate to avoid multiple mineral development conflicts. | Pete Sokolosky | 4/17/06 |
| PI | Paleontology | No known localities within the 160 acre parcels. Area was surveyed during the preparation of the original EIS. There are many known vertebrate fossil localities nearby giving this area a Condition 1 rating. Potential for destruction of paleontological resources during mining operations | John Mayers | 4/17/06 |

| Determi-nation | Resource | Rationale for Determination* | Signature | Date |
|---|---|---|---|---|
| NI | Lands / Access | The proposed area is located within the Book Cliffs Resource Management Plan area, which allows for mineral development with associated road and utility right-of-ways. Current land uses, within the area identified in the proposed action and adjacent lands, consist of existing oil and gas development, gilsonite mining, wildlife habitat, recreational use, and sheep and cattle ranching. No existing land uses would be changed or modified by the implementation of the proposed action; therefore, there would be no adverse affect. | *//Shauna Derbyshire* | 4/17/06 |
| NI | Fuels / Fire Management | No Fuels Projects in the proposed project area. No impacts to fire suppression capabilities are foreseen. | Steve Strong | 4/17/06 |
| PI | Socio-economics | The Proposed Action would initially have positive, but minor and temporary effects on the socio-economics of local cities and towns surrounding the project area. Project area work crews would likely increase local revenue through expenditures on lodging, meals, and supplies. Moving through phases 2 and 3 would increase the impact to the community as on-lease staff would be required to open and operate the mine | Stephanie Howard | 7/10/06 |
| NP | Wild Horses and Burros | No HAs or HMAs present. | Delbert Clark | 4/17/06 |
| NP | Wilderness characteristics | No areas were identified by external groups and found by the BLM as having a reasonable probability of having wilderness characteristics. | Kim A Bartel | 4-17-06 |

## FINAL REVIEW:

| Reviewer Title | Signature | Date | Comments |
|---|---|---|---|
| NEPA / Environmental Coordinator | | | |
| Authorized Officer | | | |

*Follow the italicized instructions below and then delete the asterisks"*" in the checklist, this sentence, and the instructions.*

**Rationale for Determination is required for all "NIs" and "NPs." Write issue statements for "PIs"*

*** Varies by specific location and BLM Field Office*

02-15763A:PRIN_WP\24232v1.DOC

# A P P E N D I X B

## ATP System Description

**Excerpt from Application to Bureau of Land Management**
**For Land to Conduct Research, Development and**
**Demonstration of Oil Shale Recovery Technologies**

**A narrative description of the proposed methodology for recovering oil from oil shale, including a description of all equipment and facilities needed to support the proposed technology.**

OSEC has negotiated an agreement with UMATAC Industrial Processes ("UMATAC"), a wholly owned subdivision of UMA-AECOM, whereby UMATAC is exclusively supporting OSEC's Application to the BLM and will license OSEC to use the ATP Technology in the R,D&D program and subsequently for a commercial shale oil plant. Pursuant to this agreement, UMATAC's experience and existing pilot plant demonstration facilities will be used to carry out the Research and Development programs required to demonstrate that the ATP Technology System ("ATP System") is a viable method for thermally processing crushed oil shale mined from the proposed lease to effectively recover a range of hydrocarbon products and gases in an environmentally acceptable manner.

The ATP System is a proprietary technology owned by UMATAC. AECOM, the parent company of UMA-AECOM, is based in Los Angeles, has offices world wide and about one half of its employees work in the United States. UMA-AECOM is the Canadian operating company and UMA-AECOM is based in Calgary where its pilot plant and ATP60 demonstration plant are located. UMATAC is a specialty group within the AECOM organization that has the mandate to develop, market, supply and support the ATP Technology to organizations with whom it licenses. UMATAC has access to the wide ranging engineering and management skills of the 18,000 person strong AECOM organization.

The ATP System is a thermal process for pyrolysing the oil shale. The primary unit is the ATP Processor (also "Processor"); a horizontal rotary machine externally similar to a kiln. The Processor has internal zones in which the four stages of ore processing occur: (1) preheating of the feedstock, (2) pyrolysis of the oil shale under anaerobic conditions, (3) combustion of coked solids to satisfy the process heat requirement, and (4) cooling of the combustion products by heat transfer to the incoming feed. The ATP System was originally conceived in 1974 for processing oil sand. The ATP System has been developed and applied in primary resources (processing of oil sands, oil shale, and heavy oils) and in environmental fields (hazardous organic and hydrocarbon contaminated soil treatment).

As to oil shale, commencing in 1985, UMATAC, working with Southern Pacific Petroleum of Australia, carried out a multi-stage research and development program on Australian oil shale which led to design and construction of a 250 tph ATP Technology System which was put into operation in late 1999. This plant was used as an R&D facility and the ATP System achieved design yields and operated at production rates in excess of the design capacity. The owners of this project decided that this plant had met its primary research objectives and the facility was mothballed in November 2004. During the life of this plant, it processed in excess of 2,600,000 tons of oil shale feedstock and produced approximately 1,650,000 barrels of oil products. The lighter fractions of this oil product were hydrotreated to produce a premium sulphur and nitrogen free naphtha product which was used as gasoline feedstock. The heavier end of the product oil was sold as a fuel oil cutter stock. The Fischer Assay grade of the Stuart oil shale was in the range of 150 to 200 LT0M (≈ 35 to 45 gallons per ton).

Commencing in 1989, the ATP System was successfully tested and used for processing soils containing hazardous hydrocarbons, in particular polychlorinated biphenyls (PCBs). In 1989, UMATAC designed and constructed in Calgary a 10 tph feed rate ATP Transportable Treatment Plant for SoilTech ATP Systems, Inc., a jointly owned U.S. soils treatment company. This plant was transported to and erected at 4 Superfund sites in eastern U.S. to process hazardous wastes during the period 1989 through 1994. These sites, located at Wide Beach, NY, near Chicago, Ill, Cincinnati, OH and Louisville, KY, were successfully remediated. On three of these sites, the performance of the ATP System was exhaustively analyzed and compliance reports completed by the US EPA as part of its SITE program. The ATP System met or exceeded all requirements for environmental performance which are very stringent for plants that treat hazardous wastes.

During the Louisville KY project, the plant operated at 10% to 20% above design capacity and its operating availability was in excess of 90% while processing 32,000 tons of feed soil.

5.1 Description of the process methodology and equipment of the ATP System

The R&D program of OSEC's application is based on and utilizes a series of testing and evaluation phases which are similar to those previously used by UMATAC in carrying out the Australian oil shale development for the ATP System. UMATAC's testing facilities are located in Calgary.

Testing results from BLM lease oil shale would be directly relatable to UMATAC's experience and existing data banks. A 4 ton/hr complete portable demonstration plant would be used for bulk sample testing - initially in Calgary, and then relocated to the lease site for periods of longer, continuous test piloting runs.

UMATAC's scale-up methodology and process parameters for the ATP System design have already been proven with the 250 tph Australian oil shale plant. If the results of the test phases planned for this R&D program are deemed successful, assessments of the risk and potential to go directly to a much larger ATP Processor in the size range of 250 to 500 tph capacity feedstock shale can be made. This evaluation could be carried out within 16 to 24 months provided there are no undue delays in permitting and licensing.

Following is a brief description of the ATP Processor and its associated systems.

a) ATP Processor:

The ATP Processor is the primary unit in the ATP System. It is a multi-compartmented, rotating vessel that contains the following zones:

- The Preheat Zone receives and preheats incoming feed shale to drive off free moisture. The resulting steam is discharged from the unit for collection and treatment.

- The Retort Zone transfers dry, preheated shale to the retort zone where additional heat is provided rapidly by hot, recycled solids to pyrolyze the kerogen and convert the organic content of the shale to hydrocarbon vapors and gases. Coke formed in the retorting reaction adheres to the inert solids fraction of the shale. Hydrocarbon vapors and gases exit the zone to the Oil Recovery System.
- The Combustion Zone receives the retorted, coked shale via a seal passage from the retort zone. Air is added and controlled combustion occurs to burn coke as needed to provide the heat for the process. Combusted coked solids are recycled via a seal passage to the retort zone to serve as the process heat source. The excess coked solids and flue gases pass to the cooling zone.
- In the Cooling Zone, the temperature of the partially combusted shale is reduced via heat transfer to the incoming feedstock prior to the solids (process tailings) being discharged. The combustion gases exiting this zone are also cooled in this zone. The partially cooled solids and gases are discharged from the Processor to secondary treatment as needed.

One unique feature of the ATP Processor is the use of seal passages that readily pass solids flow but act to inhibit cross flow of gases between zones. This feature dramatically reduces degradation of hydrocarbons and dilution of fuel gas by combustion gases, as occurs in some other processes used in oil shale.

b) The Oil Recovery System receives the hydrocarbon vapors from the ATP Processor Retort Zone and passes them through multiple stages of condensation for the separation of the oil products, water and non-condensible gaseous hydrocarbons. These products are pumped to storage or to secondary treatment as dictated by the particular application.

c) The Flue Gas Treatment System receives the combustion gases directly from the Processor and passes them through multiple stages of treatment as required so that the treated gases can be discharged in accordance with environmental requirements.

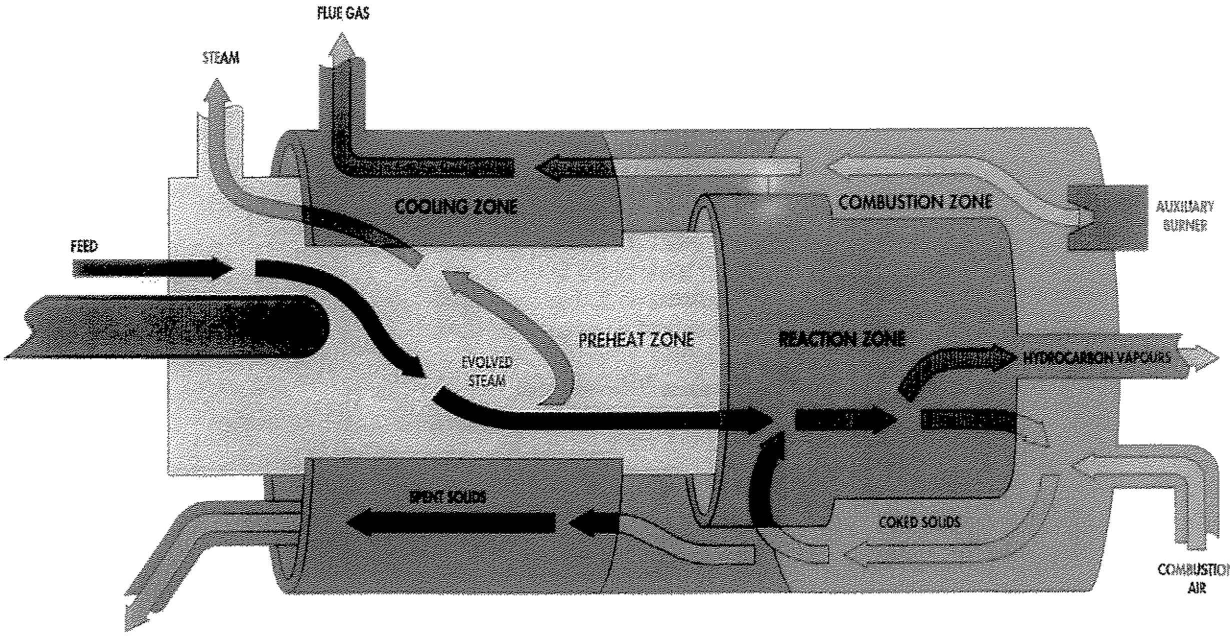
d) Feed System includes crushers, surge storage, reclaimers and feed conveyor to deliver suitable (crushed) oil shale to the Processor.

e) Spent Shale Tailings System consists of a screw transfer conveyor, a moistening mixer, transfer conveyors and/or hoppers as required to handle and load out the tailings.

f) Pumps, Piping, Fans, etc. System handles and delivers the liquid products (water and oil) to tankage and loadout.

g) Central Control Room with electrical and instrumentation systems necessary to provide process control, alarm, safety shut down and relief systems.

Details of the equipment included in the ATP60 plant are provided in Appendix 5.




*The ATP Processor*

**Schematic of the ATP Processor**

5.2 Facilities needed to support the ATP60 pilot plant:

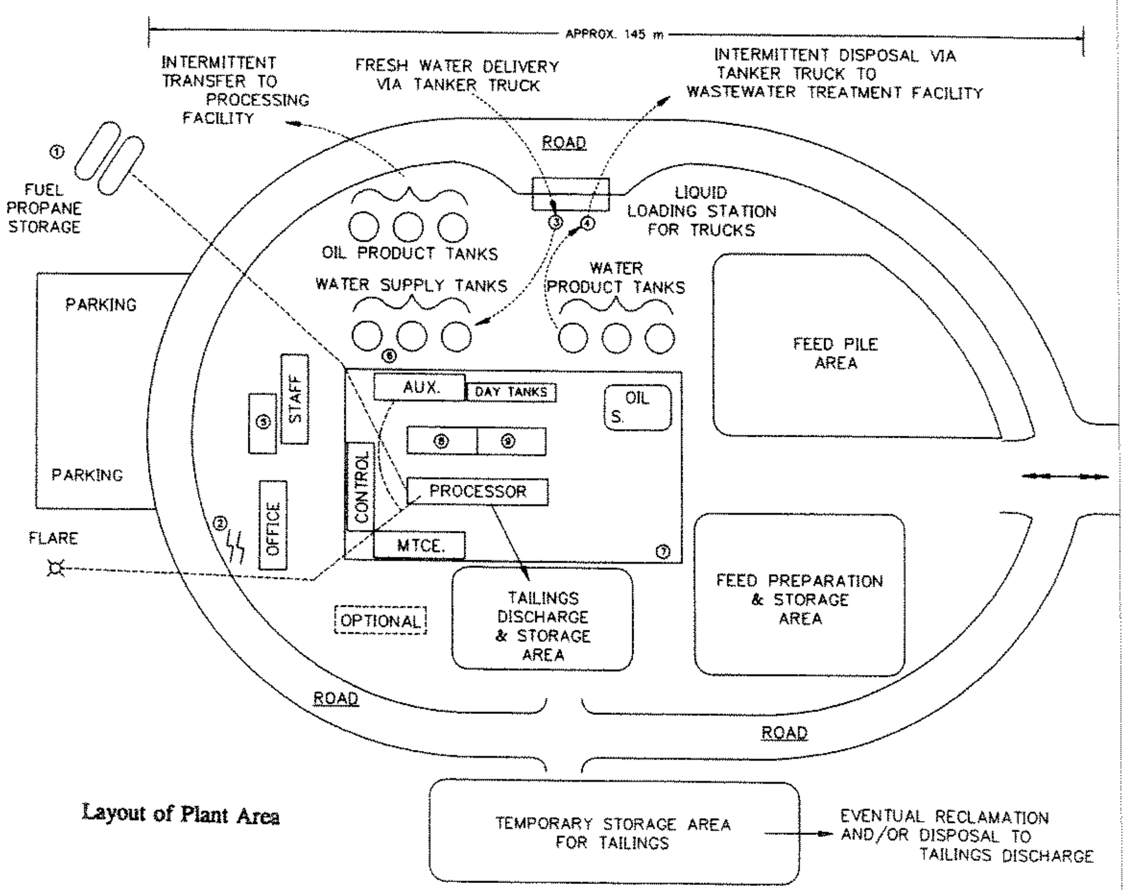
UMATAC's ATP60 pilot plant includes the ATP Processor, Oil Recovery System, and all the ancillary equipment and systems necessary to support the process. The ATP60 plant will demonstrate the suitability of the process over extended operations. This equipment is mounted on a series of heavy trailers that can be transported to a field site and set up for the plant to operate as a field demonstrator. The requirements for the field site and facilities are generally as follows:

- Road access to the 160 acre lease suitable for conventional heavy construction machinery including heavy highway transporters and 100 ton capacity cranes as well as smaller service vehicles and equipment. *(The roads have been physically inspected and they are more than adequate to serve our needs).*
- A prepared concrete foundation pad of approximate dimensions 120 ft by 200 ft. *(A site has already been selected to locate the pad/pilot plant).*
- A fuel supply - natural gas or propane can be used. This fuel is needed for plant start ups and operational trim control. *(OSEC plans to use a propane tank to satisfy its start up fuel needs and trim control).*
- Electric power – approximately 450 kW capacity at 480 VAC, 3 phase. The plant is equipped with an auxiliary generator of rated capacity 400 kW that is used for

emergency operation during power supply interruptions. *(OSEC has confirmed that there is ample power at the mine once electricity is reactivated)*

- A supply of water – process water for the plant operation (approximately 15 gph during plant operations) and potable water for operating personnel (approximately 10 persons – plant operations and technical support only). *(Initially, OSEC plans to truck water into the plant to be stored in holding tanks and ultimately to recommission the existing waste water treatment plant).*
- Tankage for liquid products and other containment or storage as required by local statutes. *(Prefabricated tanks will be located within a bermed impervious containment).*

The sketch below shows a preliminary and typical layout for the site and facilities of the ATP60 pilot plant.




**Layout of Plant Area**

Test program sequence and components:

In accordance with its test plan, OSEC will carry out the first test work in Calgary. After testing ore samples from the lease, OSEC will optimize the equipment, if required, for further field piloting testing prior to relocating the pilot plant and OSEC's process R&D operations to the lease site. Barring unforeseen circumstances, the field program and production quantities of process by products could be as follows:

Assumed composition of the feed shale:

| | | |
|---|---|---|
| Water | - connate | 1.5 wt% |
| | - pyrolysis | 2 wt% |
| Fischer assay yield of oil | | 35 gal/ton |
| Kerogen content (approximate.) | | 25 wt% |
| In place bulk density of the oil shale | | 125 lbs/ft$^3$ |
| Bulk density of the crushed oil shale | | 60 lbs/ft$^3$ |
| Bulk density of compacted spent shale | | 65 lbs/ft$^3$ |

Operating period and quantities of materials:

| | |
|---|---|
| Duration of process activities on the lease site | 7 months total |
| Scheduled period of operations | 4.5 months |
| Actual time of operating the pilot plant | 3 months |
| Average feed rate to the pilot plant | 3.5 tphr |
| Total quantity of feed shale required, including contingency | 10,000 tons |
| Approximate quantities of by products to be stored or handled: | |
| Process preheat zone water | 150 tons |
| Sour water | 200 tons |
| Oil products | 1,400 tons |
| Spent shale tailings (approx.) | 8,000 tons |

Note – Feed preparation of the mined oil shale will require multi stage crushing and segregated storage piles. OSEC will allow for handling a total quantity of ore for the test program that could approximate a larger fraction of the 50,000 tons that are present at the lease site. This would allow for grab samples, segregation of the material into several categories of feed, etc., and would also allow space for crushing equipment and surge piles.

The actual requirement for tankage, storage berms, ground water collection, etc. will be determined in detailed planning of the program preparatory prior to permitting.

5.3 Advantages Offered by the ATP System vs Vertical Stationary Retorts

During the 30 year period of ATP System development completed by UMATAC, UMATAC has had numerous opportunities to visit and study operations of other oil shales extraction technologies, in particular the many Kiviter retorts and Galoter retorts operating in Estonia and the 120 to 100 t/day vertical retorts at Fushun Coal in China. Assessment of these vertical retorts along with published data on other vertical retorts has confirmed UMATAC's conclusions that the ATP System has many distinct advantages for the oil shales application. These are summarized as follows:

- High thermal efficiency. Coke make is normally adequate fuel for all process heat requirements.
- High capacity per commercial processing unit (13,000 to 18,000 t/day of feed)
- Consistent high oil yield from feed shale over a range of feed variations
- Hydrocarbon vapors removed at reactor temperature within seconds of being produced from the kerogen.
- Product oil has a full boiling point range and low specific gravity
- The product fuel gas is not diluted with combustion gases
- Able to process 100% of mined shale with maximum size of about 10 mm
- Short residence time for gas and solids in the Processor
- Process is easy to adjust for variations in feed
- Connate water is separately extracted and recovered for reuse
- High grade (Mahogany type) oil shales, which break down readily in pyrolysis, cannot plug passages or impede flows of solids and gases.
- A 250/220 tph Processor has operated in Australia at design capacity

5.4 <u>Mining Expertise</u>

One of the owners of OSEC is Twin Pines Coal Company, Inc. ("Twin Pines"). Twin Pines is a member of the GreenFuels group of companies ("GreenFuels"). The GreenFuels group markets over 20 million tons of coal and coal-based synthetic fuel per year. OSEC will utilize the extensive mining and marketing expertise of Twin Pines and GreenFuels to mine oil shale from the White River Mine facilities and to sell the oil produced.

Twin Pines owns and operates coal mines in the United States, and through affiliates, coal mines in Mexico and Venezuela. Twin Pines has a well-qualified managerial team of geologists, mining engineers, mechanical engineers and related experts whom OSEC would use to re-open and operate the White River Mine. As one of the largest users of mining equipment in the southeastern United States, in 2005 Twin Pines will add new mining equipment valued at over $50 million for use in its three US coal mines. Twin

Pines expects to double its output from its US mines, measured from calendar year 2004 to 2005.

In addition to the mining experience of Twin Pines, OSEC would draw on the geo-technical and mining support of other GreenFuels' companies that have decades of mining experience. From 1990 to 1996, GreenFuels developed and operated Minera Maicca, a coal mine in the state of Tachira, Venezuela. Minera Maicca was sold in 1996 to a joint venture among Tomen, a Japanese trading company, Keystone Coal and Transmar.

In sum, OSEC believes its expertise in mining, acquired through Twin Pines and the GreenFuels group, sets it apart from other applicants. OSEC will be able to mine shale from the White River Mine in an efficient, productive and environmentally sound manner, utilizing "best practices" from its association with Twin Pines and the GreenFuels group.

### 5.5 Logistics Expertise

In addition to mining expertise, OSEC also brings expertise in bulk logistics. Oil shale mined from the White River Mine will have to be brought to the surface and transported to the plant. As noted in Section 5.7 below, OSEC also will offer access to oil shale to other companies doing R&D. Oil produced at the plant will also have to be shipped to refiners until a pipeline tie-in becomes feasible. For this component, OSEC will draw on the expertise of Warrior Hauling, GreenFuels' transportation and logistics subsidiary. With over 100 company-owned and leased trucks, Warrior Hauling moves over 10 million tons of coal and over 350,000 tons of asphalt per year for its affiliated companies and others. Its operations involve logistical planning and shipments on a 24/7/365 basis, with over 100 employees and a fleet of tractor trucks, dump trailers, tri-axle trucks, tankers and articulated loaders. Through its affiliation with Warrior Hauling, OSEC possesses a reliable transportation service provider dedicated to the successful operation of the White River Mine on behalf of itself and others operating shale oil extraction pilot plants.

### 5.6 Environment, Community and Employee Training

At its highest managerial level, OSEC is committed to utilizing "best practices" in regard to how its shale mining operations and refuse disposal will affect the environment. OSEC will draw upon the expertise of Twin Pines and the GreenFuels group to ensure that full compliance with environmental laws is achieved. GreenFuels' mining operations have been conducted in close proximity to neighboring communities with heightened environmental concern. In its Venezuelan coal mining project, where mining occurs in the watershed of Maracaibo, Venezuela's second largest city, GreenFuels has implemented a "best practice" plan, which is much more stringent than applicable local law, to ensure that no water or soil contamination occurs.

5.7 Transportation and Marketing of Shale Oil

OSEC will conduct characterization research on the crude shale oil produced by the ATP pilot plant and then work with equipment vendors and Utah refineries to design the process equipment needed to upgrade the shale oil to premium refinery feedstock. OSEC has also had preliminary discussions with some of the Utah refineries and has been assured that they will cooperate in getting OSEC's upgraded shale oil into the marketplace. OSEC has also identified a number of potential customers.

5.8 Mine

The nominated 160-acre R,D &D block includes most all of the surface structures installed as part of the White River Oil Shale Project between 1976 and 1985. It also includes all the existing underground mine openings and structures. Located on the surface lease are stockpiles of oil shale from the Mahogany zone; OSEC understands the stockpiles contain approximately 50,000 tons.

During Phase I, OSEC will apply for all of the required permits to move the pilot plant to the mine site and apply for all the required permits to reopen the White River Mine. Also during Phase 1, OSEC intends to use the stockpiled oil shale for pilot retort testing. OSEC intends to bring a crushing and screening plant onto the site to crush, screen and then blend feed for its pilot retort testing work in Canada. OSEC estimates that its pilot retort testing work will require approximately 1,000 tons of feedstock. OSEC could then need up to 20,000 tons of this oil shale for the on site Phase 2 program once the retort pilot plant is moved to the lease site.

OSEC is well aware that other research groups are in need of oil shale, and it is willing to reserve up to half of stockpiled oil shale at the lease site for use by others doing oil shale research. This spirit of cooperation demonstrates that we realize every opportunity should be pursued to develop Western U.S. oil shale to meet the Nation's energy needs. OSEC proposes to provide this shale to other research groups at its cost of loading and handling. When the inventory in the stockpiled oil shale reaches a nine (reserve) month supply for OSEC and that of other research groups then acquiring this feedstock, assuming it is economically and environmentally feasible, OSEC will re-commission the mine to support its needs and that of all other R,D&D groups. OSEC estimates that it will take approximately six months to open the mine, and once opened, OSEC will offer the freshly mined oil shale to the other research groups for their R&D purposes at its cost plus a reasonable return.

During Phase 2, OSEC will begin to make use of the buildings and structures on site. As this work progresses, OSEC expects to recondition the existing buildings and reopen the mine. With all permits in place to reopen the mine prior to the start of Phase 2, OSEC will remove plug materials from the decline portal and any permanent underground bulkheads in order to provide access to the lowest level of the mine workings. The mine will be operated in accordance with MSHA Gassy Mine Regulations which are applicable to underground oil shale mines. The ventilation system will require the installation of the necessary fans. Portable generators will be utilized until the power lines to the site are reconnected and put into service. The main 30-foot diameter ventilation shaft will be equipped with an escape system. This initial work will prepare the mine to supply oil shale for the next stage of OSEC's development program, which calls for a on-site Phase 3 demonstration plant running at approximately 250 tons/hour.

OSEC has team members who are very familiar with the White River Mine design and construction; the geology and rock mechanics of the site; and the room and pillar mining sequence that will be employed.

# A P P E N D I X C

## Mine Reopening Plan

## WHITE RIVER OIL SHALE MINE REOPENING PLAN

### INTRODUCTION

Upon signing the RD&D Lease, OSEC will begin securing the necessary permits for all on-site activities. The White River Oil Shale Mine reopening involves two primary tasks: permitting and physically re-entering the mine. The mine will be reopened during Phase 2 of the OSEC project. A brief overview of permitting requirements is presented first and the plan for reentering the mine follows.

The White River Oil Shale Mine is located in Uintah County, southeast of Vernal, Utah on the original Ua and Ub Federal Oil Shale Lease Tracts administered by the Bureau of Land Management (BLM). The oil shale leases were issued in 1974, as part of the Federal Prototype Oil Shale Leasing Program, to a partnership of three large oil companies: Phillips Petroleum Co, Standard Oil Co. of Ohio (Sohio) and Sun Oil Co., operating as the White River Shale Project (WRSP).

The mine is located near the geographic center of the combined leases. Mine development started in 1982 with the sinking of a vertical 1,058-foot deep, 30-foot diameter concrete-lined main shaft and the driving of a 4,574–foot long, three-segment decline to the Mahogany Zone mining horizon. The overlying Birds Nest Aquifer was grouted off in the shaft and the decline to minimize water inflow into the mine. Underground workings developed by WRSP include a crusher station, a rock mechanics test room and other supporting entries. Two other mine openings are a 16-foot ventilation shaft and a 5-foot utility raise.

Surface facilities include a 25,800 square foot mine service building with offices, warehouse and maintenance shop; a water treatment plant; a sewage treatment plant; a hoist house; a substation; and other small support buildings and structures.

During the development of the underground workings, methane was encountered, resulting in two underground fires which were extinguished by flooding the affected portions of the mine. The methane ignition incidents resulted in the mine being declared gassy by MSHA. Besides the Birds Nest Aquifer, only a small petroleum seep and a small amount of other water were encountered in the mine.

Primarily for economic reasons, WRSP terminated the project in 1985 before constructing a retort. The mine was never fully commissioned and it was never fully equipped for production. The leases were relinquished with responsibility for the mine and surface facilities being assumed by the BLM in 1986. The BLM eventually decided to abandon the mine and a closure plan was developed. In 1996, under the direction of the BLM, a 10-foot thick concrete bulkhead was placed in the lower decline below the Birds Nest Aquifer; the main exhaust fan installation was removed; the mine hoist and headframe were removed from the 30-foot diameter shaft; the

16-foot diameter ventilation shaft and the 5-foot diameter shaft were capped with reinforced concrete; the decline portal was plugged; 1.5 miles of the power line were removed; and several small support buildings were removed. A methane explosion occurred during the closure of the 30-foot diameter main shaft, resulting in a fatality, and the decision was made not to complete the capping of this shaft. This shaft is currently surrounded by a barbed-wire-topped chain link fence. Some of the equipment, including the main exhaust fan, was removed from the site; that which remains at the site is in seriously deteriorated condition.

## 1.0 Permits

OSEC's environmental and permitting team will identify the permits required for each phase of the program. The required permits fall into three main categories: environmental, operations, and health and safety. Permits will be required from various federal, state and local agencies before actual re-opening activities can begin. Environmental permits will be addressed by OSEC's environmental contractors. Only the more obvious mine-related permit requirements will be discussed here. Utah's Department of Natural Resources Division of Oil, Gas and Mining's (DOGM) Notice of Intention to Commence Large Mining Operations (NOI) addresses many operating and environmental subjects. Approval of the NOI is considered to be the critical state permit to operate the mine. A brief discussion of the DOGM Notice of Intention is presented in this report. Health & safety and other issues are also covered.

### 1.1 Environmental Permits:

#### 1.1.1 Air Quality

Utah Department of Environmental Quality's Division of Air Quality (DAQ) is responsible for issuing permits for any operation that emits any contaminant into the air. Two different kinds of permits are issued by DAQ.

**1.1.1.1 Approval Orders** are issued by DAQ's New Source Review Section, and are required for most new or modified operations. These permits may include limits on both construction and operation activities. Application must be made for an Approval Order before starting construction or operation of any emitting equipment. An application is made by submitting a Notice of Intent (NOI) to the Division of Air Quality. Guidance documents for preparing the NOI are available at the DAQ office in Salt Lake City, Utah.

**1.1.1.2 Operating Permits** for the project are issued by DAQ's Operating Permit section. These are new permits required by Title V of the 1990 Clean Air Act

Amendments and are implemented at the federal level by 40 CFR Part 70. Other requirements may include being regulated by a New Source Performance Standard (NSPS), National Emission Standard for Hazardous Air Pollutants (NESHAP) or other Clean Air Act requirements. A more detailed description of the Operating Permit program in Utah is available from the Division of Air Quality.

### 1.1.2 Water Quality

Facilities that produce, treat, and dispose or otherwise discharge waste water will need permits from the Division of Water Quality (DWQ). Under the Clean Water Act, the Environmental Protection Agency (EPA) has delegated authority to Utah to administer its own water quality regulatory programs. Required permits needed include:

#### 1.1.2.1 Surface Water Discharge Permits

Discharging waste water to surface waters, including storm drains, requires a DWQ permit prior to beginning operations. Utah Pollutant Discharge Elimination System (UPDES) Permits are required for all industrial, municipal and federal facilities, except those on Indian lands.

#### 1.1.2.2 Construction Permits

Facilities treating waste water may need construction permits from the county unless they discharge into a municipal sanitary sewer system. County building permits will also be required.

#### 1.1.2.3 Storm Water Permits

DWQ permits are required for most industries that discharge storm water runoff to surface waters such as lakes or streams. Storm water pollution prevention plans must be developed prior to application. Utah Administrative Code (UAC) R317-8-3.9 requires that all construction activities, such as clearing, grading and excavating, that disturb one acre or more are required to obtain a UPDES Construction Storm Water Permit (mainly for sediment and erosion control).

#### 1.1.2.4 Ground Water Permits

Any facility that discharges or may discharge pollutants to ground water needs a permit as determined by the DWQ.

#### 1.1.2.5 Water Permitting Process

OSEC will contact the Division of Water Quality for information on permits needed and submit completed application forms. The Division of Water Quality issues a draft permit, seeks public comment, typically, in area newspapers, holds necessary public hearings and then issues final permits.

### 1.1.3 Division of Oil, Gas and Mining Permits

The most significant permit required by the Division of Oil, Gas and Mining (DOGM) is the Notice of Intention to Commence Large Mining Operations (FORM MR-LOM). OSEC's White River Oil Shale Mine project will be considered a large mining operation because more than 5 acres of surface land will be affected. The requirements for this permit are covered in Title R647 Natural Resources; Oil, Gas and Mining; Non-Coal; Section R647-4. The requirements of R647-4 are extensive and detailed. The review and approval process is rigorous. The major elements for preparing FORM MR-LOM are listed below:

R647-4-101 – Filing Requirements
R647-4-102 – Duration of the Notice of Intention
R647-4--103 – Notice of Intention to Commence Large Mining Operations
R647-4-104 – Operator(s), Surface and Mineral Owner(s)
R647-4-105 – Maps, Drawings and Photographs
R647-4-106 – Operation Plan
R647-4-107 – Operation Practices
R647-4-108 – Hole Plugging Requirements
R647-4-109 – Impact Assessment
R647-4-110 – Reclamation Plan
R647-4-111 – Reclamation Practices
R647-4-112 – Variance
R647-4 113 – Surety
R647-4-115 – Confidential Information
R647-4 -116 – Public Notice and Appeals

### 1.1.4 Miscellaneous Permits

#### 1.1.4.1 Mine Related Health & Safety Permits

All permits required by the United States Mine Safety and Health Administration (MSHA) rules and regulations will be specific to the site, the mining method and equipment required to mine oil shale at the White River Mine. The White River Mine will fall under the Subcategory 1A as defined in 30 CFR 57 Subpart T – Safety Standards for Methane in Metal and Nonmetal Mines Paragraph 57.22003 (a),(1),(i),(B).

#### 1.1.4.2 State and Local Permits

OSEC will secure required permits relating to construction and other local issues.

## 2.0 Mine Reopening Plan

### 2.1 Preparation

#### 2.1.1 Conceptual Plan

Early in the program, OSEC will obtain all permits for mine water disposal (UPDES); mine reentry operations (DOGM & MSHA); and other permits that will be identified during the planning stage. OSEC's mine reentry plan, discussed below, will be reviewed and approved by DOGM, BLM and MSHA before work begins.

OSEC's plan for reopening the White River Mine is based on the primary concern that it meets the highest health and safety standards possible. The plan for the mine reopening includes initial mine characterization work to determine the preentry water levels and air quality above and below the bulkhead in the lower decline C. The final decision on the bulkhead removal method will depend on air quality, on both sides of the bulkhead.

### 2.2 Stage 1 Field Evaluations

The initial mine reopening effort will be to characterize conditions within the mine.

OSEC plans to acquire water levels, water quality and air quality data through the 30-foot diameter main shaft and through the vent pipes at the top of the 5-foot diameter utility raise and the 16-foot diameter ventilation shaft. The mine air will be sampled for methane, carbon monoxide, hydrogen sulfide and oxygen, plus any others that the agencies may require.

It will be necessary to drill two boreholes from the surface into the lower decline, one immediately below the bulkhead and the other immediately above the bulkhead to verify the air quality and to visually inspect the physical condition of the bulkhead and decline with a down-hole camera before the mine reopening activities begin. Because of the presence of methane in the area, the drill rig will be equipped with a blow-out-preventer. The boreholes will be cased and cemented from the decline to the surface. There are geophysical logging companies in Vernal that can provide services for this characterization work. If the air quality is hazardous below the bulkhead, air will be blown down through the lower borehole into the decline, to purge the area in order to reduce the explosion danger when the bulkhead is breeched. Immediately before the bulkhead is breeched, carbon dioxide will be injected through the lower borehole into the decline to further reduce the potential for an explosive atmosphere below the bulkhead. If an unsafe environment is detected above the bulkhead, air will be injected through the borehole, using a small blower or fan, into the decline to dilute the concentration of the problem gases so that the bulkhead may be safely approached while installing the advancing ventilation tubing. See Stage 6 below for a description of the ventilation plan for approaching the bulkhead.

## 2.3 Preopening Activities

### 2.3.1 Health, Safety and Environment Plan

OSEC will develop a detailed Health, Safety and Environment (HS&E) plan for all of its activities prior to commencement of Phase 1 of the project. This will include emergency response procedures for the site and the mine.

### 2.3.2 The Utah Division of Oil, Gas and Mining Notice of Intention to Commence Large Mining Operations

Form MR-LOM will be prepared, submitted and approved by DOGM and bonding arrangements made prior to any work being done on the actual mine reentry activities.

### 2.3.3 Stage 2 Mine Dewatering

Surface water storage and disposal facilities, such as temporary tanks, will be installed and permitted, if necessary, before mine dewatering begins. All contaminated water will be trucked by licensed operators to an off-site, licensed facility. Water from the Birds Nest Aquifer that might be pooled above the bulkhead should be relatively good quality and it will be discharged to an on-site infiltration/evaporation area, if the permit allows, but will be trucked offsite for disposal, if the quality is poor.

Below the bulkhead, the mine will be dewatered using a submersible pump lowered from the surface into the 30-foot diameter main shaft. This water may be contaminated with hydrocarbon material associated with the bitumen seep that exists in the lower portion of the mine. All contaminated water will be hauled off-site to an approved disposal facility. The amount of water in the mine is not known at this time; but it is known to be below the 1,000 foot level in the 30-foot diameter shaft. The water level is probably at a lower elevation within the underground mine workings. A portable generator located near the shaft will supply power for the pumping operation.

Above the bulkhead, there may be water dammed up to the top of the Birds Nest Aquifer and the volume would be about 2.3 million gallons. Later, as the crew advances down from the portal, this water will be pumped up the declines to the surface. This water, if of acceptable quality, will be discharged on the surface in an onsite infiltration and/or evaporation area, or to an approved offsite area, such as the retention dam to the north of the 160-acre lease.

#### 2.3.4 Stage 3 Ventilation System

Frequent air quality measurements will be made through the vent pipes located in the concrete caps before and during the opening of the 16-foot shaft and the 5-foot utility raise. An air purging plan that, which includes a preliminary purging by blowing air down the utility raise vent pipe and exhausting the air through the 16-foot shaft vent pipe; this will be followed by the continuous injection of carbon dioxide into the utility raise and the 16-foot ventilation shaft through the concrete cap vent pipes to clear any dangerous methane concentration remaining beneath the caps during cap removal.

The utility raise will be opened by removing the entire cap using a large track-hoe. The opened utility raise will serve as the temporary ventilation exhaust shaft. The steel-reinforced concrete cap on the 16-foot diameter shaft will be removed using a hydraulic concrete breaker. The rebar will be cut using a hydraulic steel-cutting demolition shear. The same precautions and procedures will apply for the cap removal at both locations.

OSEC will install and commission the permanent main pressure fan at the top of the 16-foot diameter ventilation shaft. The upper decline (A) will be ventilated prior to removing the portal plug. The fan will be sized to provide adequate ventilation during the reentry operations and subsequent mining operations. Figure V-1 shows the ventilation layout for reopening of the mine down to the bottom of the upper decline.

### 2.4 Mine Reentry

After the characterization work is complete and mine dewatering below the bulkhead through the main shaft has begun, and the ventilation system is operating, work will begin on reentering the mine.

#### 2.4.1 Stage 4 - Portal Plug Removal

With the vent fan operating and air moving to the utility raise, a front-end loader and track-hoe will be used to excavate the backfilled earth and rock in the portal plug. Backfill material was placed up to the top of the outer airlock door. Air quality will be monitored at the bottom of the 16-foot ventilation shaft during the plug removal. Extreme caution will be used as the outer and inner air-lock doors are reopened because of the potential dead-air space between them and the ventilation shaft. The initial air monitoring done during mine characterization will provide information as to what may be encountered during the opening of the air-lock doors. If the door hydraulic actuating mechanisms can be made operational, the outer door will be opened while assuring no persons are situated in front of the doors. If the doors cannot be opened using the actuating mechanisms, it will be necessary to manually open or remove the doors. The doors will be put in working order before work continues in the declines. If the door repairs are extensive, a pair of temporary travel curtains will be installed so that the decline work can progress.

### 2.4.2 Stage 5 - Upper Decline (A) Reentry

With the ventilation system operating, as shown in Figure V-1, OSEC's mine crew will advance, with caution, down the upper decline, frequently testing air quality, roof and rib integrity, and making repairs as needed. A power line, communication line, and pump discharge line will be installed as the work progresses to the lower end of the upper decline.

### 2.4.3 Stage 6 -Lower Decline (C) Re-entry

Once the advance reaches the top of the lower decline it may be necessary to pump any accumulated water from the lower decline until the bulkhead is reached. The BLM has reported that water inflow from the Birds Nest Aquifer into the lower decline was measured at 3 gallons per minute after the bulkhead was installed. A portable electric-powered submersible high-pressure centrifugal pump of a type typically used in underground mines will be used to remove the water encountered. The pump discharge line will extend up the declines to the portal where it will discharge into holding tanks for off-site or on-site disposal as required by the permits.

When the reentry activity reaches the intersection between the upper decline (A) and the lower decline (C), a travel curtain, as shown in Figure V-2, will be installed in the upper decline (A) just above the intersection with the travelway decline (B). A solid curtain or stopping, with a vent tube extending through it, will be installed in the lower decline (C) just above its intersection with travelway decline (B). An auxiliary fan of adequate size will be connected to the vent tube above the curtain or stopping and used to force fresh air down the lower decline as the mining crew advances. The return air will move up the decline and through the travelway decline to the base of the utility raise where it will be exhausted to the surface. The vent tubing, power line, communication line and the pump will be advanced as the mining crew progress down the decline to the bulkhead.

#### 2.4.4 Stage 7 - Bulkhead Removal

Once the bulkhead is reached, OSEC's mine crew will make a final determination of air and water conditions on the downhill side of the bulkhead, again sampling through the borehole from the surface. If high methane levels are detected below the bulkhead, it may be possible to vent the area below the bulkhead through the borehole from the surface and cause some degree of air purging. Alternatively, carbon dioxide can be injected down the borehole if high methane levels are detected. Air quality, especially methane, will be monitored frequently at the working face. Due to the potential for dangerous levels of methane below the bulkhead, explosives will not be used to breech the bulkhead. Instead, the bulkhead will be removed using a machine mounted hydraulic hammer with water sprays, similar to that used in surface concrete demolition or rock breaking. Adequate water sprays will be used for dust control and spark suppression during the concrete breaking at the bulkhead. A machine mounted hydraulic shear, also commonly used in surface concrete and steel demolition, will be used to remove the imbedded rebar.

The bulkhead rubble will be loaded and hauled from the mine using a rubber-tired Load-Haul-Dump (LHD) unit. The rubble and rebar will be stockpiled near the portal until a final disposal location is determined. Approximately 175 cubic yards of rubble will be removed during bulkhead demolition.

Once the bulkhead is breeched, the 5-foot utility raise will be temporarily capped and ventilation air will move down the lower decline (C), through the mine workings and be exhausted up the 30-diameter main shaft to the surface. Figure V-3 shows the ventilation layout after the bulkhead is breeched.

Note: The White River Mine originally used an exhaust fan on the 16-foot shaft with intake through the 30-foot main shaft. We are proposing to reverse the flow direction for the RD&D program to distance the mine air intake from the plant site activities.

### 2.5 Stage 8 - Reentry Completion

Reentry work will continue from the bulkhead to the bottom of the lower decline (C) and through the rest of the mine workings using the same cautious air monitoring, roof and rib inspection and remediation work. Special attention will be given to the integrity of the roof and the existing roof bolts, with any questionable areas being scaled and rebolted.

## 2.6 Post Re-entry Activities

### 2.6.1 On-going Monitoring

The 30-foot main shaft, which serves as the mine exhaust shaft, will be equipped with a continuous methane monitoring device to log the methane levels into a computer and to provide an alarm if the methane level in the exhaust air reaches one percent.

Surface air quality monitoring stations will be installed as required by the various air quality permits; these will establish baseline conditions and then monitor air quality during operations.

Surface and ground water quality will be monitored as required by the applicable permits.

### 2.6.2 Mine Planning

Concurrent with the mine reopening, a final plan will be developed for mining oil shale for the Phase 2 & 3 retorting tests. The mining will take place southeast of the 30-foot diameter main shaft and will stay within the 160-acre RD&D Lease boundary. The mine entries will be aligned with the planned orientation of the commercial mine, taking into consideration the extensive rock mechanics data that has been collected for this site.

### 2.6.3 Mine Operations

#### 2.6.3.1 Hoist and Headframe and Man-cage Installation

A hoist, headframe and mancage will be installed at the collar of the 30-foot main shaft after the mine has been reopened and prior to active mining to produce oil shale feedstock for the Phase 2 and 3 retort testing.

#### 2.6.3.2 Mining Sequence and Equipment

Oil shale for retort tests will be mined from the area identified during the 2.6.2 Mine Planning Stage. The mine will be developed using a two-bench room and pillar method. The rooms will approximately 60-feet high. This will provide a representative oil shale averaging about 28 to 30 gallons per ton over the 60-foot mining horizon. The room and pillar, two-bench mining sequence for the White River Mine is described in many of the file reports prepared by Cleveland-Cliffs and further described in the 1981 White River Shale Project Detailed Development Plan. During phase 2, the blasted ore will be hauled to the surface using LHD's, while higher production rates during Phase 3 will make it necessary to use underground haul-trucks for ore hauling. Smaller than commercial sized equipment will be used during the demonstration phase and will include a two-boom drill jumbo, a bench drill, an explosives loading machine, a mechanical scaling machine, a roofbolter, front-end loaders or LHDs, low-profile articulated haul trucks, crew transportation vehicles, auxiliary fans and ancillary equipment; all of which will meet MSHA requirements for a gassy underground oil shale mine.

### 2.6.4 Crushing, Screening and other Retort Feedstock Preparation

All crushing, screening and other feedstock preparation will be performed on the surface. The required air and other permits will be obtained prior to startup of the crushing plant.

# APPENDIX D

## Available Minerological/Geochemical Information on Green River Oil Shale – Mahogany Zone

Table 3-1 - Likely Composition of Raw Utah and Unishale B Retorted Shale

| Properties | Range | Raw Utah Shale Feed Range | Raw Utah Shale Feed Typical | Unishale B Retorted Shale (Dry Basis) Range | Unishale B Retorted Shale (Dry Basis) Typical |
|---|---|---|---|---|---|
| **Fischer Assay** | | | | | |
| Oil, modified | GPT | 20.0 to 34.0 | 26.5 | Zero to 0.3 | Zero |
| Fischer Assay | wt% | 7.6 to 13 | 10.1 | Zero to 0.1 | Zero |
| $H_2O$ (bound) | GPT | 1.7 to 6.1 | 3.64 | - | - |
| | wt% | 0.7 to 2.5 | 1.2 | - | - |
| Gas | wt% | 1.5 to 2.6 | 2.0 | Zero | Zero |
| **Other Properties** | | | | | |
| $H_2O$ (free) | wt% | 0.15 to 1.5 | 0.7 | - | - |
| Mineral $CO_2$ | wt% | 17 to 19.5 | 18.0 | 19.5 to 22.8 | 20.8 |
| C | wt% | 15.3 to 20.7 | 17.8 | 8.25 to 9.8 | 8.9 |
| H | wt% | 1.4 to 2.6 | 1.9 | 0.16 to 0.5 | 0.35 |
| O | wt% | 12.3 to 14.2 | 13.1 | 14.2 to 16.6 | 15.1 |
| N | wt% | 0.5 to 1.65 | 1.1 | 0.16 to 0.5 | 0.35 |
| S | wt% | 0.15 to 0.85 | 0.6 | 0.1 to 0.3 | 0.2 |
| Ash | wt% | 70.35 to 60.0 | 65.5 | 77.1 to 72.3 | 75.1 |
| As | ppm wt | 80.0 to 30.0 | 50.0 | 80.0 to 30.0 | 50.0 |
| Residual organic carbon | wt% | - | - | 2.95 to 3.6 | 3.5 |
| Total organic carbon | wt% | 10.66 to 15.38 | 12.9 | 2.95 to 3.6 | 3.2 |
| wt% of raw shale | | - | - | 87.0 to 85.7 | |

## 4. EVALUATION OF BASELINE PROGRAM

The geology baseline program is completed and is in compliance with the Federal Oil Shale Lease Stipulations, the Partial Exploration Program Supplement, and the Conditions of Approval of the plan and supplement. Data were compiled and analyzed in order to determine the suitability of mine facility locations and to establish a baseline for monitoring possible mining-related affects on the environment. Included are both site-specific and regional data.

The geology baseline program has adequately defined regional and site geologic conditions. In addition, the data are sufficient for determining suitabilities of mine facility locations and for establishing a baseline for monitoring of geology-related impacts such as subsidence, mass wasting, and physiographic alteration during mine development.

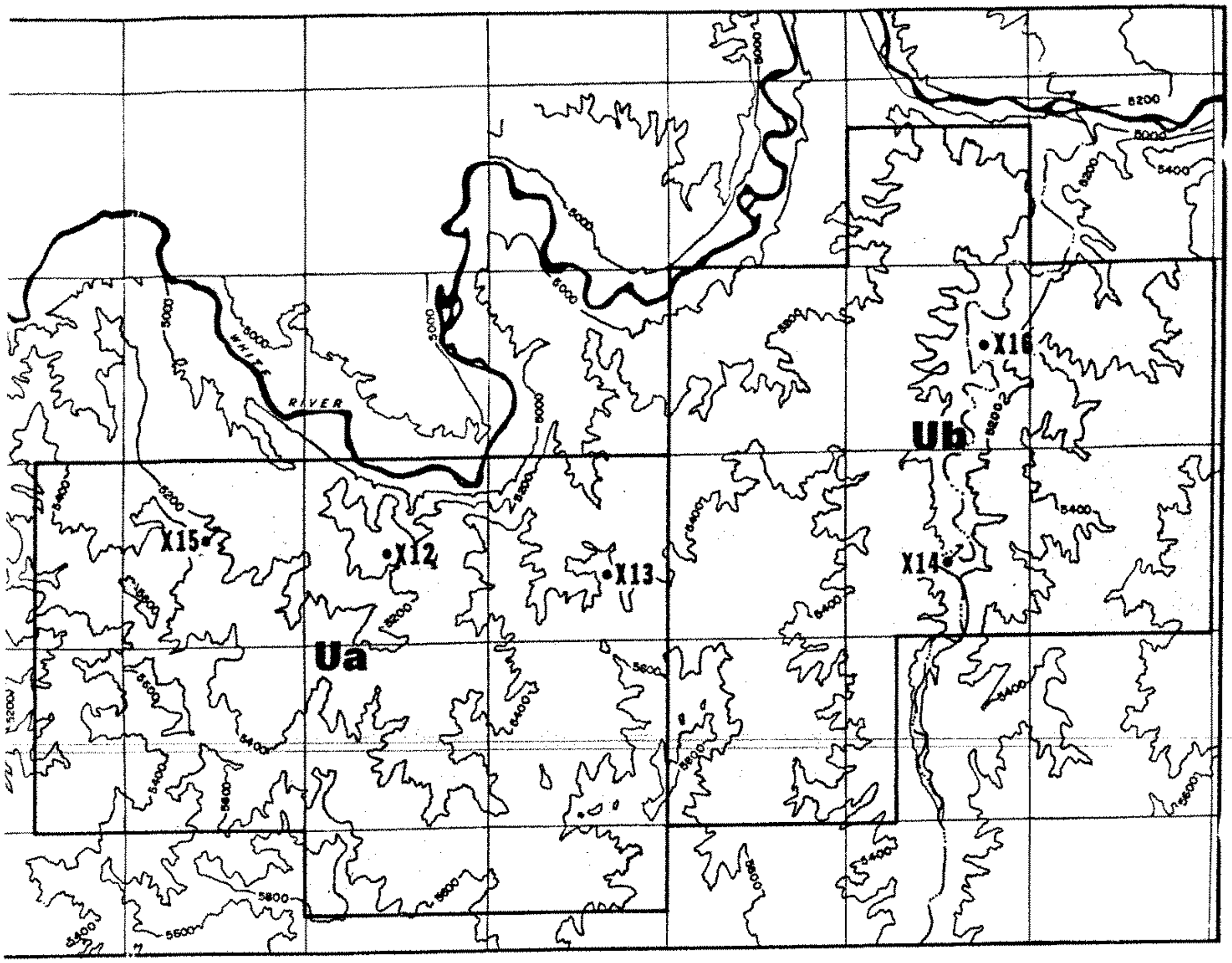
## C. GEOLOGIC EXPLORATION PROGRAM

The original geologic element of the Partial Exploration Plan was approved in November 1974, and the field work was completed in January 1975. Eleven vertical drill and core holes were completed under this element of the plan. The primary purpose of the drilling program was to supplement the existing subsurface hydrologic data, to provide additional resource evaluation data, and to collect core and cutting samples for geochemical analysis. The results of this initial program are reported either in the First Year Environmental Baseline Report or under separate cover to the Area Oil Shale Supervisor (AOSS) and will not be repeated here.

A supplemental exploration program was designed based upon some data gaps in the initial program. This program was approved by the AOSS in February 1976 and will be the topic of discussion in this report. The WRSP, through their contractor, the Cleveland Cliffs Iron Company (CCIC), has reported the results of this program to the AOSS, and the data will be summarized in this report.

### 1. METHODOLOGY

The initial exploration program was supplemented by the drilling of five additional drill and core holes. These are labeled X-12 through X-16 on Figure V-19. Two of the holes, X-14 and X-15, were slant-drilled in a northeast direction at an inclination of about 30°. These holes were




## LEGEND

• GEOLOGIC EXPLORATION CORE HOLE

SLANT-DRILLED CORE HOLE

N
NO SCALE

# DRILL HOLE SITES

SUPPLEMENTAL GEOLOGIC EXPLORATION PROGRAM

FIGURE V-19

continuously cored and were designed to provide data regarding the density and orientation of fracturing with depth. The other three holes were rotary drilled to 18 m (60 ft) above the mining zone to 27.5 m (90 ft) below the mining zone and were designed to provide additional resource evaluation and mining-zone data. Hole X-13 was drilled as an investigation hole for future shaft sinking. All holes were monitored for the quality of water discharged under the conditions of NPDES permits.

## 2. SUMMARY OF RESULTS

In addition to the trace metal analyses determinations made of core samples during the initial program, core was selected from hole X-13 in the intervals 301.34 m to 304.70 m (988 ft to 999 ft), 305.61 m to 327.88 m (1002 ft to 1075 ft), and 312.93 m to 323.0 m (1026 ft to 1059 ft). The amount of antimony, arsenic, boron, cadmium, fluoride, mercury, and selenium in these samples was determined and reported in a December 1976 report from CCIC to the WRSP entitled White River Shale Project Supplemental Exploration Project Report, as follows:

| | Interval 301.32-304.70 m | Interval 305.61-327.88 m | Interval 312.93-323.0 m |
|---|---|---|---|
| Antimony | 0.16 ppm | 0.26 ppm | 0.30 ppm |
| Arsenic | 9.00 ppm | 10.00 ppm | 12.00 ppm |
| Boron | 15.00 ppm | 12.20 ppm | 10.50 ppm |
| Cadmium | 0.10 ppm | 0.15 ppm | 0.13 ppm |
| Fluoride | 1012.00 ppm | 1250.00 ppm | 1325.00 ppm |
| Mercury | 0.10 ppm | 0.06 ppm | 0.12 ppm |
| Selenium | 0.15 ppm | .30 ppm | 0.17 ppm |

## 3. INTERPRETATION AND CONCLUSIONS

Using t-test techniques, CCIC statistically compared the rock chemistry collected during the initial exploration program with that collected from the supplemental program and concluded --

> In 95% of the cases, any further testing would not produce significantly different results and it is recommended that the data on hand be accepted as representative of the general concentrations to be found across Tracts U-a and U-b.

The chemistry and statistical results have been filed with the AOSS.

Tests for nahcolite were determined from core samples when the mineral was identified in the core. Of the 13 holes drilled for the exploration program, 4 contained nahcolite intercepts ranging from 18.3 cm to 0.69 m (0.60 ft to 2.25 ft) and are confined to an interval that lies from 2.7 m to 7.02 m (12 ft to 23 ft) below the Mahogany Marker. The results of the nahcolite testing program prompted CCIC to report --

> The best that can be said is that the distribution of nahcolite in the Mahogany Zone at U-a and U-b appears to be intermittent and the overall occurrence may be described as scarce. As a consequence, the economic importance of the mineral, as compared to the total shale oil potential of the proposed mining zone, is relatively insignificant.

Based upon the results of the slant-hole drilling, CCIC reported --

> In general, the physical competency displayed by the core as it was removed from the core barrel was very good. In particular, inclined fractures are nearly absent and only a few, relatively short vertical fractures were observed.

Gas-monitoring equipment was installed on holes X-12 and X-13 (which are now shut in and fitted with pressure gages), and flow and temperature devices were installed on X-1, X-5, X-9, and X-11. Supplemental grab samples and flow records are being collected from the last four.

## 4. EVALUATION OF BASELINE PROGRAM

Not applicable

# APPENDIX E

## Water Budget Data

## TABLE E- 1
## White River Mine Project Water Needs

| | Rate [gal/day] | Total[a] [gal] | Notes |
|---|---|---|---|
| **Phase 1[b]** | n/a | 84,000 | from ENVIRON 2006 |
| **Phase 2[b]** | n/a | 840,000 | from ENVIRON 2006 |
| **Phase 3** | 380,000 | 4,100,000 | from ENVIRON 2006 |

[a] Water need associated only with the processing of shale. Additional water needs for other purposes not included.

[b] No water rights needed for this phase as stated in the report.

<u>Sources</u>

Environ International Corporation. (ENVIRON) 2006. *Work Plan for Environmental Assessment Research, Development & Demonstration of Oil Shale Recovery Technology, WhiteRiver Mine, Utah.* Prepared for Oil Shale Exploration Company, LLC, Mobile , Alabama. February.

## TABLE E-2
## Water Resources Available in the White River Area

| Precipitation | | | | | Notes |
|---|---|---|---|---|---|
| **Annual Average [in]** | | | | | |
| 10 | | | | | Annual average from 1976-77, FEBR 1977, p. II-5 |
| **Surface Water[a]** | | | | | |
| **Location** | **Low Flow [Aug - Feb] [$ft^3/s$]** | **Medium Flow [Mar - Apr] [$ft^3/s$]** | **High Flow [May - Jul] [$ft^3/s$]** | **Annual Average [$ft^3/s$]** | |
| **White River** | 423.18 ± (182.23) | 638.21 ± (229.34) | 1289.94 ± (845.94) | 675.71 ± (580.31) | Gauge USGS09306500, 1985-2005 data |
| **Evacuation Creek** | 1.29 ± (3.91) | 1.69 ± (1.64) | 2.1 ± (2.80) | 1.56 ± (3.36) | Gauge USGS09306430, 1974-1981 data |
| **Asphalt Wash** | Ephemeral Flow | - | - | 0.22 ± (1.00) | Gauge USGS09306625, 1974-1984 data |
| **Southam Canyon** | Ephemeral Flow | - | - | 0.03 ± (0.08) | Gauge USGS09306610, 1974-1977 data |
| **Hells Hole Canyon** | Ephemeral Flow | - | - | 4.58 | 1975 Average, FEBR 1977, p. I-5 |
| **Groundwater** | | | | | |
| **Aquifer** | **Storage[b] [acre-feet]** | **Discharge[c] [$ft^3/s$]** | **Yield [gal/day]** | | |
| **Bird's Nest Aquifer** | 80,000[d] | 0.129 | 83,369 | | FEBR 1977, pp. II-147,163 |
| **P-2 Upper Aquifer** | n/a | n/a | n/a | | located 75 feet above Bird's Nest, BECHTEL 1981, p. 2-73 |
| **Alluvial Deposits** | n/a | n/a | n/a | | only well AG-6 in lower Southam contains alluvial water, FEBR 1977, p. II-141, II-164, BECHTEL 1981, p. 2-64. |
| **Douglas Creek** | n/a | n/a | 14,400 | | located below Bird's Nest, hundred feets of water bearing material, FEBR 1977, p. II-164;BECHTEL 1981, p. 2-64, 7-70 |

[a] Periods defined in FEBR 1977, p. I-4. Parentheses indicate the standard deviation.

[b] Estimated in area under Tracts U-a, U-b.

[c] Estimated aquifer discharge to the Evacuation Creek. The flow is irregular in the Evaluation Creek and the baseflow does not always correspond to the months that constitute the Low Flow period. As a result, the aquifer discharge has been estimated equal to 10% of the Evaluation Creek Low Flow period rate. Aquifer discharge to the White River occurs but it has not been estimated.

[d] Estimate derived with a storage coefficient of $1.8 \times 10^{-5}$ for confined conditions and a specific yield value of 0.1 for unconfined conditions.

**TABLE E-2**
**Water Resources Available in the White River Area**

Sources
VTN Colorado, Inc. (FEBR) 1977. Final Environmental Baseline Report. Federal Prototype Oil Shale Leasing Program. Tracts U-a and U-b. Utah *White River Shale Project.October.*

Becthel Petroleum Inc. (BECHTEL) 1981. *White River Shale Project. Detailed Development plan. Oil Shale Tracts Ua and Ub, Volume I & Volume II.* August.

Environ International Corporation. (ENVIRON) 2006. Work Plan for Environmental Assessment Research, Development & Demonstration of Oil *Shale Recovery Technology, WhiteRiver Mine, Utah. Prepared for Oil Shale Exploration Company, LLC, Mobile , Alabama. February.*

## TABLE E-3

**Water Availability and Needs in thousands gallons/day**

| | Scenarios[a] | | |
|---|---|---|---|
| | **Low Flow** | **Annual Average** | **High Flow** |
| | **Inputs** | | |
| **Locations** | **Surface Water** | | |
| **White River[b]** | 272,739.06 | 435,767.64 | 832,378.30 |
| **Evacuation Creek[c]** | 750.32 | 924.82 | 1,273.80 |
| **Asphalt Wash** | - | - | - |
| **Southam Canyon** | - | - | - |
| **Hells Hole Canyon** | - | - | - |
| **Total Surface Water** | 273,489.38 | 436,692.45 | 833,652.10 |
| **Aquifers** | **Groundwater** | | |
| **Bird's Nest Aquifer** | 83.37 | 83.37 | 83.37 |
| **P-2 Upper Aquifer** | n/a | n/a | n/a |
| **Alluvial Deposits** | n/a | n/a | n/a |
| **Douglas Creek** | 14.40 | 14.40 | 14.40 |
| **Total Groundwater** | 97.77 | 97.77 | 97.77 |
| **Total Inputs** | 273,587.15 | 436,790.22 | 833,749.87 |
| | **Outputs** | | |
| **Phase 1[d]** | **7.79** | **7.79** | **7.79** |
| **Phase 2[d]** | **77.85** | **77.85** | **77.85** |
| **Phase 3** | **380.00** | **380.00** | **380.00** |

[a] In Annual Average scenario contributions from ephemeral flows are not included.

[b] Evacuation Creek contributions have been substracted.

[c] Contribution of Evacuation Creek is computed as the available flow minus Bird's Nest Aquifer Yield.

[d] Water needs for Phases 1 and 2 have been computed based on the total need asuming same utilization rate as in Phase 3.

## TABLE E-4
## General Lithologic Character and Water-Bearing Properties of Exposed Geologic Units

| Geologic Age | Geologic Unit | Thickness (feet) | Lithologic character | General water bearing properties |
|---|---|---|---|---|
| Quartenary | Uncosolidated Alluvial Deposits | 0-150 | Alluvium, fluvial deposits. Clays, silt, sand, and some gravel. Caliche always found near water table. | Locally saturated in major drainages with slow movement of water. Yield less than 1,000 gallons per minute. |
| Tertiary | Uinta Formation | 0-5,000 | Fluvial deposits. Mostly thinly-bedded siltstone, and fine-grained sandstone and thin volcanic tuff beds. | Not water bearing in many areas where deeply incised by streams. Yields less than 5 gallons per minute to springs. |
| | Parachute Creek Member of the Green River Formation | 500-1,200 | Lacustrine deposits of thinly-bedded calystone, siltstone, fine-grained sandstone, limestone and some tuff. Contains prominent oil-shale deposits. Clays are illite and trioctahedral smectite. Local cavities of evaporite minerals. Laterally continuous. | Minimal overall permeability. Springs generally yield less than 10 gallons per minute. Wells associated with fractures may yield as much as 5,000 gallons per minute. Contains bird's nest aquifer locally. |
| | Douglas Creek Member of the Green River Formation | 200-1,300 | Predominantly marginal lacustrine deposits of calystone, siltstone, fine-grained sandstone, and limestone. Calys most smecrite and illite. Beds commonly are discontinuous. | Permeability varies. Springs yielding as much as 50 gallons per minute to wells. |

Note

Adapted from Holmes and Kimball (1987).

**TABLE E-5**
**Hydraulic Properties of Aquifers**

| Locations | Property | Aquifers | | | |
|---|---|---|---|---|---|
| | | **Alluvial Deposits** | **P-2 Upper** | **Bird's Nest** | **Douglas Creek** |
| **White River** | **Thickness[a] [ft]** | 35-50 | - | - | - |
| **Evacuation Creek** | | 21 | - | - | - |
| **Southam Canyon** | | 40 | - | - | - |
| **P-1** | | - | - | 135 | 650 |
| **P-2** | | - | 30 | 96 | 650 |
| **P-3** | | - | - | 110 | 650 |
| **White River** | **Transmissivity[b] [g/day/ft]** | $10^3$-$10^5$ | - | - | - |
| **Evacuation Creek** | | 10-$10^3$ | - | - | - |
| **Southam Canyon** | | $10^0$-$10^3$ | - | - | - |
| **P-1** | | - | - | 1500 | sandstone and limestone |
| **P-2** | | - | 150 | 75000 | |
| **P-3** | | - | - | 15 | |
| **P-1** | **Hydraulic Conductivity[c] [g/day/ft$^2$]** | - | - | 11.1 | sandstone and limestone |
| **P-2** | | - | 5 | 781.3 | |
| **P-3** | | - | - | 0.1 | |
| **P-1** | **Storage Coefficient[c] [-]** | | - | $3.52 \times 10^{-4}$ | sandstone and limestone |
| **P-2** | | - | $1.34 \times 10^{-5}$ | $6.01 \times 10^{-5}$ | |
| **P-3** | | - | - | 0.1 | |
| **P-1** | **Hydraulic Gradient[d] [ft/mi]** | - | - | 175 | - |
| **P-2** | | - | - | ~0 | - |
| **P-3** | | - | - | 175 | - |

[a] Represents average thickness for the Bird's Nest aquifer and maximum thickness for the other aquifers. (FEBR 1977, p.II-121; BECHTEL 1981, pp. 2-9,19,74)

[b] Estimated values from Freeze and Cherry 1979. Values correspond to alluvium description of the site (fine sand and gravel for White River, fine to medium sand for Evacuation Creek, silt and fine sand for Southam Canyuon) provided in the reports (FEBR 1977, p.II-127,128; BECHTEL 1981, pp. 2-9,19).

[c] (FEBR 1977, pp. II-127,128; BECHTEL 1981, p. 2-74)

[d] (FEBR 1977, p. I-7)


Sources

VTN Colorado, Inc. (FEBR) 1977. *Final Environmental Baseline Report. Federal Prototype Oil Shale Leasing Program. Tracts U-a and U-b. Utah White River Shale Project.* October.

Becthel Petroleum Inc. (BECHTEL) 1981. *White River Shale Project. Detailed Development plan. Oil Shale Tracts Ua and Ub, Volume I & Volume II.* August.

Environ International Corporation. (ENVIRON) 2006. *Work Plan for Environmental Assessment Research, Development & Demonstration of Oil Shale Recovery Technology, WhiteRiver Mine, Utah.* Prepared for Oil Shale Exploration Company, LLC, Mobile , Alabama. February.

**TABLE E-6**
**Summary of Estimated Groundwater Storage and Recoverable Water in Storage in Alluvial Aquifers near the Site**

| Drainage basin | Area of saturated alluvial deposits (acres) | Average thickness of saturated alluvial deposits (feet) | Volume of saturated alluvial deposits (acre-feet) | Estimated average porosity (percent) | Estimated specific yield | Volume of water in storage (acre-feet) | Volume of recoverable water in storage (acre-feet) |
|---|---|---|---|---|---|---|---|
| Bitter Creek | 4,300 | 40 | 172,000 | 50 | 0.05 | 86,000 | 8,600 |
| Evacuation Creek | 1,800 | 21 | 37,800 | 40 | 0.05 | 15,100 | 1,890 |
| White River | 6,100 | 32 | 195,000 | 30 | 0.02 | 58,500 | 39,000 |
| **Total** | | | **404,800** | | | **159,600** | **49,490** |

## TABLE E-7
## Summary of Groundwater Budget for the Bird's-Nest Aquifer

| **Component** | **Long-term average (acre-ft per year)** |
|---|---|
| Recharge | |
| Infiltration from Evacuation Creek | 420 |
| Downward leakage from Uinta Formation | 250 |
| Upward leakage from Douglas Creek aquifer | Insignificant |
| Precipitation falling on the outcrop area | Insignificant |
| **Total** | **670** |
| Discharge | |
| Upward leakage to White River and associated alluvial aquifer | 30 |
| Upward leakage to Bitter Creek and associated alluvial aquifer | 640 |
| **Total** | **670** |

Note

Adapted from Holmes and Kimball (1987).

## TABLE E-8
## Water Availability for Different Hypothetical Scenarios

| Assumptions | Scenario 1[a] | Scenario 2[b] | Scenario 3[c] | Scenario 4[d] | Scenario 5[e] | Scenario 6[f] |
|---|---|---|---|---|---|---|
| **Well Location** | **White River Alluvium** | **White River Alluvium** | **White River Alluvium** | **Bird's Nest at P-2** | **Bird's Nest at P-2** | **Bird's Nest at P-2** |
| **River Boundary** | White River | White River | White River | White River | Evacuation Creek | - |
| **Hydraulic Conductivity[g] [ft/sec]** | 0.0164 | 0.0164 | - | 0.0012 | 0.000033 | 0.0012 |
| **Well Radius [ft]** | 0.5 | 0.5 | - | 0.5 | 0.5 | 0.5 |
| **Distance from River Boundary [ft]** | 250 | 250 | - | 1500 | 20000 | - |
| **Aquifer Thickness[h] [ft]** | 30 | 30 | 30 | 96 | 96 | 96 |
| **Initial Hydraulic Head[i] [ft]** | 30 | 30 | - | 336 | 336 | 336 |
| **Steady State Drawdown [ft]** | 1.1 | 0.55 | - | 326 | 326 | - |
| **Well Yield [gal/min]** | 263.9 | 263.9 | 660 | 6087.2 | 138.8 | 550 |
| **Assumed Well Losses** | 20% | 20% | - | 50% | 50% | - |
| **Time Until Meeting Phase 3 Water Needs[j] [days]** | 10.8 | 10.8 | 4.3 | 0.5 | 20.5 | 5.2 |
| | **Input - Output** | | | | | |
| **Available Water [gal/day]** | **380,000** | **380,000** | **952,286** | **8,770,000** | **200,000** | **785,714** |
| **Phase 3 Water Needs [gal/day]** | **380,000** | **380,000** | **380,000** | **380,000** | **380,000** | **380,000** |
| **Water Surplus [g/day]** | **0** | **0** | **572,286** | **8,390,000** | **-180,000** | **405,714** |

Notes

[a] Derived assuming steady state pumping of fully penetrated well in unconfined aquifer.

[b] Derived assuming two fully poenetrated wells separated by 500 ft are pumping in unconfined aquifer. The well yield reflects the sum of the flow rates.

[c] Maximum well yield observed by Hood et al. (1976).

[d] Most optimistic scenario. Assumed that Bird's Nest Aquifer is connected with White River at location P-2. Derived assumed steady state pumping of fully penetrated well in confined aquifer with constant hydraulic head at the White River.

[e] Derived assuming no connection of Bird's Nest Aquifer with the White River. A constant head was assumed at Evacuation Creek. Derived assuming steady state pumping of fully penetrated well in confined aquifer.

[f] Derived assuming pumping equal to rate used in the P-2 Lower pumping test, FEBR 1977.

## TABLE E-8
## Water Availability for Different Hypothetical Scenarios

[g] Hydraulic conductivity for White River Alluvium scenarios was assumed based on description provided in FEBR (1977). Values for scenarios 4 and 6 were referenced in FEBR (1977) and BECHTEL (1981). Value for scenario 5 was derived assuming an effective hydraulic conductivity derived for a domain that has a hydraulic conductivity value equal to the value reported at P-2 for its first half and a value equal to the value reported at P-1 (FEBR, 1977; BECHTEL 1981).

[h] (FEBR 1977, p.II-121; BECHTEL 1981, pp. 2-9,19,74; Holmes and Kimball, 1987).

[i] Based on contours on the ground water surface of the Bird's Nest Aquifer provided in FEBR 1977, p. II-125.

[j] Derived assuming Phase 3 total needs presented in Table 1.

<u>Sources</u>


Hood, J. W.., Mundorff, J. C., and D. Price, 1976. *Selected Hydrologic DataUinta Basin Area, Utah and Colorado.* U.S. Geological Sururvey, Water Resources Investigations, 80-951, 90 p.

VTN Colorado, Inc. (FEBR) 1977. *Final Environmental Baseline Report. Federal Prototype Oil Shale Leasing Program. Tracts U-a and U-b. Utah White River Shale Project.* October.

Becthel Petroleum Inc. (BECHTEL) 1981. *White River Shale Project. Detailed Development plan. Oil Shale Tracts Ua and Ub, Volume I & Volume II.* August.

Holmes, W. F. and B. A. Kimball 1987. *Ground Water in the Southeastern Uinta Basin, Utah and Colorado.* U.S. Geological Sururvey, Water-Supply Paper 2248.

**Figure 1**
**Measured montly flow rate averages in the White River**
**near Watson, Utah (USGS Station Number 09306500)**

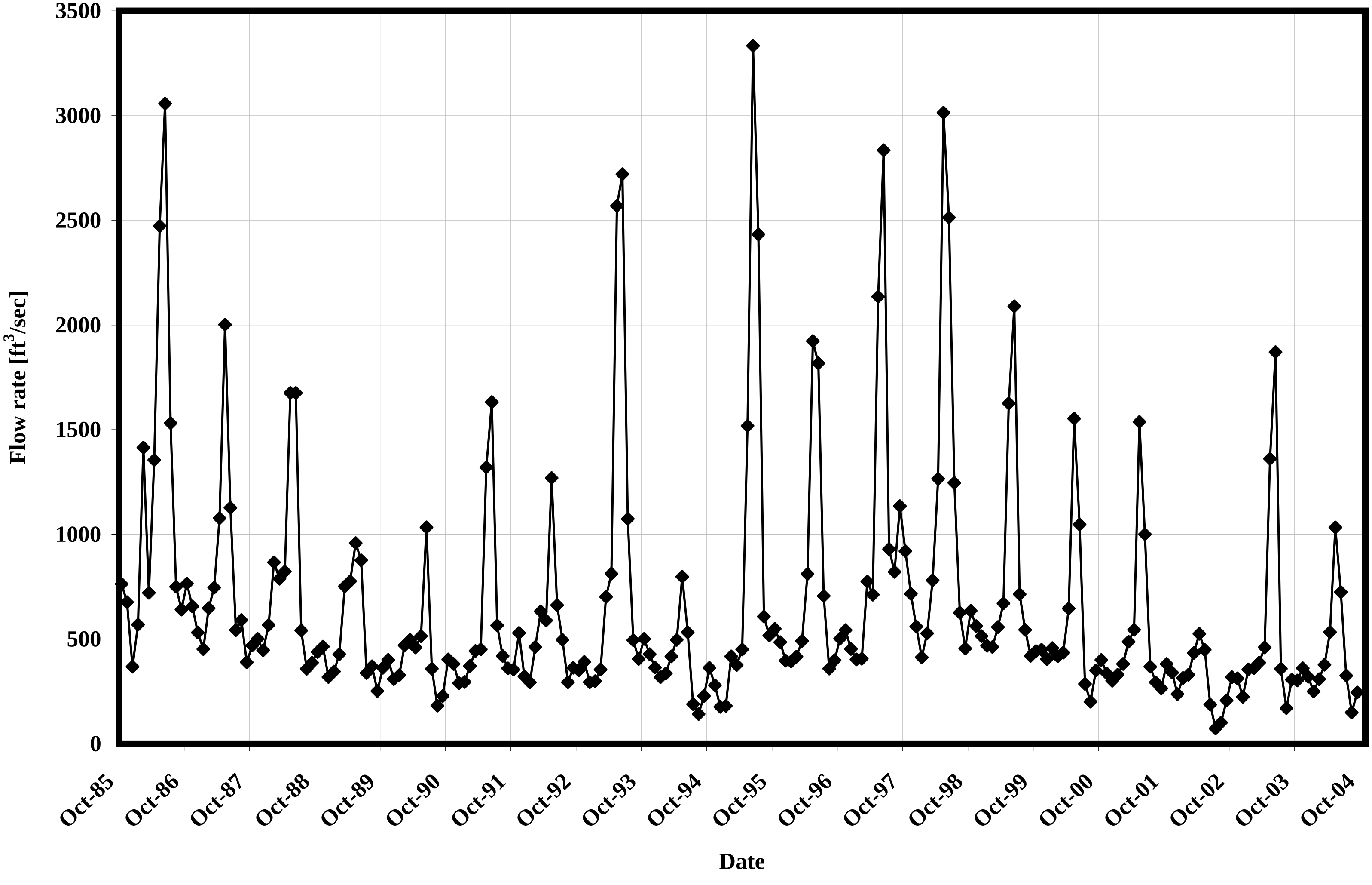
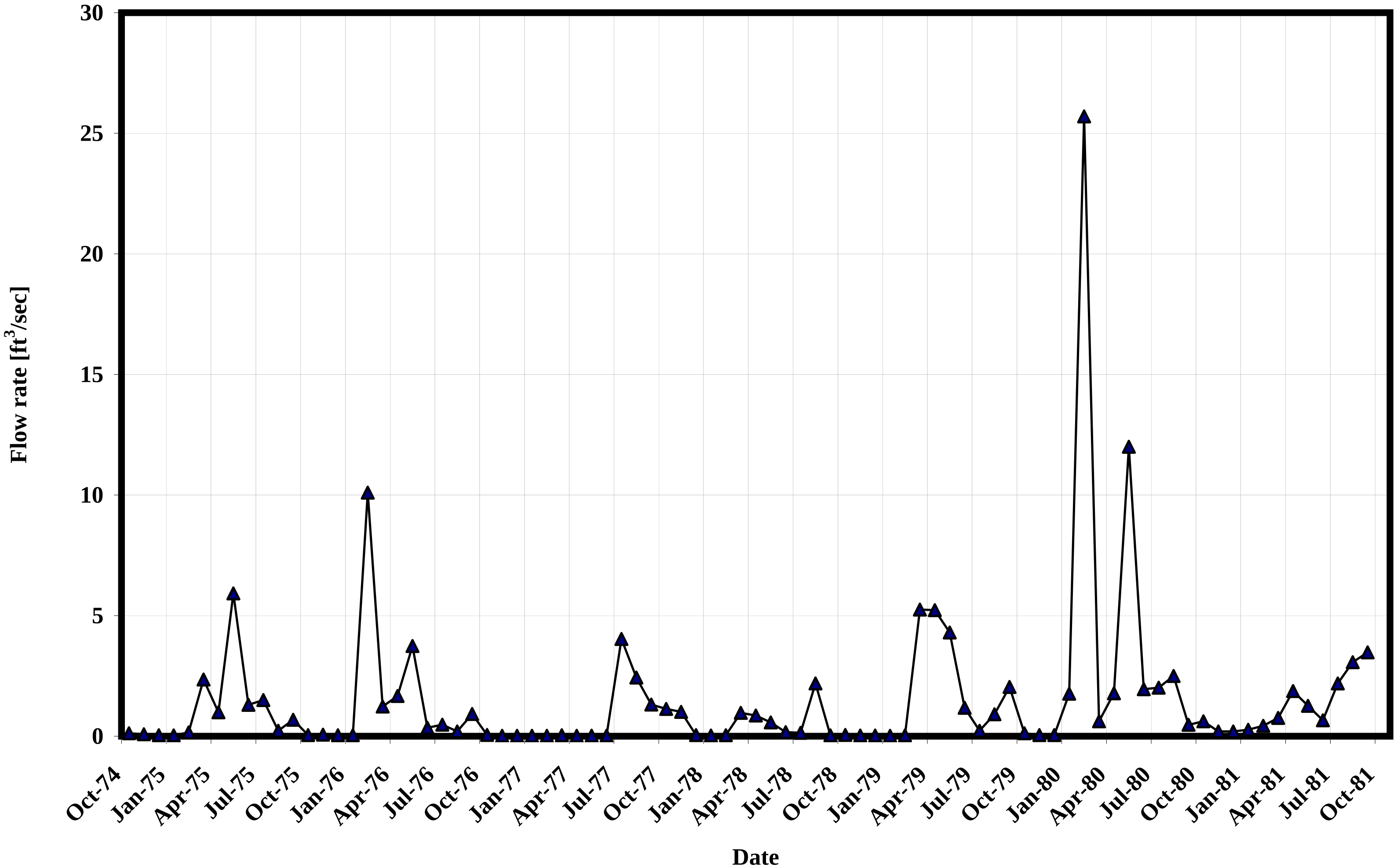


**Figure 2**
**Measured monthly flow rate averages in the Evacuation Creek at Watson, Utah, near mouth of creek (USGS Station Number 09306430)**



# A P P E N D I X F

## Responses to Comments Received on Draft EA

**Responses to Comments Received on Draft EA**

As noted in Section 5, a total of 9 individuals, groups or agencies submitted comments by letter, fax and Internet response. All comment letters were reviewed, and most comments fell within general topics or 'themes'. Eleven themes were identified that encompassed the majority of the comments. The themes, and the number of comments that were categorized within the themes, are as follows:

NEPA process
Regulatory/Permitting
Air Emissions
Spent Shale Handling and Disposal
Water Resources
Wildlife/Ecology
Floodplains/Wetlands/Wild& Scenic Rivers
Socio-economics
Cumulative Impacts
ATP System/Viability of Technology
General/Miscellaneous

A summary of the comments is provided below. The person, organization, or agency that provided the individual comments is also identified. Responses follow the comments. In most cases, responses are provided for each specific comment. In other instances, a response is provided for a group of comments.

**NEPA Process**

1. Purpose and need too narrowly defined because it does not include potential conversion of RD&D lease to commercial lease. – *Southern Utah Wilderness Alliance*

2. Range of alternatives is inadequate because it omits alternatives such as other potential process technologies, not reopening the mine, other RD&D proposals. – *Southern Utah Wilderness Alliance*

3. The proposed project requires an EIS. Phase 3 is essentially a commercial operation and OSEC will not commence Phase 3 unless it has already decided to lease 4,960 acres for commercial operation. – *Southern Utah Wilderness Alliance*

4. All of the proposed RD&D leases should be evaluated in one EIS, which should be prepared before any leases are issued. Significance should be measured by total potentially recoverable resource and not by analyses which focus on separate RD&D projects. This approach avoids failure to consider cumulative impacts. – *Southern Utah Wilderness Alliance*

5. Adoption of regulations for RD&D program requires EIS. – *Southern Utah Wilderness Alliance*

6. Should consider same project on another site as an alternative. – *Utah Rivers Council*

*General Response: A number of commenters asserted that NEPA requires that the proposed White River Mine RD&D lease, other similar proposed leases, and the RD&D leasing program should be addressed in an EIS. Some also noted that the development of regulations for the RD&D program required an EIS. The commenters failed to cite adequate legal or factual authority requiring such an EIS or demonstrating that the proposed FONSI for the White River Mine RD&D lease will violate NEPA.*

*Additional commenters asserted that the NEPA analysis for the proposed White River Mine RD&D lease should include the potential impacts of commercial development of such lease but without providing any reason why NEPA requires such an analysis at this stage of the decision-making. Such comments seemed to assume without support that granting the proposed White River Mine RD&D lease would result in granting OSEC a lease for commercial development as well. However, the Federal Register notice soliciting oil shale RD&D proposals clearly noted that BLM will not grant such a commercial development lease unless and until it can be demonstrated that OSEC's proposed processing of oil shale at this site is commercially feasible and BLM determines that, based on further environmental review, commercial-scale operations can be conducted without unacceptable environmental consequences. NEPA analysis will occur prior to that separate decision, at which time additional relevant information will have been developed as a result of the RD&D project. Further, Congress has required and that the BLM is in the process of preparing an EIS for commercial development of oil shale.*

*Some commenters also asserted that the EA contains an inadequate alternatives analysis. However, such additional proposed alternatives are either beyond the scope of the decision-making or were not described by the commenters in sufficient detail to permit any analysis. For example, one commenter stated that other types of processes should be analyzed as alternatives. Another commenter's comments consisted almost exclusively of a comparison between OSEC's ATP process and another particular type of oil shale processing. However, the process for the proposed White River Mine RD&D lease has already been selected and presented to BLM by OSEC. Moreover, other types of processes are in fact under consideration for RD&D leases at other sites which are also undergoing NEPA review.*

*Another commenter suggested that another site for the RD&D project proposed by OSEC should have been considered but failed to identify any other such site. As explained in the EA, the proposed White River Mine RD&D site is under consideration due to the existence of the White River Mine which in fact will reduce environmental impacts.*

7. BLM has abdicated its responsibility by letting OSEC determine environmental control required for spent shale – *Southern Utah Wilderness Alliance*

*Response: The environmental controls to be required for the spent shale will be approved by BLM as well as other regulatory authorities. The spent shale will be* *isolated from any potential surface water and ground water until it is demonstrated that the shale is environmentally benign. BLM has provided requirements that ensure that the handling and disposal of spent shale are managed such that impacts to the environment are minimized. BLM has strictly adhered to its regulatory responsibilities throughout the EA process. Stipulations in the lease and the permit conditions will mandate OSEC compliance.*

8. EA relies too much on information to be developed during the process, for example permitting and results of operation of ATP process – *Southern Utah Wilderness Alliance*

*Response: Research, Development and Demonstration projects, by their very nature, deal with a certain degree of uncertainty until the initial phases of work are completed. Therefore, the proposed action is specifically designed with a phased approach which will allow the information gathered during the initial phases to be used in subsequent phases. Nonetheless, the EA is the appropriate approach for evaluating potential environmental impacts and is adequate for the NEPA process.*

9. BLM should not rely on mitigation to support FONSI, because terms of the lease have not been disclosed and mitigation discussed in EA is too vague. This also prevents public from determining effectiveness of proposed mitigation. – *Southern Utah Wilderness Alliance*

*Response: The discussion of applicant-committed measures and mitigation in the EA is not vague. For example, the discussion of air emissions anticipated in Phase 3 states specifically that a PSD permit will likely be required, describes potential control mechanisms that may be employed, and then estimates the level of emissions likely under such a permit. Similarly, the proposed mitigation for invasive species identifies nine specific actions that will be taken to prevent invasion of nuisance plant species. As to the lease terms, BLM published the proposed oil shale RD&D lease on June 9, 2005, 70 Fed. Reg. 33753. Therefore, although the final lease terms for this site have not been published, the published proposed lease provides adequate indication of the lease terms to be employed.*

**Regulatory/Permitting**

1. BLM should not preempt regulatory authority of state surface managing agencies. – *Center for Water Advocacy*

*Response: A number of regulatory programs may be applicable to the granting of the proposed White River Mine RD&D lease and operations at the site and OSEC will be required to comply with all of those which are applicable. Please note that due to the RD&D project being within the exterior boundaries of the Uintah and Ouray Reservation, air and water permitting falls under EPA jurisdiction.*

2. BLM should require compliance with local and county requirements. – *Center for Water Advocacy*

3. Generally supportive of project as long as it is subject to environmental regulation and water consumption is not subsidized. – *Eric Lauber*

4. Mining activities are subject to rules regulating fugitive emissions. - *Utah Resource Development Coordinating Committee*

5. On-site crushing of stone, use of compressor, or use of pump will require air permit application. – *Utah Resource Development Coordinating Committee*

*General Response: As with the NEPA process, a number of commenters addressed the issue of identifying the regulatory programs which may be applicable to the proposed White River Mine RD&D lease. Many of these in fact came from agencies of the State of Utah. However, most of these comments did not appear to be asserting that either the regulatory or environmental impacts analysis in the EA was inadequate for purposes of NEPA. As stated in the EA (pp. 7-10) a number of regulatory programs may be applicable to the granting of the proposed White River Mine RD&D lease and operations at the site and OSEC will be required to comply with all of those which are applicable as well as requirements imposed by BLM pursuant to the lease terms, the plans of operations, and BLM regulations. None of the regulatory comments noted any specific omission in this discussion. To the extent that such comments addressed specific types of environmental impacts (e.g., air), they are addressed below in the specific subject matter sections.*

6. Best management practices must be followed to avoid erosion sediment load to surface waters. OSEC should prevent increase in turbidity, effects on any potential fish spawning areas, and decrease in stream flow in the White River. Storm water and construction dewatering permits may be required. Permits may be required for construction and operation of the wastewater treatment facility. A permit may be required for discharge of wastewater. Water quality must be protected as part of reclamation. – *Utah Resource Development Coordinating Committee*

*Response: As described in the applicant-committed measures section (2.2.5), several actions are included in the proposed action to prevent/mitigate any increases in turbidity and effects on fish spawning. Importantly, it should be noted that there is to be no discharge of any water generated by the project to any surface water body. Rather, any water that meets applicable water quality standards will be discharged to the retention dam area where it will either evaporate or percolate into soils. As such, there will be no water discharges from the dam and no sediment loading to surface waters from on-site activities. Further, during the processing phase, all, or nearly all connate water generated, will be used to cool/moisten the spent shale, rather than be discharged to the environment. Sour water in Phase 2 will be trucked from the site for off-site disposal. During Phase 3, it is expected that sour water will be treated and used on site. During construction of off-site utilities, the EA does describe applicant-committed best management practices that will minimize potential erosion-related sediment loading to nearby surface waters.*

*As to decreases in flow in the White River, the peak water usage during Phase 3 would result in less than a 0.2% change in flow in the White River under low flow conditions, if the alluvial wells or direct withdrawal of surface water are the source of water. This would result in an essentially imperceptible change (<0.01 foot) in stage level in the White River. Phase 3 operations will continue for approximately two years.*

*As described in the EA, all necessary permits, including any necessary storm water and wastewater discharge permits, will be obtained prior to the commencement of any activities requiring such permits. Surface water and ground water quality will be protected throughout the three phases of the project and during reclamation.*

7. Water rights will be required for retention dam and diversion from White River. – *Utah Resource Development Coordinating Committee*

*Response: As described in the EA, the applicant will obtain/maintain the required water rights for the retention dam and any withdrawals from the White River or pumping from the Birds Nest Aquifer.*

**Air Emissions**

1. Even controlled air emission sources will result in emission of pollutants, causing unspecified health and visibility problems. – *Center for Water Advocacy*

*Response: As noted in the EA, the Proposed Action will result in emissions to the atmosphere. Consequently, to evaluate the potential impacts of the emissions, screening modeling was conducted for Phases 2 and 3, consistent with the methodology used in Prevention of Significant Deterioration (PSD) modeling to determine whether emission sources have a "significant impact," and would cause an exceedance of the National Ambient Air Quality Standards (NAAQS). The modeling showed that the project-related air emissions will not cause exceedances of the NAAQS. Operations during Phase 2 will be used to ensure that the appropriate technologies are used. The control efficiencies and the resultant estimated emissions in the EA are reasonable for the RD&D program.*

2. Mining activities are subject to rules regulating fugitive emissions. - *Utah Resource Development Coordinating Committee*

*Response: OSEC has committed to complying with all applicable permitting and air emission control requirements. Please note that due to the RD&D project being within the exterior boundaries of the Uintah and Ouray Reservation, air and surface water discharge permitting falls under EPA jurisdiction.*

3. On-site crushing of stone, use of compressor, or use of pump will require air permit application. – *Utah Resource Development Coordinating Committee*

*Response: See response to # 2 above.*

4. Lack of analysis of cumulative impacts of air emissions. - *Megan Williams*

*Response: The EA did provide an analysis of the cumulative impacts of air emissions including the PSD increment analysis (Table 4-18 of the OSEC EA). As described in the EA, the Vernal Planning Area (8667 sq. miles) was designated by the BLM as the area of concern for the evaluation of all cumulative impacts, including air emissions. The EA fully covered the potential cumulative impacts for air quality in and around the Vernal Planning Area. OSEC obtained an inventory of sources from the Utah DAQ and EPA prior to conducting the SCREEN3 model. The only additional source identified was the nearby Bonanza Power Plant. The impact of these emissions was included in the model. Several of the areas noted by the commenter (e.g., Wyoming and various areas in Colorado) are a significant distance from the proposed project. BLM thus determined that it is not necessary to include these areas in the cumulative impacts analysis for this project.*

*Also, the closest Class I areas are discussed in Section 3.3 of the OSEC EA – Flat Tops Wilderness Area and Arches National Park, as is Dinosaur National Monument (sensitive area). Additional Class I areas other than those discussed in the EA are beyond 100 km distance from the project and outside of the Vernal Planning Area. Given the characteristics of the emission sources (i.e., low stack height, low stack temperatures and velocities, low emissions), emissions are anticipated to have low buoyancy and therefore not travel long distances. Impacts to Class I areas will be negligible.*

5. The estimation of air impacts omitted potential sources such as storage tanks, shale crushing, diesel combustion and unpaved roads in the modeling. This resulted in most of the $NO_x$ and PM emissions being omitted. Same comments with respect to mobile sources. - *Megan Williams*

*Response: Estimates of the expected emissions from all of the cited sources are provided in the EA. However, consistent with the methodology used in Prevention of Significant Deterioration (PSD) modeling to determine whether emission sources have a "significant impact" and would cause an exceedance of the National Ambient Air Quality Standards (NAAQS), certain sources were not included in the screening modeling conducted for Phases II and III. Point sources of emissions are included in the model while fugitive and mobile emission sources were not included. Because the screening modeling used is conservative, it is likely that, even if these additional sources had been used in a more sophisticated modeling approach, the overall estimated impacts would be no greater than those indicated by the screening modeling.*

6. No quantification of emissions of particulate matter with aerodynamic diameter of less than 2.5 microns ($PM_{2.5}$) and therefore no analysis of compliance with $PM_{2.5}$ NAAQS. $PM_{2.5}$ will result from all combustion sources at project and fugitive dust sources. - *Megan Williams*

*Response: While $PM_{2.5}$ NAAQS have been promulgated, regulatory requirements for sources have not yet been established for $PM_{2.5}$. EPA has not yet established an* *implementation plan to achieve $PM_{2.5}$ NAAQS in Federal/Tribal areas that do not meet the NAAQS. In addition, EPA has not established the "significance level" for $PM_{2.5}$. This "significance level" will be established by EPA for PSD modeling purposes to determine which projects are significant, and require NAAQS modeling. Further, emission factors are not yet available for modeling $PM_{2.5}$ emissions from several of the sources.*

*It should be noted that the $PM_{10}$ levels are very low and even if it is assumed that all $PM_{10}$ emissions were in the form of $PM_{2.5}$ emissions, the levels would be orders of magnitude below the $PM_{2.5}$ NAAQS (1.3% of the 24 hour standard and 1.1% of the annual standard). Therefore, further evaluation of $PM_{2.5}$ emissions is not necessary for this EA.*

7. The EA also lacks analysis of $PM_{10}$ and flaring emissions, as well as from diesel combustion, some of which sources may lack built-in controls. - *Megan Williams*

*Response: The EA does in fact include detailed analysis of both $PM_{10}$ and flaring emissions. It should be noted that there was an error in the unpaved road $PM_{10}$ calculation because an incorrect value was pulled from the AP-42 tables for the silt content. The worse-case emissions should be 0.48 tons for Phase II and 167.66 tons for Phase III. The EA has been corrected to reflect these emissions estimates. As stated in the EA, however, OSEC has committed to using wet suppression techniques to reduce PM emissions from on-site activities.*

*The flare will only operate for short periods of time during startup, shutdown, and upset situation when the process off-gases will not be consumed in the process or process heaters. Therefore, flare emissions will be relatively minor. For purposes of the EA, flare operations were assumed to be approximately 50% of the time, which is highly conservative (page 100 of the EA). The estimated emissions from flaring are based on test data from a similar ATP processor used in Calgary. Based on that data, emissions of $NO_x$ and $SO_2$ are estimated to be insignificant.*

*The emissions estimate for diesel combustion was based on information using emission factors from a recent vintage diesel generator. It is anticipated that such a recent vintage engine will be used for the on-site diesel generators. In addition, the calculation in the EA generated conservative emissions estimates because it was assumed that much of the fuel would be consumed in the diesel generator when, in fact, much of it will be used in on-site trucks (specifically in Phase III) that will likely have more stringent on-road emission standards than the generator. Therefore, the emissions calculated for diesel fuel use are conservative.*

8. BLM should not assume that emissions will meet control limits if such limits are not imposed by BLM. - *Megan Williams*

*Response: As noted in the EA (p. 37), OSEC is committed and required to meet all EPA permitting and air emissions control requirements. The purpose of the RD&D program is to collect operational data and demonstrate that the ATP process will work on Utah oil* *shale at a commercial level. As such, during Phase 2, OSEC will be implementing the technology that will be likely used in Phase 3. Phase 3 will be subject to PSD permitting and Best Available Control Technology (BACT). Currently, it is assumed that BACT will be acid gas scrubbing for sulfur dioxide ($SO_2$) removal and oxidation or combustion for carbon monoxide (CO) and volatile organic compounds (VOC) control. Phases 1 and 2 will be trial and demonstration for Phase 3 and therefore, will incorporate, as far as practical, the same emission control technology as for Phase 3. Therefore, the control efficiencies and the resultant estimated emissions in the EA are reasonable for the RD&D program.*

9. Air modeling was inadequate, due to lack of input from other sources (especially electric utilities) in the area and failure to meet certain specifications regarding meteorological data. - *Megan Williams*

*Response: The air modeling presented in the EA was adequate. As noted in the EA and above, the screening modeling that was completed does include data relative to the Bonanza Power Plant, is very conservative (i.e., tends to overestimate potential impacts) and use of a more sophisticated modeling approach would likely show that the actual expected impacts are less than those projected from the screening model. Responses to specific comments are provided below.*

*i. Impacts within the lease site*

*Based on the industrial activities that will be taking place on the 160-acre lease property, access to these areas by the general public will be restricted. Given this restricted access and because air permit modeling typically uses the property boundary as a compliance point,, the modeling was conducted to determine maximum impacts beyond the lease property boundaries.*

*ii. Background concentrations not considered*

*Background concentrations were considered in the cumulative impacts analysis summarized in Table 4-17.*

*iii. Other modeling comments*

*See Responses to #4 and #5 above.*

10. Inadequate cumulative analysis of impacts to Class I areas. Numerous such areas were omitted from the analysis. - *Megan Williams*

*Response: See Response to #4 above.*

11. EA lacks analysis of ozone impacts due to light alkaline hydrocarbons and methane produced from oil and gas projects. - *Megan Williams*

*Response: First, it should be noted that methane is not considered a significant cause of ozone formation and is an exempt compound from regulation. Second, the lease site has been designated as in attainment for the 8-hour ozone NAAQS. The relatively insignificant emissions of $NO_x$ and VOC from the project presented on Tables 4.4 and 4.8 will not affect the ozone attainment designation.*

12. EA lacks analysis of HAP, and $CO_2$ and greenhouse gas emissions. - *Megan Williams*

*Response: Estimates of hazardous air pollutant (HAP) and $CO_2$ and other greenhouse gas emissions are provided in Tables 4-4 through 4-8. As shown in Tables 4-4 and 4-6, HAP emissions for Phases II and III are relatively insignificant, well below the HAP major source threshold of 10 tons/year of any individual HAP or 25 tons/year of combined HAPs. Therefore, HAP impacts are anticipated to be relatively insignificant. Regarding greenhouse gas emissions, OSEC proposes to research potential opportunities to reduce and/or capture and sequester $CO_2$ emissions from the process.*

13. There is no cumulative air impact analysis from off-site activities such as transport to the crushing site and for crushing, as well as transport of shale to third parties. - *Megan Williams*

*Response: The off-site crushing and screening facility that will be used by OSEC during Phase I is already permitted, and the emissions from these operations are included in the state inventory and background concentrations of particulate matter. A qualitative discussion of the relatively small incremental increase in the volume of truck traffic that would occur by transport of the oil shale to off-site locations is provided in the EA (e.g., less than 40 truck loads of shale will be transported off-site for Phase 1 testing). Given the very small number of trucks involved relative to the overall volume of truck traffic on state and interstate highways, a quantitative evaluation was not deemed necessary.*

14. The EA should affirm the need to obtain a PSD permit using BACT prior to constructing Phase 3. - *USEPA*

*Response: BACT analysis will be required in order to obtain a PSD permit for Phase 3. Language has been added to the EA to state explicitly that BACT will be installed that complies with the PSD requirements based on BACT analysis.*

15. Controlled emissions were based on 95% control and a baghouse for PM. - *USEPA*

*Response: No response necessary.*

16. EPA may require more refined models and additional meteorological data for PSD modeling purposes during permitting. - *USEPA*

*Response: As EPA states, the EA does disclose that more refined PSD modeling will be needed during PSD permitting. In addition, ambient air monitoring data will be required to be collected during this process. OSEC is in discussions with the EPA to assess what* *requirements are needed for the PSD permit, including the availability of ambient monitoring data for background.*

17. Please discuss potential impacts of the project on ambient ozone concentrations. - *USEPA*

*Response: The lease site has been designated as in attainment for the 8-hour ozone NAAQS. The relatively insignificant emissions of* $NO_x$ *and VOCs from the project will not significantly affect the ozone attainment designation. If we assume that all the* $NO_x$ *and VOC emissions in Phase III (Table 4-7) were to equate to* $O_3$*, the resulting concentration would be only 9.7% of the NAAQS for the 8-hr* $O_3$ *(157 ppm).*

18. Provide further information on potential impacts to AQRVs. - *USEPA*

*Response: As suggested by the EPA, OSEC conducted worst-case analysis of the air quality related values for Phases I and II. The plume visual impact screening and analysis model used, VISCREEN, is a conservative model that assumes worst-case meteorological conditions such as extremely stable atmospheric conditions, low wind speed and a plume directly adjacent to the observer. Results from this model indicate that emissions from Phase I and II will not negatively impact the Class I areas (Flat Tops Wilderness and Arches National Park) and Class II area (Dinosaur National Monument) identified in the EA. For Phase III, OSEC will be required to obtain a PSD permit which entails conducting more refined visibility impact modeling using CALPUFF than is possible using VISCREEN. Through refined modeling, actual meteorological data will be used as well as updated emission estimates based on information gained during Phases I and II. OSEC has committed to complying with the requirements under PSD to obtain the required permit which includes complying with visibility impact thresholds for Class I areas.*

19. Recommend considering opportunities for capturing and using methane on-site. In addition, recommend reporting GHG emissions as carbon equivalences per barrel. - *USEPA*

*Response: OSEC plans to explore options for capturing* $CO_2$ *during Phase III of the RD&D project. Methane emissions from the mine are expected to be negligible. In addition, as recommended, the reported GHG emissions for Phases II and III are 0.42 and 0.11 carbon equivalence/barrel of shale oil produced for 6,000 bbls and 1.8 million bbls, respectively. The emission estimates assume the* $CO_2$ *emissions will increase proportionally for the ATP from a 4 ton/hr unit to a 250 ton/hr unit. However, a greater amount of shale oil will be obtained during Phase III relative to the size of the unit compared to that in Phase II and thus, the carbon equivalence/barrel is lower during Phase III. Data gained during Phase II will assist in refining the* $CO_2$ *emissions expected during Phase III.*

20. Please verify the values of $PM_{10}$ emissions in Table 4-3, 4-4 and 4-7. - *USEPA*

*Response: As commented on by the EPA, there was an error in the unpaved road $PM_{10}$ calculation in Table 4-4 and 4-7. The worst-case emissions should be 0.48 tons for Phase II and 167.66 tons for Phase III. An incorrect value was pulled from the AP-42 tables for the silt content. The EA has been corrected to reflect these emissions estimates. The $PM_{10}$ emissions for truck loading and unloading of uncrushed oil shale in Table 4-3 is based on an emission factor provided in AP-42 Chapter 11.19.2 which provides an emission factor of $1.6 \times 10^{-5}$ lb $PM_{10}$/ton of material. As stated in the EA, however, OSEC has committed to using wet suppression techniques to reduce PM emissions from on-site activities.*

**Spent Shale Handling and Disposal**

1. Unclear comments about pit mining and volume of spent shale (not all of which are relevant to project). – *Center for Water Advocacy*

*Response: There will be no pit mining conducted as part of the OSEC RD&D Proposed Action. All mining activity will occur in the existing underground White River Mine. Therefore, comments or concerns with the potential impacts of pit mining are not relevant. It is acknowledged that a large volume of spent shale will be generated during Phase 3 of the proposed action. The EA adequately discusses and describes the potential environmental impacts of spent shale disposal.*

2. Revegetation of spent shale has not been demonstrated and is likely to be unsuccessful. – *Center for Water Advocacy*

*Response: The Proposed Action calls for the stripped topsoil removed from the spent shale disposal area to be placed back over the spent shale disposal pile at the conclusion of the disposal activities. Further, beginning in Phase 1 and progressing through Phase 2, OSEC will be characterizing the spent shale chemically, mineralogically, and physically. This research will entail leaching tests, compaction tests, and agronomic tests, both in the lab and in the field at the White River Mine site. This research work will then be incorporated into the design and permit requirements for the larger Phase 3 program. The agronomic testing will specifically address how to best revegetate the spent shale disposal area.*

3. Shale processing waste will contaminate surface and ground waters with metals, organics, and salinity. - *Center for Water Advocacy*

*Response: The OSEC Project is intended to be research oriented with the objective of answering crucial environmental, technical, and operating questions while looking at overall project economics. One of the important elements of the program will address the spent shale issues, and specifically how to prevent/mitigate potential impacts to surface water and ground water. Importantly, it should be noted that for the fully retorted oil shale, there should be essentially no organics left in the spent shale. Testing to demonstrate this and to evaluate potential concerns with metals and salinity are included in both Phases 1 and 2, and discussed further below.*

*Extensive work on spent shale characteristics and reclamation was completed at leading institutions during the 1970s and 1980s. Programs were funded by industry and government agencies. The White River Corporation itself performed spent shale studies and conducted revegetation studies on test plots near the White River Mine site. That earlier test work resulted in the EPA declaring that spent shale is not a hazardous material  The OSEC proposal will consider the previous work on spent shale but will also focus research on the properties of the Utah spent shale leaving the ATP retort, which may have characteristics that are different from spent shale produced by other retorting schemes. Beginning in Phase 1 and progressing through Phase 2, OSEC will be characterizing the spent shale chemically, mineralogically, and physically. This research will entail leaching tests, compaction tests, and agronomic tests, both in the lab and in the field at the White River Mine site. This research work will then be incorporated into the design and permit requirements for the larger Phase 3 program. These activities are described in Sections 2.2.2, 2.2.3 and 2.2.5 of the EA.*

*During Phase 1, the ATP test work in Canada will provide spent shale for initial analytical and physical tests. These tests will include analyses both for chemical composition of the spent shale as well as leachate for both metals and organics and geotechnical properties of the spent shale.*

*During Phase 2 at the White River site, the startup of the ATP plant will likely produce some incompletely retorted/combusted spent shale, which will be segregated and placed on a bermed, lined pad for further processing or testing and research. Once the retort reaches steady-state operations and the characterization of the spent shales demonstrates that the spent shale is environmentally benign, the combusted spent shale will go to a two-acre engineered impoundment for storage and testing. Eventually, this spent shale pile will be reclaimed by grading the surface to prevent pooling of atmospheric moisture; the pile will then be covered with an mixture of native rock and soils to minimize infiltration. The evapotranspiration (ET) cover will minimize water reaching the spent shale while supporting a vegetative cover on the pile.*

*When permitting work begins for Phase 3 of OSEC's RD&D, the OSEC engineering team and the agencies' permitting teams will have the benefit of the spent shale research work completed in Phase 1 and Phase 2. The 38-acre, Phase 3 spent shale repository will incorporate the knowledge and experience into the design and monitoring system network; this earlier work will also demonstrate whether or not a liner is required beneath the spent shale pile to prevent/mitigate potential adverse impacts to ground water. The permits for the Phase 3 work will stipulate those design requirements, safeguards and reclamation requirements for the spent shale repository to prevent possible surface water or ground water contamination.*

*Both the Phase 2 and phase 3 spent shale disposal areas will incorporate run-on and run-off controls to minimize any possible contact of storm water with the spent shale and to allow testing of any runoff water from the spent shale disposal area prior to release to the retention dam area. Further, it is important to note that there will be no discharges to surface water bodies as all run-off from the site will be directed to the retention dam area* *where such water will either evaporate or percolate into the ground surface. Lysimeters and ground water monitoring points will allow evaluation of any leachate generation.*

4. Spent shale should be de-charred due to leachability of char in terms of unsaturated benzene ring carcinogens. – *Brent Fryer*

*Response: When fully retorted, essentially all organics will be removed from the spent shale. Testing during Phases 1 and 2 will demonstrate this. As noted above, the start-up of the ATP process will likely produce some incompletely retorted/combusted shale and this material will be handled separately from the fully-retorted shale.*

5. Inadequate proposed measures to address reclamation of spent shale especially when combined with other oil shale projects. - *Brent Fryer*

*Response: The proposed measures for the management of the spent shale include placement of the spent shale in an on-site engineered impoundment that will include grading and berms to control run-on and run-off of storm water; sloping and covering the spent shale with topsoil to minimize possible infiltration of precipitation; no release of water to a surface water body; and revegetation of the spent shale disposal area are adequate for the purposes of the Proposed Action. Handling of spent shale from large commercial- scale operations or with respect to the other RD&D projects is beyond the purview of this EA.*

6. Should require development of data on spent shale hydraulic and leaching characteristics before spent shale is generated in Phase 2. - *Watershed Environmental LLC*

*Response: As noted in the responses to comment 3 above, the Proposed Action includes the collection of chemical and geotechnical data on the spent shale during Phase 1 of the project. These data will be used in finalizing the design and securing permits for the Phase 2 spent shale disposal area. The Proposed Action for Phase 2 calls for all spent shale to be placed on an impervious liner until such time as the data demonstrates that such a liner is not necessary for protection of the environment.*

7. Water infiltration from shale dumps cannot be eliminated. - *Watershed Environmental LLC*

*Response: While it is not possible to fully eliminate the potential infiltration of rain water into the spent shale, the proposed measures, including positive grading of the spent shale pile to prevent pooling of any water and to promote surface run-off to a controlled retention basin and discharge point at the toe of the spent shale disposal and the final covering of the spent shale disposal area with native soil and rock, will minimize potential infiltration. Further, given the low average annual precipitation, the high evaporation rate, and great depth to ground water, the possible extent of any infiltration is very limited.*

8. Lack of information as to whether a liner would be required for entire 38-acre spent shale pile requires EIS. - *Watershed Environmental LLC*

*Response: An EIS is not necessary. The testing of the spent shale proposed for Phases 1 and 2 will provide data for a more quantitative evaluation of potential concerns with this issue and aid the final Phase 3 engineering design to minimize the potential for any adverse impacts. See response to Comment 3 above.*

9. The spent shale may present a threat to ground water due to the potential leachability of toxic metals, particularly arsenic and selenium - *USEPA.*

*Response: As noted in the EA (pp. 28 and 31), chemical analyses will be conducted as part of Phases 1 and 2 to determine both the composition of the spent shale and the leachate characteristics of the shale. Both the compositional and leachate analyses will include heavy metals, major cations, and various organic parameters to fully evaluate the potential concerns with the spent shale and to aid in the design of the spent shale disposal area. The EA has been modified to provide additional information on the testing that will be conducted and the parameters that will be analyzed. Further it should be noted that based on various investigations at the site, the static water table is more than 300 feet below the ground surface in the vicinity of the proposed spent shale disposal area, making the possibility of any leachable constituents reaching ground water to be very low.*

10. Spent catalysts or sour water could be mixed with spent shale potentially compounding the risk of ground water contamination. - *USEPA*

*Response: As described in the EA, all spent catalysts will be disposed of off-site and will not be mixed with the spent shale. Prior to off-site disposal, the wastes will be contained in constructed waste storage areas with appropriate spill containment features. During Phase 3, sour water will be treated in an on-site wastewater treatment facility. As described in the EA, treated water will not be used to moisten/cool the spent shale unless it meets water quality standards.*

11. Long term erosion of spent shale presents an unknown and unquantified risk to water quality in the area. - *USEPA*

*Response: As described in the EA, the spent shale pile will be sloped and graded to minimize potential infiltration and erosion. Further, following the completion of disposal activities, the disposal area will be capped with previously stripped topsoil and revegetated. This will further minimize potential erosion of the spent shale itself. The area will also be bermed to control run-on and run-off of storm water and minimize the potential of storm water that does contact the spent shale pile from transporting either sediment or dissolved phase constituents away from the spent shale pile. Finally, all runoff water from the site is directed to the retention dam area and does not discharge to the White River or any other surface water body. The ground water table is 300 feet below the ground surface which reduces the likelihood of impacts to ground water* *quality. The testing of the spent shale proposed for Phases 1 and 2 will provide data for a more quantitative evaluation of potential concerns with this issue and aid the final Phase 3 engineering design to minimize the potential for any adverse impacts.*

12. If the wastes are not covered by the Beville exclusion, OSEC will need to apply the Toxicity Characteristic Leaching Procedure (TCLP) testing protocol to determine the applicability of RCRA requirements (USEPA). In the absence of definitive test results supporting a non-hazardous designation, BLM may want to require isolation of the spent shale from the environment. - *USEPA*

*Response: During the oil shale activities in the 1980s, EPA made a determination that the Beville exclusion [42 USC 6921 (b) (3) (A) (ii)] does apply to spent shale. A copy of that determination is provided at the end of this Appendix. As such, the TCLP testing procedure will not be used to evaluate whether or not the spent shale constitutes a RCRA hazardous waste. However, either the TCLP procedure or a similar leachability testing procedure such as the synthetic leaching procedure will be used to evaluate the leachability of constituents in spent shale during Phase 1. As described in the EA, the results of the Phase 1 and Phase 2 testing will be used to evaluate whether a liner is necessary for the Phase 3 spent shale disposal area.*

13. Potential long-term monitoring of the spent shale disposal area may need to be addressed in implementing Phase 3 as part of the Plan of Operations and may be subject to additional NEPA analysis. - *USEPA*

*Response: We agree that some degree of longer term monitoring of the spent shale disposal area may be appropriate to ensure that, as projected, the spent shale disposal does not result in significant adverse impacts to the environment and that it can be addressed in the Phase 3 Plan of Operations. The various tests to be conducted during Phase 1 and Phase 2 will provide important information on the nature of the spent shale and potential impacts and how to engineer the Phase 3 disposal area to minimize any potential impacts. Prior to obtaining that data, it is not possible to determine what such longer term monitoring, if any, should consist of.*

14. Information on the mineralogical or chemical composition of the Mahogany Oil Shale Bed would be helpful in understanding spent shale chemistry and the specific testing programs to demonstrate the lack of organic content of the spent shale are not described. - *USEPA*

*Response: Pre-retorting mineralogical and chemical composition information on the oil shale will not necessarily help predict the characteristics of the spent shale. However, available information on the mineralogy and chemical composition of the Mahogany Zone oil shales from the previous work done at the White River Mine Site has been added to the EA. Though not finalized yet, it is likely that the testing during Phase 1 to demonstrate the lack of organics in the spent shale will include total organic carbon, some form of petroleum hydrocarbon analysis, and volatile and semi-volatile organic* *compound analysis. Language has been added to the EA to indicate the range of possible tests for this purpose.*

15. Testing of the quality of the connate water and make-up waters is recommended to ensure protections of underlying potential drinking water sources. - *USEPA*

*Response: As described in the EA, connate water and any retort water used to moisten the spent shale will be tested to ensure that it meets appropriate water quality standards prior to use for moistening and cooling the spent shale.*

16. Will the multi-depth lysimeters proposed for Phase 2 also be used to define the infiltration rate? Information on the particle size distribution and permeability would be useful in determining construction requirements for the spent shale disposal area. It is also recommended that the data collected during Phase 2 be as representative of the proposed disposal methods for Phase 3 as practicable. - *USEPA*

*Response: The multi-depth lysimeters are intended to collect data both on the quality of any leachate and, to the extent possible, on infiltration rates. In addition, the material testing during Phase 1 will include both particle size distributions of the spent shale and compaction and permeameter testing, which will also aid in estimating possible infiltration rates. Language has been added to the EA to clarify this. It is intended that the Phase 2 disposal methods will be the same as the Phase 3 disposal methods unless data collected indicate that additional engineering controls are appropriate.*

17. Please describe the criteria which would be used to determine the requirement for a liner, a cover, and revegetation. - *USEPA*

*Response: As described in the EA (pp. 28 and 106), analytical data from the testing of the spent shale (chemical composition, leaching tests, and geotechnical testing (e.g., compaction, density, permeability)) will be collected during Phase 1. Using these data, an evaluation of the nature of the constituents dedicated in the spent shale and the potential for leaching and migration of constituents under the existing site conditions will be used to determine the need for a liner. Also as described in the EA (p. 107), stripped topsoil will be used to cover the spent shale disposal area and will be revegetated regardless of testing results.*

18. Please explain the term “soften” as applied to the use of connate and sour water and the spent shale. - *USEPA*

*Response: Following retorting it is necessary to cool and moisten the spent shale to reduce potential fugitive dust emissions and to aid in material handling and compaction (p.31). The EA does not use the term “soften”, but describes the potential use of connate and treated sour water (provided it meets appropriate water quality criteria) to moisten the spent shale (pp. 32 and 35). It is not anticipated that this practice would be detrimental to leachate conditions resulting during Phase 3 since the spent shale is not* *moistened to saturated conditions. The lysimeters for Phase 2 will aid in evaluating this situation.*

19. Please clarify if there is a significant difference between what is mined in Phase 3 and in earlier phases and whether results from the earlier phases will still be representative in Phase 3. - *USEPA*

*Response: It is not anticipated that there will be significant compositional differences between the previously mined oil shale used in Phase 1 and for part of Phase 2 and the freshly-mined shale used for the latter part of Phase 2 and for Phase 3. However, it is possible that there may be some differences between the oil shale in the existing piles and that processed straight from the mine due to weathering of the existing shale stockpile since the 1980s. For example, the amount of lighter-end, more volatile hydrocarbon compounds may be somewhat lower in the weathered shale than in fresh shale due to volatilization of these compounds from the stockpiled shale. This is one reason why the Proposed Action includes mining and processing of fresh shale as part of Phase 2. It is not anticipated that there would be any difference in the fresh shale mined and processed during Phases 2 and 3.*

**Water Resources**

1. Data on water quality and quantity is out of date. OSEC should be required to provide one full year of baseline water data. - *Utah Rivers Council*

*Response: Baseline water quality data was obtained as part of the EIS for the prior White River Mine Project. Although this data was collected during the 1970s and 1980s, based on the lack of significant activity at the site and in the surrounding area which may have changed conditions, there is no reason to suspect that the available water quality data is not representative of current conditions. A detailed description of the water monitoring program will be outlined in the Plan of Operations.*

2. White River is a "threatened system" and further withdrawals are not acceptable. This is also true for other surface water bodies such Evacuation Creek. - *Utah Rivers Council*

*Response: The commenter does not provide any explanation or basis for characterizing the White River as a threatened system. The EA fully evaluates the potential impacts of water withdrawals from the White River.*

3. BLM should require mitigation for withdrawal of 380,000 gallons per day of makeup water. *– Utah Rivers Council*

*Response: Provided that the applicant obtains and maintains the necessary water rights during the project, there is no regulatory basis to require mitigation simply for the use of water.*

4. Cumulative impacts of water withdrawal in the area have not been evaluated. – *Utah Rivers Council*

*Response: The incremental change in the cumulative impacts on water resources in the Vernal Planning Area has been evaluated in Section 4.3.3 (p. 169).*

5. Mitigation should include acquisition of instream flow rights, riparian and wetlands restoration, and removal of structures in drainages that affect channel morphology. - *Utah Rivers Council*

*Response: As described in the EA, the necessary water rights and/or permits will be obtained for any withdrawals affecting the White River. The applicant-committed measures include several actions to minimize potential disturbance of and impacts to riparian and wetland areas, primarily because the Proposed Action calls for avoiding work in these areas to the extent possible or conducting the work in already-affected areas such as areas where there are existing structures crossing the White River. Additional mitigation measures to enhance or restore riparian and wetland zones should disturbance occur are described in Section 4.2.7 of the EA. There are no structures proposed for drainages that will affect channel morphology.*

6. EA lacks baseline data on 160-acre tract with respect to surface and ground water quality, effects of two existing oil shale stockpiles, and sediment loading to retention dam. - *Watershed Environmental LLC*

*Response: Baseline water quality data was obtained as part of the EIS for the prior White River Shale Project. Although this data was collected during the 1970s and 1980s, based on the lack of significant activity at the site and in the surrounding area which may have changed conditions, there is no reason to suspect that the available water quality data is not representative of current conditions. A detailed description of the water monitoring program will be outlined in the Plan of Operations.*

*The commenter has not described any potential impacts of the existing shale stockpile which require evaluation.*

*Given the size of the area behind the retention dam, the fact that it is dry except after major rainfall events, and that there will be no water released from the dam area, no sediment deposition downstream of the retention dam is expected to occur. Given the low volume of water expected to actually be discharged to the retention basin from the process, the grading and sediment erosion controls that will be in place during the construction of the facilities and the spent shale pile which minimize erosion from site operations, and the height of the dam (~48 feet), sedimentation behind the dam sufficient to materially affect the dam's retention capacity is not expected.*

7. Comparison of proposed Phase 3 water use to existing use in basin does not include other proposed water uses. - *Watershed Environmental LLC*

*Response: Information regarding other water usages proposed for the area is not available.*

8. Ground water quality at site should be fully characterized. - *Watershed Environmental LLC*

*Response: The ground water quality of the site and surrounding area was well-characterized as part of the previously completed EIS for the White River Shale Project. Based on the general lack of activity in the area of the site since that time, there is no reason to believe that there have been significant changes in water quality since the completion of the EIS.*

9. The EA should identify the quality of ground water and aquifer properties in the shallowest aquifer below the spent shale disposal area. The degree of protection of ground water depends on the quality of the water as well as what may "leach" into the ground water. - *USEPA*

*Response: In the vicinity of the spent shale disposal area, the Birds Nest Aquifer is the shallowest aquifer present. The extensive studies previously completed at the site showed that, although there may be one or two perched water zones above the Birds Nest aquifer, the Birds Nest Aquifer is the shallowest aquifer in the area. The static water table for this aquifer is between 300' and 400' beneath the ground surface in the vicinity of the site and there is a low permeability confining zone between the surface and the top of the Birds Nest aquifer. As described in the EA, the water in the Birds Nest aquifer in the vicinity of the site is not considered potable due to high total dissolved solids concentrations. Language has been added to the EA to clarify that the Birds Nest is the shallowest aquifer beneath the site.*

**Wildlife/Ecology - O&G**

1. Inadequate analysis of potential impacts on Townsend's big-eared bat (sensitive species) and Colorado River endangered fish because of inadequate support for assertions of no impact. - *Southern Utah Wilderness Alliance*

*Response: The EA has been revised (Sections 1.7.9, 3.3.9, 4.2.9 and 4.3.3) to address the potential presence of the Townsend's big-eared bat, and measures have been included for its protection.*

*The EA does analyze the potential impacts of the water withdrawals on the 4 Colorado River endangered fish species and in fact concludes based on USFWS guidelines that the Proposed Action has a "May affect, likely to adversely affect" impact on the Colorado River endangered fish species due to the fact that the Proposed Action will result in a withdrawal of water from the White River. As described in the EA, OSEC will comply with all USFWS requirements to mitigate the potential impacts.*

2. Failure to consider potential impacts on macro-invertebrate species in springs. - *Utah Rivers Council*

*Response: The EA has been modified (p. 135) to reflect the potential impacts to macro-invertebrates to possible changes in sedimentation in springs which may act as spawning grounds for macro-invertebrates. The applicant-committed measures to minimize soil disturbance and erosion impacts, and to protect water quality are deemed sufficient to reasonably protect macro-invertebrate populations.*

**Floodplains/Wetlands/ Wild & Scenic Rivers**

1. Inadequate disclosure of requirement to protect floodplains and to prevent erosion from high velocity flows. – *Utah Rivers Council*

*Response: Executive Order No. 11988 (May 24, 1977, 42 FS 26951) calls for avoidance "to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains. The Proposed Action includes applicant-committed measures (Section 2.2.7) designed to minimize any impacts to floodplain areas. The measures, include where possible, only conducting activities in already disturbed areas, the use of horizontal drilling under the floodplain for the installation of the natural gas pipeline, and placing transmission line poles outside of the floodplain area.*

*The Proposed Action will not cause any high velocity flow in any channel or floodplain area. If natural flooding damages any project-related structure installed beneath a floodplain area, Section 4.2.7 describes the mitigation that will be undertaken to repair the structures and restore the affected area.*

2. Inadequate discussion of vegetation at project site, source of water for wetlands, and habitat in wetlands. - *Utah Rivers Council*

*Response: Vegetation at the project site is discussed in the sections on Wetlands/Riparian Zones (pp 59), Fish and Wildlife other than USFWS Candidate or Listed Species (pp 66-67), Threatened and Endangered Plant Species (68-70), Vegetation Including Special Status Species other than USFWS Candidate or Listed Species (pp 70-73), and Invasive Non-native Species (pp 74-76).*

*A discussion of the source of water for wetlands is found on pages 123-125 of the EA (Section 4.2.3 – Water Resources). This section discusses the effects of the proposed project on surface and ground water resources. The analyses show that there would be little change in local alluvial water levels resulting from project water use. Thus, the effects of the proposed project on water levels in local wetlands would be negligible.*

*Habitat in wetland/riparian zones is discussed in the sections on Wetlands/Riparian Zones (pp 59), Fish and Wildlife other than USFWS Candidate or Listed Species (pp 66-67), Vegetation Including Special Status Species other than USFWS Candidate or Listed Species (pp 70-73), and Invasive Non-native Species (pp 74-76). Because the effects on water levels in local wetlands would be negligible and mitigation measures to reduce* *impacts to wetland/riparian zones will be implemented, we believe that this is an adequate discussion of the wetland/riparian zones at the project site.*

3. Power lines crossing White River and Evacuation Creek are inconsistent with existing or potential protected status (WSR) of these two streams. Power can be supplied to the project by other routes, avoiding such crossings. - *Utah Rivers Council*

*Response: The EA does discuss and recognize the potential impacts (primarily visual) at proposed power line crossings of the White River and Evacuation Creek. Other than the proposed crossing of Evacuation Creek, the proposed crossings are located in areas that are already disturbed and which have other structures that are not consistent with the current status of either of these streams.*

*No WSRs currently exist in the project area. BLM 8351 Manual (Wild and Scenic Rivers – Policy and Program Direction for Identification, Evaluation, and Management), Section .51 (Management) identified in the draft Vernal RMP (page 3-84) only protects river segments that have been designated into the NWSRS, which is not the case for the proposed eligible White River (Segment A) and Evacuation Creek Wild and Scenic River (WSR) segments. However, the BLM provides clarification regarding the protective management policy in the 8351 Manual with respect to eligible river segments in a memorandum dated June 21, 2004. This protective management policy allows for eligible rivers, such as the White River and Evacuation Creek, to be managed and protected at the point of eligibility determination, so as not to adversely constrain the suitability assessment or subsequent recommendation to Congress (Instruction Memorandum 2004-196).*

*The eligible segment 1 of the White River is proposed to be a WSR with a tentative classification of scenic. Evacuation Creek is proposed to be a WSR with a tentative classification of recreational. Until the ROD for the draft Vernal RMP is signed, protection of the eligible segments involves case-by-case review and mitigation of any actions proposed that might affect the eligibility. Mitigation measures presented in the OSEC EA would help reduce the visibility of the proposed power lines and would comply with the current RMP. The proposed power line crossing of the eligible segment of the White River would be located within an existing utility corridor. Impacts would be incremental, but minor. The two power line crossings associated with Evacuation Creek would be located along the northern portion of the eligible river segment and therefore away from the historic protected values of the creek (narrow gauge railroad, towns of Watson and Rainbow). The proposed action and alternatives would not be precluded because the values for which the WSR was considered would not be impacted. Furthermore, mitigation measures do offer some protection to the potentially eligible WSR segments. Although not all of the impacts would be eliminated, the proposed locations of the power line crossings would not jeopardize the tentative classifications of their eligibility status, especially given the proposed applicant-committed measures to be employed.*

4. Failure to consider cumulative impacts in wetlands and riparian areas. - *Utah Rivers Council*

*Response: The EA does consider cumulative impacts to wetlands and riparian zones (p. 169).*

**Socio-Economics**

1. Due to local socio-economic impacts, there should be no cap on the state severance tax. - *Center for Water Advocacy*

*Response: Decisions regarding state severance tax are beyond the purview of this EA and outside of the control of the BLM.*

**Cumulative Impact Analysis**

*General Response: Several commenters made a number of assertions that the cumulative impacts analysis in the EA was inadequate. The EA includes extensive cumulative impacts analyses, and many of these comments failed to identify a specific deficiency in these discussions. Further, many of the cumulative impacts comments addressed issues beyond the scope of the EA by arguing, for example, that the cumulative impacts of all of the proposed oil shale RD&D leases, or all of the oil shale RD&D program, or all of the oil shale program (including commercial development) should be addressed in an EIS. As indicated in the response above under "NEPA Process," BLM is in the process of preparing as EIS for the commercial development of oil shale. To the extent comments addressing cumulative impacts identify specific types of impacts or sources of such impacts, they are discussed below.*

1. Inadequate discussion of cumulative impacts from potential surface mines in Piceance Basin, air emissions in Rockies, federal Class I air-quality standards, power demand, and socio-economic impacts. - *Center for Water Advocacy*

*Response: Several of the sources identified by the commenter are outside of the Vernal Planning Area (Piceance Basin, air emissions in the Rockies, several of the cited Class I areas) and others have been defined for evaluating cumulative impact (e.g., power demand). All of the issues raised were discussed in the EA.*

2. Cumulative impacts such as the commercial phase of the OSEC project were not considered. - *Southern Utah Wilderness Alliance*

*Response: Any commercial phase activities are beyond the scope of this EA and would be subject to a separate EA or EIS.*

3. Cumulative impacts of commercial development of 4960 acres should be included. - *Watershed Environmental LLC*

*Response: See Response to #2 above.*

4. Lack of analysis of cumulative impacts of air emissions. - *Megan Williams*

*Response: See Response to #4 in the air quality section of the comment responses.*

5. Inadequate cumulative analysis of impacts to Class I areas. Numerous such areas were omitted from the analysis. - *Megan Williams*

*Response: See Response to #4 in the air quality section of the comment responses.*

6. There is no cumulative air impact analysis from off-site activities such as transport to and from crushing site and for crushing, as well as transport of shale to third parties. - *Megan Williams*

*Response: See Response to #13 in the air quality section of the comment responses.*

7. Cumulative impacts of water withdrawal in the area have not been evaluated. (water resources) – *Utah Rivers Council*

*Response: The incremental change in the cumulative impacts on water resources in the Vernal Planning Area has been evaluated in Section 4.3.3 (p. 169).*

8. Failure to consider cumulative impacts in wetlands and riparian areas. - *Utah Rivers Council*

*Response: The EA does consider cumulative impacts to wetlands and riparian zones (p. 169).*

**ATP System**

1. ATP will not be competitive to Black Box Oil Shale Pyrolysis Process, which commenter developed, or Chevron/Texaco process. – *Brent Fryer*

2. OSEC must overcome problems encountered in Southern Pacific Petroleum project in Gladstone, Australia which failed financially because process was too unreliable and because of environmental criticism. - *Brent Fryer*

3. ATP should not have been selected by BLM for RD&D because it fails to meet criteria for selection developed by commenter. – *Brent Fryer*

4. Phase 3 borders on commercial scale and cannot extrapolate impacts of demonstration project to commercial scale. – *Brent Fryer*

5. Spent shale should be de-charred due to leachability of char in terms of unsaturated benzene ring carcinogens. – *Brent Fryer*

6. EA failed to address (1) raw pyrolysis gas treatment to remove H2S before product gas can be flared in Phase 2; (2) raw oil shale hydrotreating and heavy metal removal

before use as fuel; and (3) product gas disposition for Phase 3 other than possible use as fuel or for production of hydrogen for hydrotreating raw oil shale. – *Brent Fryer*

7. ATP does not recover nearly all of the BTUs in shale feed. – *Brent Fryer*

8. Loss of eight percent of Fischer Assay oil recovery is intolerable. – *Brent Fryer*

9. BLM should come up with ways to determine whether ATP process will work without actually employing it (e.g., modeling). – *Brent Fryer*

10. This project will leave too much oil shale behind in mine. – *Brent Fryer*

11. ATP is too inefficient with respect to recoverable energy and use of energy. - *Brent Fryer*

12. EA should include cost benefit analysis of using two gallons of water to develop one gallon of oil. - *Watershed Environmental LLC*

*General Response: The above questions regarding the ATP system are not applicable to the EA. This EA discloses the potential environmental impacts of the phased research and development process to be followed in evaluating the viability of this process for commercial production of shale oil. These questions are beyond the scope of the proposal, and should be addressed when, and if, a proposal is submitted to expand the operations to commercial production. At that stage, additional environmental review will be required.*

**General/Miscellaneous**

1. BLM should delay granting commercial lease until proposed technology is viable for commercial application. – *Center for Water Advocacy*

*Response: The decision on whether or not to grant the commercial lease is beyond the scope of this EA.*

2. If OSEC lacks financial ability to solve problems, bonding may be inadequate to cover cost of reclamation. – *Brent Fryer*

*Response: The financial abilities of OSEC were evaluated during the lease application review process and are not within the scope of the EA.*

3. There may not be a market for raw shale oil. It has too much nitrogen for refinery feedstock. - *Brent Fryer*

*Response: Consideration of the market for raw shale is outside the scope of this EA.*

4. Inconsistencies in EA, particularly between text and appendices. - *Brent Fryer*

*Response: Any noted inconsistencies have been reviewed and the EA corrected as necessary.*

5. EA did not address impacts of offering unused shale to third parties. - *Southern Utah Wilderness Alliance*

*Response: While OSEC has agreed to offer oil shale to third parties, there have been no agreements reached to do so with any specific parties. It is not anticipated that large volumes of shale will be transported off-site for use by third parties. Therefore, the increase in truck traffic to and from the site will be nominal. The impacts of the actual processing of any such shale by a third party would be subject to separate review and are beyond the scope of this EA.*

6. Regulation of effects of phases is too vague to allow assessment of effectiveness. - *Watershed Environmental LLC*

*Response: As noted above, operations under the proposed White River Mine RD&D lease will be subject to all applicable regulatory requirements. The project is proposed to occur in three phases in part for the purpose of using knowledge gained in one phase to direct the design, construction and operations under the next phase. The EA discloses the extent to which information currently available is not adequate to fully assess the applicability or impact of specific regulatory programs. As the necessary information is developed during the various phases, this new information will be used to satisfy regulatory purposes. The commenter has not identified any avoidable impacts which will result from this approach or an alternative method under NEPA of addressing such regulatory requirements.*

7. EA lacks discussion of how utility alignments were chosen and how construction will prevent erosion. - *Utah Rivers Council*

*Response: The utility alignments were selected in consultation with local utility providers and were generally targeted to run parallel to existing utility alignments and/or cross already disturbed areas. The EA does discuss measures to minimize/mitigate erosion from construction activities in Sections 2.2.5 and 4.2.4.*

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# A P P E N D I X G

## Summary of Changes to EA

**Summary of Changes to UT – 080 – 06 – 280**

In response to public comments, the Environmental Assessment (EA) for the White River Mine Oil Shale Research, Development, and Demonstration Project has been revised to provide clarification and to include additional information necessary for analysis. The specific changes to the EA are highlighted below.

**Page 2 – Section 1.2**
*The legal description of the tract was added.*

**Original Text:** The RD&D site proposed by OSEC encompasses a 160-acre tract and associated preference right to an additional contiguous area of 4,960 acres as established in the FR notice. The larger area may be converted to commercial lease at a future time after additional BLM review and approval. Upon OSEC's successful production of commercial quantities of shale oil and a determination by BLM that commercial scale operations can be conducted, subject to mitigation measures to be specified in stipulations or regulations, without unacceptable environmental consequences, BLM will non-competitively convert the preference right acreage into a commercial oil shale lease for fair market value. Separate environmental review of the larger preference right acreage would occur at that time because the terms and conditions of the RD&D lease do not guarantee the issuance of the additional 4,960 acres or the conditions under which such lands would be leased. Leases will be issued with sufficient terms and conditions to allow BLM to monitor for and prevent unnecessary and undue degradation to public lands. This Environmental Assessment (EA) addresses only the 160-acre nominated lease site and the associated utility rights-of-way and the Plan of Operations for the RD&D Project proposed by OSEC, and does not analyze additional impacts or development potential associated with the preference right acreage.

**Revised Text:** The RD&D site proposed by OSEC encompasses a 160-acre tract and associated preference right to an additional contiguous area of 4,960 acres as established in the FR notice. The 160-acre tract encompasses a portion of the former White River Oil Shale mine site developed in the early 1980s. The 160-acre lease tract is described as follows:

T. 10 S., R. 24 E., SLM, Utah.
Sec. 22, E½SE¼SE¼SW¼, NE¼NE¼SE¼,
S½ NE¼SE¼, S½ NW¼SE¼,
SW¼SE¼, W½SE¼SE¼;

Sec. 27, NW¼NE¼, E½NE¼NE¼NW¼.

Containing 160.00 acres, more or less.

The larger area may be converted to a commercial lease at a future time after additional BLM review and approval. Upon OSEC's successful production of commercial quantities of shale oil and a determination by BLM that commercial scale operations can be conducted, subject to mitigation measures to be specified in stipulations or regulations, without unacceptable environmental consequences, BLM will non-competitively convert the preference right acreage into a commercial oil shale lease for fair market value. Separate environmental review of the larger preference right acreage would occur at that time because the terms and conditions of the RD&D lease do not guarantee the issuance of the additional 4,960 acres or the conditions under which such lands would be leased. Leases will be issued with sufficient terms and conditions to allow BLM to monitor for and prevent unnecessary and undue degradation to public lands. This Environmental Assessment (EA) addresses only the 160-acre nominated lease site and the associated utility rights-of-way and the Plan of Operations for the RD&D Project proposed by OSEC, and does not analyze additional impacts or development potential associated with the preference right acreage.

**Page 4 – Section 1.4**
*Text was added to indicate that the bulk sample of shale to be used for Phase 1 testing could also come from shale that BLM has moved to a site adjacent to U.S. Highway 40 to be available for BLM's distribution for research purposes.*

**Original Text:** Phase 1 of the RD&D Project involves the collection of a bulk sample (approximately 1,000 tons) of oil shale from an existing stockpile within the White River Mine 160-acre lease area for initial process testing in Calgary, Alberta, Canada. The oil shale sample will be crushed at a gravel pit in Uintah County and then transported by truck to Calgary. The oil shale will be processed in a 4-ton/hour ATP pilot plant operated by UMATAC Industrial Process. UMATAC Industrial Processes, a division of UMA Engineering Ltd., is the company that develops, manufactures and licenses the use of the ATP retort. Approximately 650 bbl of raw shale oil will be produced in Phase 1. OSEC will document the results of the process work, and associated tests and analyses (including shale oil yield; shale oil quality; the geochemistry, geotechnical and engineering properties of the spent shale; and air emissions), at the completion of the pilot plant work in Calgary.

**Revised Text:** Phase 1 of the RD&D Project involves the collection of a bulk sample (approximately 1,000 tons) of oil shale for initial process testing in Calgary, Alberta, Canada. This bulk sample will be collected from an existing stockpile within the White River Mine 160-acre lease area and/or from an existing stockpile BLM has established by U.S. Highway 40 for distribution to interested parties for research purposes. The oil shale sample will be crushed at a gravel pit on private land in Uintah County and then transported by truck to Calgary. The oil shale will be processed in a 4-ton/hour ATP pilot plant operated by UMATAC Industrial Process. UMATAC Industrial Processes, a division of UMA Engineering Ltd., is the company that develops, manufactures and licenses the use of the ATP retort. Approximately 650 bbl of raw shale oil will be produced in Phase 1. OSEC will document the results of the process work, and associated tests and analyses (including shale oil yield; shale oil quality; the geochemistry, geotechnical and engineering properties of the spent shale; and air emissions), at the completion of the pilot plant work in Calgary.

**Page 5 – Section 1.4.1**
*The second paragraph was changed to better reflect BLM's actions with respect to the White River Oil Shale Mine*

**Original Text:** Primarily for economic reasons, WRSP terminated the project in 1985 before constructing a retort. The mine was never fully commissioned nor fully equipped for production. The leases were relinquished with responsibility for the mine and surface facilities being assumed by the BLM in 1986. The BLM eventually decided to abandon the mine and a closure plan was developed. In 1996, under the direction of the BLM, a 10-foot thick concrete bulkhead was placed in the lower decline below the Birds Nest Aquifer; the main exhaust fan installation was removed; the mine hoist and headframe were removed from the 30-foot diameter shaft; the 16-foot diameter ventilation shaft and the 5-foot diameter shaft were capped with reinforced concrete; the decline portal was plugged; 1.5 miles of the power line were removed; and several small support buildings were removed. A methane explosion occurred during the closure of the 30-foot diameter main shaft, resulting in a fatality, and the decision was made not to complete the capping of this shaft. The shaft area is currently surrounded by a barbed-wire-topped chain link fence and chain link fence also covers the shaft opening.

**Revised Text:** Primarily for economic reasons, WRSP terminated the project in 1985 before constructing a retort. The mine was never fully commissioned nor fully equipped for production. The leases were relinquished with responsibility for the mine and surface facilities being assumed by the BLM in 1986. After maintaining the mine for a number of years, the BLM decided to abandon the mine and a closure plan was developed. In 1996, under the direction of the BLM, a 10-foot thick concrete bulkhead was placed in the lower decline below the Birds Nest Aquifer; the main exhaust fan installation was removed; the mine hoist and headframe were removed from the 30-foot diameter shaft; the 16-foot diameter ventilation shaft and the 5-foot diameter shaft were capped with reinforced concrete; the decline portal was plugged; 1.5 miles of the power line were removed; and several small support buildings were removed. A methane explosion occurred during the closure of the 30-foot diameter main shaft, resulting in a fatality, and the decision was made not to complete the capping of this shaft. The shaft area is currently surrounded by a barbed-wire-topped chain link fence and chain link fence also covers the shaft opening.

**Page 16 – Section 1.7.6**

*Text was added to clarify that flood plains are not present within the 160-acre lease area, and that activities on rights-of-way were evaluated.*

**Original Text:** The area along the White River contains relatively narrow alluvial banks and terraces that flood during periods of high flow (i.e., flood plains). Activities on the 160-acre lease area are not expected to have an effect on the Whitie River flood plain. However, ground water wells, possible water supply lines, and gas and power lines are planned to be installed along rights-of-way during the RD&D Project. Potential effects on the floodplain as a result of these activities along the utility rights-of-way are examined in this EA. OSEC has evaluated the following aspects to determine potential impacts to floodplains:

- Impacts of water well development in the vicinity of the White River.
- Potential impacts of installing power and gas lines which will cross the flood plain.

**Revised Text:** The area along the White River contains relatively narrow alluvial banks and terraces that flood during periods of high flow (i.e., flood plains). Although the flood plains do not occur within the 160-acre lease area, ground water wells, possible water supply lines, and gas and power lines are planned to be installed along rights-of-way during the RD&D Project. Potential effects on the floodplain as a result of these activities along the utility rights-of-way are examined in this EA. The following aspects have been evaluated to determine potential impacts to floodplains:

- Impacts of water well development in the vicinity of the White River.
- Potential impacts of installing power and gas lines which will cross the flood plain.

**Page 17 – Section 1.7.8**
*Text was changed to clarify current status of Bald Eagles and potential nesting habitat.*

**Original Text:**

- *Bald Eagle* (Threatened) – Afforded a 1.0 mile timing stipulation limitation (TSL) from January 1 through August 15. Surveys for bald eagle nests were included as part of the 2006 raptor surveys and will be included in future surveys conducted during the appropriate time period (January 1 – August 15) prior to construction. A survey for roost sites will be conducted during the appropriate time period (November 1 - March 15) prior to construction.

**Revised Text:**

- *Bald Eagle* (Threatened) – Suitable bald eagle habitat exists in the Project Area. Both potential nesting and roosting habitat have been identified along the White River but no active bald eagle nests are known to occur in Uintah County. Although bald eagles are listed as a threatened species, they are presently being considered for delisting.

**Page 17 – Section 1.7.8**
*Text was re-ordered to clarify location of introduced Black-footed ferret population.*

**Original Text:**

- *Black-footed ferret* (Endangered) – Afforded protection if there is adequate habitat. Potential adequate habitat in the Project Area would be any white-tailed prairie dog town greater than 200 acres. There are no prairie dog towns present on the 160-acre lease site and no active towns were located along the proposed rights-of-way. The only black-footed ferret population that exists in Uintah County is designated as experimental and was introduced into Coyote Basin.

**Revised Text:**

- *Black-footed ferret* (Endangered) – The only black-footed ferret population that exists in Uintah County is designated as experimental and was introduced into Coyote Basin approximately seven miles north of the project area. Potential adequate habitat in the Project Area would be any white-tailed prairie dog town greater than 200 acres. There are no prairie dog towns present on the 160-acre lease site and no active towns were located along the proposed rights-of-way.

**Page 17 – Section 1.7.8**

*Text was revised to clarify that suitable Mexican Spotted Owl habitat does not exist within 0.5 miles of thr 160-acre lease or rights-of-way.*

**Original Text:**

- *Mexican Spotted Owl* (Threatened) – Critical habitat for the owl does not exist within 0.5 mile of the 160-acre lease or the proposed utility rights-of-way. However, potential suitable habitat does exist in Uintah County.

**Revised Text:**

- *Mexican Spotted Owl* (Threatened) – Suitable habitat for the owl does not exist within 0.5 mile of the 160-acre lease or the proposed utility rights-of-way.

**Page 17 – 1.7.8**

*Language was deleted regarding applicant committed measures since not appropriate for this section.*

**Original Text:**

- *Yellow-billed Cuckoo* (Candidate) – Habitat for this species would typically be found in riparian zones along major rivers such as the White River. The 160-acre lease is approximately one mile south of the river. The utility rights-of-way (except powerlines) will be installed under the White River to eliminate impacts to habitat.

**Revised Text:**

- *Yellow-billed Cuckoo* (Candidate) – Habitat for this species would typically be found in riparian zones along major rivers such as the White River. The 160-acre lease is approximately one mile south of the river.

**Page 18 – Section 1.7.9**

*A bullet was added concerning Townsend's big-eared bat as a species not excluded from evaluation.*

**Original Text:** None

**Revised Text:**

- *Townsend's big-eared bat* – A BLM sensitive species adapted to living underground in caves and mines.

**Page 19 – Section 1.7.10**

*Language concerning applicant-committed measures was deleted since not appropriate in this section.*

**Original Text:**

- *Ute ladies'-tresses orchid* (Threatened) - There is no habitat for Ute ladies'-tresses orchid on the 160-acre lease area. Horizontal Directional Drilling (HDD) will be used to reduce habitat impacts where the utilities cross the White River. There could be impacts to habitat downriver from water depletions from the White River.

**Revised Text:**

- *Ute ladies'-tresses orchid* (Threatened) - There is no habitat for Ute ladies'-tresses orchid on the 160-acre lease area. However, habitat may exist along the White River.

**Page 22 – Section 1.7.18**

*Text revised to clarify situations where segments of the Whiite River and Evacuation Creek would be proposed for Wild & Scenic Rivers status.*

**Original Text:** A portion of the White River is being evaluated for suitability for inclusion in the Wild & Scenic River system as a scenic segment. In addition, a portion of Evacuation Creek is being evaluated for suitability for inclusion in the Wild & Scenic River system as a recreation segment. Under certain alternatives being considered in the Draft Vernal RMP, segments of the White River and Evacuation Creek would be proposed for inclusion in the Wild Scenic River System. The 160-acre lease site is not in or adjacent to the Wild & Scenic River Segments, but the utility rights-of-way would be adjacent to or cross both the White River and Evacuation Creek segments. To assess the impacts of the proposed development on the potential Wild & Scenic River designation, the following factors were reviewed:

- The specific boundaries of the areas which may be designated as eligible for inclusion.
- The allowed activities under the Wild & Scenic Rivers Act for such areas.

- The nature of proposed activities along the rights-of-way which cross any such areas.
- The effect on the free-flowing nature of the river.

**Revised Text:** Under certain alternatives being considered in the Draft Vernal RMP, segments of the White River and Evacuation Creek would be proposed for inclusion in the Wild & Scenic River system. A portion of the White River is being evaluated for suitability for inclusion in the Wild & Scenic River system as a scenic segment. In addition, a portion of Evacuation Creek is being evaluated for suitability for inclusion in the Wild & Scenic River system as a recreation segment. The 160-acre lease site is not in or adjacent to the Wild & Scenic River segments, but the utility rights-of-way would be adjacent to or cross both the White River and Evacuation Creek segments. To assess the impacts of the proposed development on the potential Wild & Scenic River designation, the following factors were reviewed:

- The specific boundaries of the areas which may be designated as eligible for inclusion.
- The allowed activities under the Wild & Scenic Rivers Act for such areas.
- The nature of proposed activities along the rights-of-way which cross any such areas.
- The effect on the free-flowing nature of the river.

**Page 27 – Section 2.2.2**

*Text was added to clarify that some of the shale for Phase 1 testing could come from a shale stockpile at an existing gravel pit in Uintah County.*

**Original Text:** The 1,000 tons of shale will be transported by truck from the 160-acre lease out of the Project Area to a gravel pit in Uintah County where it will be crushed to design specifications (minus 3/8 inch). During Phase 1, no crushing of oil shale will be performed within the White River Mine lease area. The exact crushing location has yet to be determined and will depend on which operation has capacity to complete the work at the time the Phase 1 activities are initiated. The potential crushing operations are all located within an approximately 25-mile radius of Vernal, Utah. It is estimated that approximately 40 truckloads (25 tons/load) will be transported to the selected crushing operation. Although the exact route has not been determined, most of the route toward Vernal will be along Highway 45, which is already highly utilized by trucks servicing the oil, gas and mining activities in the area. The total travel distance for each truck will be on the order of 50 to 75 miles.   Transport of the shale to the crushing facility is expected to occur over a one to two week period.

**Revised Text:** The 1,000 tons of previously mined shale will be transported by truck from the on-site surface stockpile and/or from an existing gravel pit site in Uintah County where a small amount of shale is currently stockpiled. This shale will be crushed to design specifications (minus 3/8 inch) and transported to the ATP pilot unit in Calgary, Canada. During Phase 1, no crushing of oil shale will be performed within the White River Mine lease area. The exact crushing location has yet to be determined and will depend on which crushing facility has capacity to complete the work at the time the Phase 1 activities are initiated. The existing commercial gravel pits with crushing operations are all located within an approximately 25-mile radius of Vernal, Utah. It is estimated that approximately 40 truckloads (25 tons/load) will be transported to the selected crushing operation. Although the exact route has not been determined, most of the route toward Vernal will be along Highway 45, which is already highly utilized by trucks servicing the oil, gas and mining activities in the area. The total travel distance for each truck will be on the order of 50 to 75 miles.   Transport of the shale to the crushing facility is expected to occur over a one to two week period.

**Page 28 – Section 2.2.2**

*A sentence was added to provide further information on the nature of the tests that will be conducted on the spent shale during Phase 1.*

**Original Text:** Approximately 800 tons of non-RCRA hazardous spent shale will be produced from the processing of the 1,000 tons of feed shale. Samples of this material will be retained for testing and analysis in Canada and the United States. The remaining spent shale will be disposed in a licensed landfill in Alberta, or stored on-site in Alberta pending identification of a beneficial reuse.

**Revised Text:** Approximately 800 tons of non-RCRA hazardous spent shale will be produced from the processing of the 1,000 tons of feed shale. Samples of this material will be retained for testing and analysis in Canada and the United States. The testing will include analyses for both geotechnical properties (e.g., particle size analysis, compaction, permeability) and chemical properties (e.g., chemical analysis of both the spent shale and leachate for total metals, organic compounds (VOCs, SVOCs, and phenols), and major cations). The remaining spent shale will be disposed in a licensed landfill in Alberta, or stored on-site in Alberta pending identification of a beneficial reuse.

**Page 29 – Section 2.2.3**

*Text was revised to clarify requirement for isolating Phase 2 spent shale from the environment.*

**Original Text:** The small spent shale disposal area for Phase 2 is located on Figure 2-1. Approximately 8,000 tons of spent shale will be generated and placed in a small valley impoundment, less than two acres in size. If the analytical results from Phase 1 demonstrate that the spent shale needs to be isolated from the environment, BLM will require that the disposal area be constructed with an impervious liner and bermed so that surface water runoff will be directed around the impoundment to prevent contact of storm water runoff from other areas of the lease with the spent shale pile. Overall flow will be directed to the gully near the dam. In the event that the spent shale from Phase 1 is determined to be a hazardous material, additional steps will be taken to isolate the spent shale disposed during Phase 2. Precipitation falling directly on the spent shale must be contained within the lined disposal area and will be allowed to evaporate. No water will removed from the containment area unless it meets the approved water standards. When the spent shale area is reclaimed, any spent shale that is determined to be a hazardous waste will be covered with an impermeable layer, then with soil and planted with native seeds and plants.

**Revised Text:** The small spent shale disposal area for Phase 2 is located on Figure 2-1. Approximately 8,000 tons of spent shale will be generated and placed in a small valley impoundment, less than two acres in size. Until the testing and analytical results demonstrate that the spent shale does not need to be isolated from the environment, BLM will require that the disposal area be constructed with an impervious liner and bermed so that surface water runoff will be directed around the impoundment to prevent contact of storm water runoff from other areas of the lease with the spent shale pile. Overall flow will be directed to the gully near the dam. Precipitation falling directly on the spent shale must be contained within the lined disposal area and will be allowed to evaporate. No water will be removed from the containment area unless it meets the approved water standards.

During Phase 2, OSEC will install lysimeters or similar soil moisture/leachate monitoring devices at multiple depths (such as 1, 3 and 5 meters) within the spent shale disposal area. Following rainfall events, the monitoring points will be checked regularly and samples will be collected of any leachate that accumulates in the devices. The samples will be tested for the parameters determined from the Phase 1 analyses. In addition, a storm water monitoring point will be identified to allow sampling of runoff from the Phase 2 spent shale area. This information will allow OSEC to consider the potential for leaching of constituents in designing the Phase 3 spent shale disposal area.

**Page 31 – Section 2.2.3.2**

*A sentence was added clarifying that the instrumentation in the spent shale impoundment would be used, in conjunction with other tests, to evaluate the potential infiltration rate of leachate in the spent shale and underlying soils.*

**Original Text:** Phase 2 shale processing will produce approximately 8,000 tons of spent shale. The spent shale will be moistened at the pilot plant to aid in cooling, control dust, and aid material handling and compaction. The material will be placed in a bermed and graded surface impoundment covering approximately 2 acres within the 160-acre lease area. The surface impoundment will be designed and constructed to avoid surface water erosion and contact with runoff from other portions of the site, and to minimize infiltration of rainwater. The specific impoundment design will be based on the results of the testing and analysis of the spent shale (including geochemistry and leach testing) performed during Phase 1. The impoundment will be provided with a topsoil cover at the completion of Phase 2 operations. OSEC will collect samples of the spent shale during Phase 2 for further material testing to better understand the engineering and environmental properties of the material. This testing will be done off-site. In addition, OSEC will include instrumentation in the spent shale impoundment that will monitor moisture ingress and any leachate generation during this phase of work.

**Revised Text:** Phase 2 shale processing will produce approximately 8,000 tons of spent shale. The spent shale will be moistened at the pilot plant to aid in cooling, control dust, and aid material handling and compaction. The material will be placed in a bermed and graded surface impoundment covering approximately 2 acres within the 160-acre lease area. The surface impoundment will be designed and constructed to avoid surface water erosion and contact with runoff from other portions of the site, and to minimize infiltration of rainwater. The impoundment area will also be lined with an impervious barrier until such time that BLM determines that a liner is not necessary. The specific impoundment design will be based on the results of the testing and analysis of the spent shale (including geochemistry and leach testing). The impoundment will be provided with a topsoil cover at the completion of Phase 2 operations. OSEC will collect samples of the spent shale during Phase 2 for further material testing to better understand the engineering and environmental properties of the material. This testing will be done off-site. In addition, OSEC will include instrumentation in the spent shale impoundment that will monitor moisture ingress and any leachate generation during this phase of work.

Along with the results from the particle size and permeameter testing completed during Phase 1, the inclusion of instrumentation in the spent shale impoundment will allow an evaluation of the potential infiltration rate of leachate through the spent shale.

**Page 35 – Section 2.2.4.2**
*A sentence was added to clarify that transmission line right-of-way is assessed in the EA.*

**Original Text:** Up to 14 MW of electrical power may be required at the site during Phase 3, and it is assumed that electrical power to the site will be provided from the grid via a new 138 KV transmission line. Emergency diesel generator capacity will also be provided on-site to meet both plant backup and mine operational and safety requirements.

**Revised Text:** Up to 14 MW of electrical power may be required at the site during Phase 3, and it is assumed that electrical power to the site will be provided from the grid via a new 138 KV transmission line. The transmission line right-of-way is assessed in this EA. Emergency diesel generator capacity will also be provided on-site to meet both plant backup and mine operational and safety requirements.

**Page 37 – Section 2.2.5**
*A sentence was added clarifying that Phase 3 would require best available control technology (BACT) air emission control devices that comply with PSD requirements.*

**Original Text:**

- OSEC will obtain and comply with all necessary air permits and install, operate and maintain air emission control devices on the ATP system during Phase 2 and Phase 3 and on units of the wastewater treatment system and hydrotreatment system during Phase 3.

**Revised Text:**

- OSEC will obtain and comply with all necessary air permits and install, operate and maintain air emission control devices on the ATP system during Phase 2 and Phase 3 and on units of the wastewater treatment system and hydrotreatment system during Phase 3. This will include, for Phase 3, Best Available Control Technology (BACT) that complies with PSD requirements.

**Page 40 – Section 2.2.5**

*Language modified to clarify requirements regarding distance and timing restrictions on construction if bald eagle nests or roosts are present.*

**Original Text:**

*Threatened/Endangered Wildlife Species*

- OSEC will conduct pre-construction clearance surveys in the spring prior to construction to identify active bald eagle nests within 1.0 mile of the surface occupancy area and in the winter to identify active bald eagle roosts within 0.5 mile of the project site and utility rights-of-way. Construction activities will not occur within a 1.0 mile of active bald eagle nest from January 1 through August 15 and within 0.5 mile of roosting areas from November 1 through March 31.

**Revised Text:**

*Threatened/Endangered Wildlife Species*

- OSEC will conduct pre-construction clearance surveys in the spring prior to construction to identify active bald eagle nests within 1.0 mile of the surface occupancy area and in the winter to identify active bald eagle roosts within 0.5 mile of the project site and utility rights-of-way. Construction activities will not occur within 1.0 mile of any active bald eagle nest without further consultation with the USFWS. Construction activities will not occur within 0.5 mile of roosting areas from November 1 through March 31.

**Page 41 – Section 2.2.5**

*Bullet added regarding applicant-committed measures for Townsend's big-eared bat.*

**Original Text:** None

**Revised Text:**

- The White River mine shaft is not expected to be suitable bat habitat because of the presence of methane in the mine. However, if bats are found in the White River Mine, OSEC will install one-way doors or other suitable mitigation at the mine shaft entrances allowing sufficient time prior to re-opening the mine for bats to leave but not to re-enter the mine shafts.

**Page 49 – Section 3.2.5**
*A sentence was added clarifying status of AUMs at mine site.*

**Original Text:** The 160-acre lease area and corridors are located in the Book Cliffs and Bonanza livestock forage assignment localities (BLM, 2005 Draft EIS). The White River mine site is within the Hell's Hole Allotment. Sheep are grazed in that allotment from December 1 to April 30 and are allowed 3,999 AUMs.

**Revised Text:** The 160-acre lease area and corridors are located in the Book Cliffs and Bonanza livestock forage assignment localities (BLM, 2005 Draft EIS). The White River mine site is within the Hell's Hole Allotment. Sheep are grazed in that allotment from December 1 to April 30 and are allowed 3,999 AUMs. None of the AUMs is allocated to the 160-acre lease area, which is not managed as rangeland due to the existing mine site.

**Page 50 – Section 3.3.2**
*Language removed regarding previously-stripped topsoil and mine spoils removed since not relevant to this section.*

**Original Text:** There are no known quantities of any wastes currently on-site, except there may be small quantities of various wastes remaining from the prior development contained within existing structures. Although not considered a waste, there are still large surface stockpiles of oil shale produced during the prior development of the mine currently present on site. The raw oil shale (~ 50,000 tons) is primarily stored in two surface piles, one is essentially a talus slope on the side of a steep ravine and the other pile is a large mounded area. Much of this raw oil shale will be processed as part of this project during Phase 1 and Phase 2. Topsoil stripped from the land surface and mine spoils removed from the shafts and decline above the mining horizon during the prior construction and mining activities at the site have also been stockpiled at the surface to the south, north, and northeast of the main shaft (over 200,000 cubic yards in total).

**Revised Text:** There are no known quantities of any wastes currently on-site, except there may be small quantities of various wastes remaining from the prior development contained within existing structures. Although not considered a waste, there are still large surface stockpiles of oil shale produced during the prior development of the mine currently present on site. The raw oil shale (~ 50,000 tons) is primarily stored in two surface piles, one is essentially a talus slope on the side of a steep ravine and the other pile is a large mounded area.  Much of this raw oil shale will be processed as part of this project during Phase 1 and Phase 2, resulting in the generation of spent shale.

**Page 53 – Section 3.3.3**

*A sentence was added to clarify that the Birds Nest Aquifer is the shallowest aquifer beneath the site.*

**Original Text:** *Ground Water – Birds Nest Aquifer*:  The Birds Nest Aquifer is the principal aquifer that was investigated during the baseline study for the White River Shale Project.  It is located near the top of the Parachute Creek Member of the Green River Formation and consists predominantly of cavities formed by leaching of nahcolite from the marlstone strata.  The thickness of the aquifer ranges from 90 to 205 feet and averages about 115 feet.  The upper surface of the aquifer slopes uniformly to the northwest at approximately 250 feet per mile.  The stratigraphic position of the aquifer is very consistent, typically occurring in the top 50 to 125 feet of the Green River Formation.  The Birds Nest aquifer is exposed continuously at the confluence of the White River and Evacuation Creek, and then southward for several miles along the banks or canyon walls of Evacuation Creek.  Springs and seepage from the aquifer are common throughout the area (Bechtel Petroleum, Inc., 1981).  The aquifer's aerial extent to the west and north is unknown, but it has been estimated to extend as far as Bitter creek to the west and several miles beyond the White River to the north.  Water levels in the aquifer range from a few feet below the surface where the aquifer crops out in the Evacuation Creek to more than 400 feet below land a few miles to the west.

**Revised Text:** *Ground Water – Birds Nest Aquifer*:  The Birds Nest Aquifer is the principal aquifer that was investigated during the baseline study for the White River Shale Project.  It is located near the top of the Parachute Creek Member of the Green River Formation and consists predominantly of cavities formed by leaching of nahcolite from the marlstone strata.  Although there are a few non-continuous, intermittent water-bearing zones above the Birds Nest Aquifer, they do not fit the definition of a regional aquifer, and the Birds Nest Aquifer is considered the shallowest aquifer beneath the site.  The thickness of the aquifer ranges from 90 to 205 feet and averages about 115 feet.  The upper surface of the aquifer slopes uniformly to the northwest at approximately 250 feet per mile.  The stratigraphic position of the aquifer is very consistent, typically occurring in the top 50 to 125 feet of the Green River Formation.  The Birds Nest Aquifer is exposed continuously at the confluence of the White River and Evacuation Creek, and then southward for several miles along the banks or canyon walls of Evacuation Creek.  Springs and seepage from the aquifer are common throughout the area (Bechtel

Petroleum, Inc., 1981). The aquifer's aerial extent to the west and north is unknown, but it has been estimated to extend as far as Bitter Creek to the west and several miles beyond the White River to the north. Water levels in the aquifer range from a few feet below the surface where the aquifer crops out in the Evacuation Creek to more than 400 feet below the surface a few miles to the west.

**Page 56 – Section 3.3.5**
*A sentence was added to indicate that available information on the geochemistry of the Mahogany oil shale bed is provided in Appendix D.*

**Original Text:** The Parachute Creek Member consists of marlstone and oil shale as well as numerous thin beds of tuff and some thin beds of siltstone. The upper part of this unit contains small pods and lenses of nahcolite ($NaHCO_3$). A rich oil shale sequence, called the Mahogany zone, is approximately 100 feet thick and occurs approximately 500 feet below the contact with the Uinta Formation. The richest layer in this zone, the Mahogany oil shale bed, is approximately 10 feet thick.

**Revised Text:** The Parachute Creek Member consists of marlstone and oil shale as well as numerous thin beds of tuff and some thin beds of siltstone. The upper part of this unit contains small pods and lenses of nahcolite ($NaHCO_3$). A rich oil shale sequence, called the Mahogany zone, is approximately 100 feet thick and occurs approximately 500 feet below the contact with the Uinta Formation. The richest layer in this zone, the Mahogany oil shale bed, is approximately 10 feet thick. Information on the general geochemistry of the Mahogany oil shale bed, gathered during the prior work at the White River Mine site, is included in Appendix D.

**Page 62, Table 3-4 – Section 3.3.5**
*Table 3-4 (BLM Sensitive Wildlife Species) was modified to indicate that potential habitat exists for the Townsend's big-eared bat and that it is not eliminated from detailed analysis.*

**Original Text:** Yes. Potential habitat exists in the Project Area but the species would not be active during daytime construction hours and no known caves are present in the area.

**Revised Text:** No. Potential habitat exists in the Project Area and individuals could be using the mine shaft.

**Page 64 – Section 3.3.9**

*A bullet was added to indicate the Townsend's big-eared bat is a species not eliminated from detailed analysis.*

**Original Text:** None

**Revised Text:**

- Townsend's big-eared bat (*Corynorhinus townsendii)*

**Page 64, Table 3-5 – Section 3.3.9**

*Table 3-5 was corrected to indicate that "winter range", not "crucial winter range", for the mule deer exisits at the 160-acre site and utility ROWs south of the White River.*

**Original Text:**

**TABLE 3-5**
**Utah Department of Wildlife Resources Managed Species**

| Species | Scientific Name | Eliminated From Detailed Analysis | Habitat |
|---|---|---|---|
| **BIG GAME** | | | |
| Moose | *Alces alces* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Prefers mosaic of second-growth forest, openings, swamps, lakes, wetlands. Requires water bodies for foraging and hardwood-conifer forests for winter cover. Avoids hot summer conditions by utilizing dense shade or bodies of water. Young are born in protective areas of dense thickets. |
| Pronghorn Antelope | *Antilocapra Americana* | **No** Those areas north of the White River contain year-long range. | Grasslands, sagebrush plains, deserts, and foothills. Need for free water varies with succulence of vegetation in the diet. Birth and fawn bedding sites in a sagebrush-steppe community were in dense shrub cover, but the tallest, most dense cover was avoided. |
| Bison | *Bison bison* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Open plains and grasslands in south; woodland and openings in boreal forest, meadows, and river valleys in north. |
| Rocky Mountain Elk | *Cervus elaphus* | Yes, the RMP/EIS indicates no elk range at the RD&D site or utility rights-of-way. | Uses open areas such as alpine pastures, marshy meadows, river flats, and aspen parkland, as well as coniferous forests, brushy clear cuts or forest edges, and semi-desert. |
| Mountain Lion | *Puma concolor* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Now associated generally with mountainous or remote undisturbed areas. May occupy wide variety of habitats: swamps, riparian woodlands, broken country with good cover of brush or woodland. |
| Mule Deer | *Odocoileus hemionus* | **No** Much of the Project Area and ROW south of the White River lie within crucial winter range. The RD&D site and utility rights-of-way lie within year-long range. | Coniferous forests, desert shrub, chaparral, grasslands with shrubs. Often associated with successional vegetation, especially near agricultural lands. Often on warmer slopes in winter. |

**TABLE 3-5**
**Utah Department of Wildlife Resources Managed Species**

| Species | Scientific Name | Eliminated From Detailed Analysis | Habitat |
|---|---|---|---|
| Bighorn Sheep | *Ovis canadensis* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Mesic to xeric, alpine to desert grasslands or shrub-steppe in mountains, foothills, or river canyons. Escape terrain (cliffs, talus slopes, etc.) is an important feature. In winter, Rocky Mountain Bighorns spend as much as 86% of their time within 100 meters of escape terrain, and usually stay within 800 meters of escape terrain throughout the year. |
| Black Bear | *Ursus americanus* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Prefers mixed deciduous-coniferous forests with a thick understory, but may occur in various situations. When inactive, occupies den under fallen tree, in ground-level or above-ground tree cavity or hollow log, in underground cave-like sites, on ground surface in dense cover. Young are born in a den. |
| **UPLAND GAME BIRDS/WATERFOWL** | | | |
| Chukar | *Alectoris chukar* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Prefers rocky slopes in sagebrush-grassland communities where water is available. |
| Waterfowl | *Anatidae* | Yes, HDD will be used where the ROW crosses the White River to minimize impacts. | Occur throughout the area but concentrations of nesting and winter utilization occur along the White River. |
| Ruffed Grouse | *Bonasa umbellus* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Dense forest with some deciduous trees, in both wet and relatively dry situations from boreal forest (especially early seral stages dominated by aspen) and northern hardwood ecotone to eastern deciduous forest and oak-savanna woodland. Young forest provides optimum conditions. |
| California Quail | *Callipepla californica* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Brushy, grassy and weedy areas in both humid and arid regions, including chaparral, forest edge, cultivated lands, semi-desert scrub, thickets, sagebrush and, less frequently, open second-growth woodland. Usually near water. |
| Sage Grouse | *Centrocercus urophasianus* | Yes, the RMP/EIS indicates no sage grouse leks are present at the RD&D site or utility rights-of-way. | Foothills, plains, and mountain slopes where sagebrush is present. Uses mixes of low and tall sagebrush with abundant forbs, riparian and wet meadows. |
| Blue Grouse | *Dendragapus obscurus* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Coniferous forest, especially fir, mostly in open situations with a mixture of deciduous trees and shrubs. Spends winter, usually at higher elevations than summer habitat, in conifer forest of various categories of age and tree density; roosts in large conifers with dense foliage (e.g., Douglas-fir during day, subalpine fir at night in northeastern Utah). |
| Wild Turkey (Merriam’s and Rio Grand) | *Meleagris gallopavo* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Forest and open woodland, scrub oak, deciduous or mixed deciduous-coniferous areas, especially in mountainous regions. |
| Ring-necked Pheasant | *Phasianus colchicus* | Yes, no individuals were observed during habitat surveys. | Open country (especially cultivated areas, scrubby wastes, open woodland and edges of woods), grassy steppe, desert oases, riverside thickets, swamps and open mountain forest. Winter shelter includes bushes and trees along streams, shelterbelts, and fencerows. |

| TABLE 3-5<br>Utah Department of Wildlife Resources Managed Species | | | |
|---|---|---|---|
| **Species** | **Scientific Name** | **Eliminated From Detailed Analysis** | **Habitat** |
| Mourning Dove | *Zenaida macroura* | **No**<br>Individuals were observed during habitat surveys. | Open woodland, forest edge, cultivated lands with scattered trees and bushes, parks and suburban areas, arid and desert country (generally near water) and second growth (Tropical to Temperate zones). |

## Revised Text:

| TABLE 3-5<br>Utah Department of Wildlife Resources Managed Species | | | |
|---|---|---|---|
| **Species** | **Scientific Name** | **Eliminated From Detailed Analysis** | **Habitat** |
| **BIG GAME** | | | |
| Moose | *Alces alces* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Prefers mosaic of second-growth forest, openings, swamps, lakes, wetlands. Requires water bodies for foraging and hardwood-conifer forests for winter cover. Avoids hot summer conditions by utilizing dense shade or bodies of water. Young are born in protective areas of dense thickets. |
| Pronghorn Antelope | *Antilocapra Americana* | **No**<br>Those areas north of the White River contain year-long range. | Grasslands, sagebrush plains, deserts, and foothills. Need for free water varies with succulence of vegetation in the diet. Birth and fawn bedding sites in a sagebrush-steppe community were in dense shrub cover, but the tallest, most dense cover was avoided. |
| Bison | *Bison bison* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Open plains and grasslands in south; woodland and openings in boreal forest, meadows, and river valleys in north. |
| Rocky Mountain Elk | *Cervus elaphus* | Yes, the RMP/EIS indicates no elk range at the RD&D site or utility rights-of-way. | Uses open areas such as alpine pastures, marshy meadows, river flats, and aspen parkland, as well as coniferous forests, brushy clear cuts or forest edges, and semi-desert. |
| Mountain Lion | *Puma concolor* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Now associated generally with mountainous or remote undisturbed areas. May occupy wide variety of habitats: swamps, riparian woodlands, broken country with good cover of brush or woodland. |
| Mule Deer | *Odocoileus hemionus* | **No**<br>Much of the Project Area and ROW south of the White River lie within winter range. The RD&D site and utility rights-of-way lie within year-long range. | Coniferous forests, desert shrub, chaparral, grasslands with shrubs. Often associated with successional vegetation, especially near agricultural lands. Often on warmer slopes in winter. |
| Bighorn Sheep | *Ovis canadensis* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Mesic to xeric, alpine to desert grasslands or shrub-steppe in mountains, foothills, or river canyons. Escape terrain (cliffs, talus slopes, etc.) is an important feature. In winter, Rocky Mountain Bighorns spend as much as 86% of their time within 100 meters of escape terrain, and usually stay within 800 meters of escape terrain throughout the year. |

| **TABLE 3-5**<br>**Utah Department of Wildlife Resources Managed Species** | | | |
|---|---|---|---|
| **Species** | **Scientific Name** | **Eliminated From Detailed Analysis** | **Habitat** |
| Black Bear | *Ursus americanus* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Prefers mixed deciduous-coniferous forests with a thick understory, but may occur in various situations. When inactive, occupies den under fallen tree, in ground-level or above-ground tree cavity or hollow log, in underground cave-like sites, on ground surface in dense cover. Young are born in a den. |
| **UPLAND GAME BIRDS/WATERFOWL** | | | |
| Chukar | *Alectoris chukar* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Prefers rocky slopes in sagebrush-grassland communities where water is available. |
| Waterfowl | *Anatidae* | Yes, HDD will be used where the ROW crosses the White River to minimize impacts. | Occur throughout the area but concentrations of nesting and winter utilization occur along the White River. |
| Ruffed Grouse | *Bonasa umbellus* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Dense forest with some deciduous trees, in both wet and relatively dry situations from boreal forest (especially early seral stages dominated by aspen) and northern hardwood ecotone to eastern deciduous forest and oak-savanna woodland. Young forest provides optimum conditions. |
| California Quail | *Callipepla californica* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Brushy, grassy and weedy areas in both humid and arid regions, including chaparral, forest edge, cultivated lands, semi-desert scrub, thickets, sagebrush and, less frequently, open second-growth woodland. Usually near water. |
| Sage Grouse | *Centrocercus urophasianus* | Yes, the RMP/EIS indicates no sage grouse leks are present at the RD&D site or utility rights-of-way. | Foothills, plains, and mountain slopes where sagebrush is present. Uses mixes of low and tall sagebrush with abundant forbs, riparian and wet meadows. |
| Blue Grouse | *Dendragapus obscurus* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Coniferous forest, especially fir, mostly in open situations with a mixture of deciduous trees and shrubs. Spends winter, usually at higher elevations than summer habitat, in conifer forest of various categories of age and tree density; roosts in large conifers with dense foliage (e.g., Douglas-fir during day, subalpine fir at night in northeastern Utah). |
| Wild Turkey (Merriam's and Rio Grand) | *Meleagris gallopavo* | Yes, no habitat is present at the RD&D site or utility rights-of-way. | Forest and open woodland, scrub oak, deciduous or mixed deciduous-coniferous areas, especially in mountainous regions. |
| Ring-necked Pheasant | *Phasianus colchicus* | Yes, no individuals were observed during habitat surveys. | Open country (especially cultivated areas, scrubby wastes, open woodland and edges of woods), grassy steppe, desert oases, riverside thickets, swamps and open mountain forest. Winter shelter includes bushes and trees along streams, shelterbelts, and fencerows. |
| Mourning Dove | *Zenaida macroura* | **No**<br>Individuals were observed during habitat surveys. | Open woodland, forest edge, cultivated lands with scattered trees and bushes, parks and suburban areas, arid and desert country (generally near water) and second growth (Tropical to Temperate zones). |

**Page 69 – Section 3.3.10**

*Language changed to reflect current listing status of Graham's beardtongue.*

**Original Text:**

- Graham Beardtongue (*Penstemon grahamii*) – Federally Listed Proposed.

**Revised Text:**

- Graham's beardtongue (*Penstemon grahamii*) – Listing declined; litigation pending.

**Page 97, Table 4-4 – Section 4.2.1**

*Table 4-4 was corrected to provide the corrected emission estimates for $PM_{10}$ from unpaved on-site roads and to add an explanation in the footnotes as to why $PM_{2.5}$ emissions were not modeled separately.*

**Original Text:**

**TABLE 4-4**
**Phase 2 Estimated Emissions**

| Emission Point | Estimated Emissions Summary (tons/Phase 2) | | | | | |
|---|---|---|---|---|---|---|
| | $NO_x$ | $SO_2$ | CO | VOC | $PM_{10}$ | HAPs |
| ATP Processor Operation[1] | 0.55 | 1.23 | 8.21 | 0.14 | 0.55 | -- |
| Start-Up Burner[2] | 0.086 | 0.000072 | 0.014 | 0.0023 | 0.0027 | 0.000033 |
| Flaring of flue gas[3] | -- | -- | 0.26 | 5.98 | -- | -- |
| Diesel Generator[4] | 7.73 | 1.44 | 0.86 | 0.91 | 1.44 | 0.27 |
| Diesel Storage Tank[5] | -- | -- | -- | 0.0062 | -- | -- |
| Shale Crushing/Screening[6] | -- | -- | -- | -- | 0.026 | -- |
| Truck Loading/Unloading[6] | -- | -- | -- | -- | 0.00008 | -- |
| Stockpiled Shale[6] | -- | -- | -- | -- | 0.48 | -- |
| ANFO Blasting[7] | 0.032 | 0.004 | 0.126 | -- | -- | -- |
| Shale Oil Storage Tank[8] | -- | -- | -- | 0.73 | -- | -- |
| Unpaved On-site Roads[9] | -- | -- | -- | -- | 0.000018 | -- |
| **Total** | **8.40** | **2.67** | **9.47** | **7.77** | **2.49** | **0.27** |

[1] Estimated concentration data provided by UMATAC based on a pilot project in Canada. Emissions assumed a 95% control on CO, VOC, and $SO_2$, and a filter bag for PM control. The $CO_2$ formed during oxidation of CO, assuming 100% conversion, was added to the total amount of $CO_2$. HAP emissions are not known at this time. A portion of these emissions will be due to the start-up burner. To be conservative, assumed the start-up burner emissions are separate.

[2] Assumed a 24 hour start-up period, required 15 times over the course of the phase. Assumed a natural gas burner consuming 48 MMBtu per start-up. A portion of these emissions may be included in the ATP process data; however, to be conservative, assumed the start-up burner emissions are separate. Emission factors are from USEPA AP-42, Chapter 1.5, *Liquified Petroleum Gas Combustion*, October 1996; HAP emissions were taken from USEPA AP-42 Chapter 1.4, *Natural Gas Combustion*, July 1998.

[3] Estimated based on flare gas from previous pilot study conducted on similar ATP60 plant. Assumed a 98% destruction efficiency based on USEPA AP-42 Chapter 13.5, *Industrial Flares*, September

| TABLE 4-4<br>Phase 2 Estimated Emissions | | | | | | |
|---|---|---|---|---|---|---|
| Emission Point | Estimated Emissions Summary (tons/Phase 2) | | | | | |
| | $NO_x$ | $SO_2$ | CO | VOC | $PM_{10}$ | HAPs |

1991. The amount of CO converted to $CO_2$ in the flare is included in the $CO_2$ emission value.

4 Estimated assuming 592,000 gal of diesel will be needed for length of Phase 2. To be conservative, assumed all diesel is used in diesel-fired generators; however, some (~22,000 gal) will be used in the haul trucks and other unknown underground equipment. In order to comply with concentration thresholds, a CO and $NO_x$ APCD device may need to be installed; therefore, a 85% and 90% control efficiencies for $NO_x$ and CO were assumed. Emissions factors were obtained from typical Cummins 1 MW diesel generator specifications; $CO_2$ emission factor was from USEPA AP-42, Chapter 3.3, *Gasoline and Diesel Industrial Engines*, October 1996.

5 Working and breathing losses for 15,000 gal. tanks with a total throughput of 592,000 gallons (570,000 gal for power generation, 22,000 gal for the mine work) for the Phase, estimated using EPA Tanks4.0 program.

6 Emission factors from USEPA AP-42 Chapter 11.19.2, *Crushed Stone Processing and Pulverized Mineral Processing*, August, 2004. Assumed controlled emissions using wet suppression. Assumed 2 intermediate conveying transfer points between one primary crusher, one secondary crusher, and one screener. Aggregate storage emission factor from US EPA FIRE 6.25

7 Emission factors are from USEPA AP-42 Chapter 13.3, *Explosives Detonation*, February 1980.

8 Working and breathing losses for a 31,500 gal tank used to store the produced shale oil with a total project throughput of 6,400 gal, estimated using EPA Tanks4.0 program.

9 Estimated $PM_{10}$ emissions from unpaved vehicle traffic on-site using USEPA AP-42, Chapter 13.2.2, *Unpaved Roads*, December 2003; assumed a total of 50 miles traveled during Phase 2 for a 200 ton truck to gather 10,000 tons of shale oil (200 tons at a time) and transport it back to the ATP.

## Revised Text:

| TABLE 4-4<br>Phase 2 Estimated Emissions | | | | | | |
|---|---|---|---|---|---|---|
| Emission Point | Estimated Emissions Summary (tons/Phase 2) | | | | | |
| | $NO_x$ | $SO_2$ | CO | VOC | $PM_{10}$ | HAPs |
| ATP Processor Operation[1] | 0.55 | 1.23 | 8.21 | 0.14 | 0.55 | -- |
| Start-Up Burner[2] | 0.086 | 0.000072 | 0.014 | 0.0023 | 0.0027 | 0.000033 |
| Flaring of flue gas[3] | -- | -- | 0.26 | 5.98 | -- | -- |
| Diesel Generator[4] | 7.73 | 1.44 | 0.86 | 0.91 | 1.44 | 0.27 |
| Diesel Storage Tank[5] | -- | -- | -- | 0.0062 | -- | -- |
| Shale Crushing/Screening[6] | -- | -- | -- | -- | 0.026 | -- |
| Truck Loading/Unloading[6] | -- | -- | -- | -- | 0.00008 | -- |
| Stockpiled Shale[6] | -- | -- | -- | -- | 0.48 | -- |
| ANFO Blasting[7] | 0.032 | 0.004 | 0.126 | -- | -- | -- |
| Shale Oil Storage Tank[8] | -- | -- | -- | 0.73 | -- | -- |
| Unpaved On-site Roads[9] | -- | -- | -- | -- | 0.48 | -- |
| **Total** | **8.40** | **2.67** | **9.47** | **7.77** | **2. 98** | **0.27** |

1 Estimated concentration data provided by UMATAC based on a pilot project in Canada. Emissions

| TABLE 4-4 Phase 2 Estimated Emissions | | | | | | |
|---|---|---|---|---|---|---|
| Emission Point | Estimated Emissions Summary (tons/Phase 2) | | | | | |
| | $NO_x$ | $SO_2$ | CO | VOC | $PM_{10}$ | HAPs |

| | |
|---|---|
| | assumed a 95% control on CO, VOC, and $SO_2$, and a filter bag for PM control. The $CO_2$ formed during oxidation of CO, assuming 100% conversion, was added to the total amount of $CO_2$. HAP emissions are not known at this time. A portion of these emissions will be due to the start-up burner. To be conservative, assumed the start-up burner emissions are separate. |
| 2 | Assumed a 24 hour start-up period, required 15 times over the course of the phase. Assumed a natural gas burner consuming 48 MMBtu per start-up. A portion of these emissions may be included in the ATP process data; however, to be conservative, assumed the start-up burner emissions are separate. Emission factors are from USEPA AP-42, Chapter 1.5, *Liquified Petroleum Gas Combustion*, October 1996; HAP emissions were taken from USEPA AP-42 Chapter 1.4, *Natural Gas Combustion*, July 1998. |
| 3 | Estimated based on flare gas from previous pilot study conducted on similar ATP60 plant. Assumed a 98% destruction efficiency based on USEPA AP-42 Chapter 13.5, *Industrial Flares*, September 1991. The amount of CO converted to $CO_2$ in the flare is included in the $CO_2$ emission value. |
| 4 | Estimated assuming 592,000 gal of diesel will be needed for length of Phase 2. To be conservative, assumed all diesel is used in diesel-fired generators; however, some (~22,000 gal) will be used in the haul trucks and other unknown underground equipment. In order to comply with concentration thresholds, a CO and $NO_x$ APCD device may need to be installed; therefore, a 85% and 90% control efficiencies for $NO_x$ and CO were assumed. Emissions factors were obtained from typical Cummins 1 MW diesel generator specifications; $CO_2$ emission factor was from USEPA AP-42, Chapter 3.3, *Gasoline and Diesel Industrial Engines*, October 1996. |
| 5 | Working and breathing losses for 15,000 gal. tanks with a total throughput of 592,000 gallons (570,000 gal for power generation, 22,000 gal for the mine work) for the Phase, estimated using EPA Tanks4.0 program. |
| 6 | Emission factors from USEPA AP-42 Chapter 11.19.2, *Crushed Stone Processing and Pulverized Mineral Processing*, August, 2004. Assumed controlled emissions using wet suppression. Assumed 2 intermediate conveying transfer points between one primary crusher, one secondary crusher, and one screener. Aggregate storage emission factor from US EPA FIRE 6.25 |
| 7 | Emission factors are from USEPA AP-42 Chapter 13.3, *Explosives Detonation*, February 1980. |
| 8 | Working and breathing losses for a 31,500 gal tank used to store the produced shale oil with a total project throughput of 6,400 gal, estimated using EPA Tanks4.0 program. |
| 9 | Estimated $PM_{10}$ emissions from unpaved vehicle traffic on-site using USEPA AP-42, Chapter 13.2.2, *Unpaved Roads*, December 2003; assumed a total of 50 miles traveled during Phase 2 for a 200 ton truck to gather 10,000 tons of shale oil (200 tons at a time) and transport it back to the ATP. Although $PM_{2.5}$ was not modeled due to lack of emission factors, even if all $PM_{10}$ emissions were in the form of $PM_{2.5}$, emissions would be well below the $PM_{2.5}$ NAAQS. |

**Page 98 – Section 4.2.1**

*A sentence was added to provide the Phase 2 greenhouse gas emissions in carbon equivalence per barrel of shale oil produced.*

**Original Text:**

*Phase 2 Greenhouse Gas Emissions*

Greenhouse gas emissions (GHG) from Phase 2 will be generated from combustion of spent shale in the ATP processor, start-up burner, flare, and generators; in addition, methane will be emitted from the mine opening. Table 4-5 outlines the estimated GHG emissions and the associated carbon equivalence associated with each of these processes.

**Revised Text:**

*Phase 2 Greenhouse Gas Emissions*

Greenhouse gas emissions (GHG) from Phase 2 will be generated from combustion of spent shale in the ATP processor, start-up burner, flare, and generators; in addition, methane will be emitted from the mine opening. Table 4-5 outlines the estimated GHG emissions and the associated carbon equivalence associated with each of these processes. The overall GHG emissions estimated for Phase 2 equate to 0.42 carbon equivalence/barrel of shale oil produced.

**Page 101 – Section 4.2.1**

*A sentence was added confirming that BACT will be installed as part of Phase 3 emissions controls. A paragraph was added concerning the potential impact of* $NO_x$ *and VOC emissions on ozone attainment.*

**Original Text:** The uncontrolled emissions are estimated to exceed the PSD 250 ton/yr permitting threshold for CO, VOCs and $SO_2$. Therefore, OSEC anticipates that Phase 3 will require a PSD permit. Obtaining a PSD permit requires air dispersion modeling and BACT analyses in the permit application to demonstrate that the project complies with ambient air quality standards, will not adversely impact air quality, and meet current standards of air pollution controls for the type of equipment being operated. OSEC will comply with PSD permitting requirements and therefore will conduct more detailed air dispersion modeling and BACT analyses during the preparation of the permit application. For purposes of estimating the Phase 3 emissions, air pollution control devices on the ATP processor are assumed to be required for $SO_2$, CO and VOCs under PSD permitting. Therefore, the estimated emissions in Table 4-7 include the assumption that a CO and VOC control device, such as a CO boiler, and a $SO_2$ control device, such as an acid scrubber, will be installed on the ATP. The specifics of the types of control devices and associated destruction efficiency required will be discussed with the EPA prior to submittal of the PSD application. OSEC will comply with all county, state and federal permit conditions and stipulations.

**Revised Text:** The uncontrolled emissions are estimated to exceed the PSD 250 ton/yr permitting threshold for CO, VOCs and $SO_2$. Therefore, OSEC anticipates that Phase 3 will require a PSD permit. Obtaining a PSD permit requires air dispersion modeling and BACT analyses in the permit application to demonstrate that the project complies with ambient air quality standards, will not adversely impact air quality, and meet current standards of air pollution controls for the type of equipment being operated. OSEC will comply with PSD permitting requirements and therefore will conduct more detailed air dispersion modeling and BACT analyses during the preparation of the permit application. BACT will be installed that complies with PSD requirements based on the BACT analysis. For purposes of estimating the Phase 3 emissions, air pollution control devices on the ATP processor are assumed to be required for $SO_2$, CO and VOCs under PSD permitting. Therefore, the estimated emissions in Table 4-7 include the assumption that a CO and VOC control device, such as a CO boiler, and a $SO_2$ control device, such as an acid scrubber, will be installed on the ATP. The specifics of the types of control devices and associated destruction efficiency required will be discussed with the EPA prior to submittal of the PSD application. OSEC will comply with all county, state and federal permit conditions and stipulations.

The $NO_x$ and VOC emissions have the potential to impact ambient ozone concentrations. The lease site has been designated as in attainment for the 8-hour ozone NAAQS. The $NO_x$ and VOC emissions from the project will not affect the ozone attainment designation. Even if it is assumed that all the $NO_x$ and VOC emissions equate to $O_3$, the resulting concentration would be only 9.7% of the 8-hour ozone NAAQS.

**Page 101 – Section 4.2.1**

*A sentence was added clarifying that dust control measures will be used to minimize dust emissions from spent shale handling and from traffic along haul roads. Language was added to clarify the greenhouse gas emission evaluation included the Bonanza Power Plant. A sentence was added to provide the Phase 3 greenhouse gas emissions in carbon equivalence per barrel of shale oil produced.*

**Original Text:** As discussed under Phase 2, to minimize dust from the underground mining activities reaching the surface atmosphere, watering or wetting agents will be used. A mine ventilation system is used to maintain breathable air within the mine. The current design for this system is for a flow rate up to 18 MMscfh. Blast fumes and fugitive dust from the mine will be entrained by this system, and exhausted above the mine surface. It is anticipated that most of the dust will settle out within the mine because of its size distribution, and relatively little will be carried any distance from the mine. In addition, proper maintenance of the vehicles used underground will assist in minimizing the combustion emissions associated with these devices.

*Phase 3 Greenhouse Gas Emissions*

GHG from Phase 3 will be generated from combustion of spent shale in the ATP processor, start-up burner, electric power grid, flare, hydrogen plant, and generators; in addition, methane will be emitted from the mine. Table 4-8 outlines the estimated GHG emissions and the associated carbon equivalence associated with each of these processes.

**Revised Text:** As discussed under Phase 2, to minimize dust from the underground mining activities reaching the surface atmosphere, watering or wetting agents will be used. A mine ventilation system is used to maintain breathable air within the mine. The current design for this system is for a flow rate up to 18 MMscfh. Blast fumes and fugitive dust from the mine will be entrained by this system, and exhausted above the mine surface. It is anticipated that most of the dust will settle out within the mine because of its size distribution, and relatively little will be carried any distance from the mine. In addition, proper maintenance of the vehicles used underground will assist in minimizing the combustion emissions associated with these devices. In addition to controlling fugitive dust from the mine, watering and wetting agents will be used to control dust from the handling of the shale and spent shale at the surface and along haul roads.

*Phase 3 Greenhouse Gas Emissions*
GHG emissions from Phase 3 will be generated from pyrolosis of oil shale and combustion of spent shale in the ATP retort, flare, hydrogen plant, and generators from on-site operations and from the Bonanza Power Plant In addition, methane will be emitted from the mine. Table 4-8 outlines the estimated GHG emissions and the associated carbon equivalence associated with each of these processes. The Phase 3 GHG emissions are estimated to equate to 0.11 carbon equivalence/barrel of shale oil produced.

**Page 103, Table 4-7 – Section 4.2.1**
*Table 4-7 was modified to provide the correct emission estimate for $PM_{10}$ emissions from unpaved on-site roads. A sentence was added to the footnotes explaining why $PM_{2.5}$ emissions were not modeled separately.*

**Original Text:**

**TABLE 4-7**
**Phase 3 Estimated Emissions**

| Emission Point | Estimated Emissions Summary (tons/Phase 3) | | | | | |
|---|---|---|---|---|---|---|
| | $NO_x$ | $SO_2$ | CO | VOC | $PM_{10}$ | HAPs |
| ATP Processor Operation[1] | 126.97 | 285.67 | 1,904.49 | 31.74 | 13.34 | -- |
| Start-Up Burner[2] | 17.75 | 0.015 | 2.99 | 0.47 | 0.56 | 0.0068 |
| Electrical Needs (14 MW)[3] | 207.79 | 34.94 | -- | -- | -- | -- |

**TABLE 4-7**
**Phase 3 Estimated Emissions**

| Emission Point | Estimated Emissions Summary (tons/Phase 3) | | | | | |
|---|---|---|---|---|---|---|
| | $NO_x$ | $SO_2$ | CO | VOC | $PM_{10}$ | HAPs |
| Hydrogen Plant Reformer[4] | 5.15 | 0.06 | 8.64 | 0.57 | 0.78 | 0.00 |
| Flaring of flue gas[5] | -- | -- | 8.19 | 186.94 | -- | -- |
| Diesel Storage Tank[6] | -- | -- | -- | 0.024 | -- | -- |
| Shale Crushing/Screening[7] | -- | -- | -- | -- | 7.14 | -- |
| Stockpiled Shale[7] | -- | -- | -- | -- | 132.00 | -- |
| Truck Loading/Unloading[7] | -- | -- | -- | -- | 0.02 | -- |
| ANFO Blasting[8] | 14.88 | 1.75 | 58.63 | -- | -- | -- |
| Diesel Combustion[9] | 870.81 | 24.25 | 145.50 | 15.43 | 24.25 | 4.52 |
| Shale Oil Storage Tank[10] | -- | -- | -- | 9.19 | -- | -- |
| Unpaved On-site Roads[11] | -- | -- | -- | -- | 0.0065 | -- |
| **Total** | **1243.34** | **346.69** | **2,128.44** | **244.36** | **178.10** | **4.52** |

[1] Estimated concentration data provided by UMATAC based on a pilot project in Canada. Emissions assumed a 95% control on CO, VOC, and $SO_2$, and a filter bag for PM control. The $CO_2$ formed during oxidation of CO, assuming 100% conversion, was added to the total amount of $CO_2$. HAP emissions are not known at this time. A portion of these emissions will be due to the start-up burner. To be conservative, assumed the start-up burner emissions are separate.

[2] Assumed a 24 hour start-up period, required 50 times over the course of the phase. Assumed a natural gas burner consuming 3,000 MMBtu per start-up. A portion of these emissions may be included in the ATP process data; however, to be conservative, assumed the start-up burner emissions are separate. Emission factors are from USEPA AP-42, Chapter 1.5, *Liquified Petroleum Gas Combustion*, October 1996; HAP emissions were taken from USEPA AP-42 Chapter 1.4, *Natural Gas Combustion*, July 1998.

[3] Emissions were estimated based on the average 2000-2005 Bonanza I Power Plant emissions data from the USEPA Clean Air Markets. Between 2000 and 2005, the power plant required on average 4,996 MMBtu/hr. The additional power needed for Phase 3 would result in a maximum increase in usage of 3%. Assumed 3% of the average power plant emissions provided on the Clean Air Markets website would be emitted due to operation of Phase 3. Data on CO, VOC, $PM_{10}$ and HAPs was not provided on the website.

[4] Emissions were estimated assuming a 5.8 MW reformer fueled on natural gas and USEPA AP-42 Chapter 1.4, *Natural Gas Combustion*, July 1998. These emissions only account for an estimate of the hydrogen reformer; additional combustion devices that may be needed are not included or known at this time. The hydrotreating process is not anticipated to result in emissions not already accounted for in the ATP processor emissions estimate.

[5] Estimated based on previous test run conducted on similar ATP60 plant scaled up for the 250 ton/yr processor, assuming only 50% of the off-gas is flared. This value is highly conservative given the flaring may only occur during emergency situations and/or the off-gas may be used instead to further fuel the ATP.

[6] Working and breathing losses for 15,000 gal. tanks with a total throughput of 10,000,000 gallons for the Phase, estimated using EPA Tanks 4.0 program.

[7] Emission factors from USEPA AP-42 Chapter 11.19.2, *Crushed Stone Processing and Pulverized Mineral Processing*, August, 2004. Assumed controlled emissions using wet suppression. Assumed 2 conveying transfer points. Aggregate storage emission factor from US EPA FIRE 6.25

[8] Emission factors are from USEPA AP-42 Chapter 13.3, *Explosives Detonation*, February 1980.

[9] Diesel fuel will be used mostly in underground haul trucks and other mining equipment. Some surface equipment or standby emergency generator may be used. To be conservative, the estimated 10 million gallons of diesel was assumed to be burned in a generator.

[10] Working and breathing losses for shale oil storage tanks with a total project throughput of 75,348,000 gal, estimated using EPA Tanks4.0 program.

| **TABLE 4-7**<br>**Phase 3 Estimated Emissions** | | | | | | |
|---|---|---|---|---|---|---|
| **Emission Point** | **Estimated Emissions Summary (tons/Phase 3)** | | | | | |
| | **$NO_x$** | **$SO_2$** | **CO** | **VOC** | **$PM_{10}$** | **HAPs** |

[11] Estimated $PM_{10}$ emissions from unpaved vehicle traffic on-site using USEPA AP-42, Chapter 13.2.2, *Unpaved Roads*, December 2003; assumed a total of 18,100 miles traveled during Phase 3 for a 200 ton truck to gather 2.7 million tons of shale oil (200 tons at a time) and transport it back to the ATP.

## Revised Text:

| **TABLE 4-7**<br>**Phase 3 Estimated Emissions** | | | | | | |
|---|---|---|---|---|---|---|
| **Emission Point** | **Estimated Emissions Summary (tons/Phase 3)** | | | | | |
| | **$NO_x$** | **$SO_2$** | **CO** | **VOC** | **$PM_{10}$** | **HAPs** |
| ATP Processor Operation[1] | 126.97 | 285.67 | 1,904.49 | 31.74 | 13.34 | -- |
| Start-Up Burner[2] | 17.75 | 0.015 | 2.99 | 0.47 | 0.56 | 0.0068 |
| Electrical Needs (14 MW)[3] | 207.79 | 34.94 | -- | -- | -- | -- |
| Hydrogen Plant Reformer[4] | 5.15 | 0.06 | 8.64 | 0.57 | 0.78 | 0.00 |
| Flaring of flue gas[5] | -- | -- | 8.19 | 186.94 | -- | -- |
| Diesel Storage Tank[6] | -- | -- | -- | 0.024 | -- | -- |
| Shale Crushing/Screening[7] | -- | -- | -- | -- | 7.14 | -- |
| Stockpiled Shale[7] | -- | -- | -- | -- | 132.00 | -- |
| Truck Loading/Unloading[7] | -- | -- | -- | -- | 0.02 | -- |
| ANFO Blasting[8] | 14.88 | 1.75 | 58.63 | -- | -- | -- |
| Diesel Combustion[9] | 870.81 | 24.25 | 145.50 | 15.43 | 24.25 | 4.52 |
| Shale Oil Storage Tank[10] | -- | -- | -- | 9.19 | -- | -- |
| Unpaved On-site Roads[11] | -- | -- | -- | -- | 167.66 | -- |
| **Total** | **1243.34** | **346.69** | **2,128.44** | **244.36** | **345.75** | **4.52** |

[1] Estimated concentration data provided by UMATAC based on a pilot project in Canada. Emissions assumed a 95% control on CO, VOC, and $SO_2$, and a filter bag for PM control. The $CO_2$ formed during oxidation of CO, assuming 100% conversion, was added to the total amount of $CO_2$. HAP emissions are not known at this time. A portion of these emissions will be due to the start-up burner. To be conservative, assumed the start-up burner emissions are separate.

[2] Assumed a 24 hour start-up period, required 50 times over the course of the phase. Assumed a natural gas burner consuming 3,000 MMBtu per start-up. A portion of these emissions may be included in the ATP process data; however, to be conservative, assumed the start-up burner emissions are separate. Emission factors are from USEPA AP-42, Chapter 1.5, *Liquified Petroleum Gas Combustion*, October 1996; HAP emissions were taken from USEPA AP-42 Chapter 1.4, *Natural Gas Combustion*, July 1998.

[3] Emissions were estimated based on the average 2000-2005 Bonanza I Power Plant emissions data from the USEPA Clean Air Markets. Between 2000 and 2005, the power plant required on average 4,996 MMBtu/hr. The additional power needed for Phase 3 would result in a maximum increase in usage of 3%. Assumed 3% of the average power plant emissions provided on the Clean Air Markets website would be emitted due to operation of Phase 3. Data on CO, VOC, $PM_{10}$ and HAPs was not provided on the website.

[4] Emissions were estimated assuming a 5.8 MW reformer fueled on natural gas and USEPA AP-42 Chapter 1.4, *Natural Gas Combustion*, July 1998. These emissions only account for an estimate of the hydrogen reformer; additional combustion devices that may be needed are not included or known at this time. The hydrotreating process is not anticipated to result in emissions not already accounted for in the ATP processor emissions estimate.

[5] Estimated based on previous test run conducted on similar ATP60 plant scaled up for the 250 ton/yr processor, assuming only 50% of the off-gas is flared. This value is highly conservative given the flaring may only occur during emergency situations and/or the off-gas may be used instead to further fuel the ATP.

| TABLE 4-7<br>Phase 3 Estimated Emissions | | | | | | |
|---|---|---|---|---|---|---|
| Emission Point | Estimated Emissions Summary (tons/Phase 3) | | | | | |
| | $NO_x$ | $SO_2$ | CO | VOC | $PM_{10}$ | HAPs |

[6] Working and breathing losses for 15,000 gal. tanks with a total throughput of 10,000,000 gallons for the Phase, estimated using EPA Tanks 4.0 program.

[7] Emission factors from USEPA AP-42 Chapter 11.19.2, *Crushed Stone Processing and Pulverized Mineral Processing*, August, 2004. Assumed controlled emissions using wet suppression. Assumed 2 conveying transfer points. Aggregate storage emission factor from US EPA FIRE 6.25

[8] Emission factors are from USEPA AP-42 Chapter 13.3, *Explosives Detonation*, February 1980.

[9] Diesel fuel will be used mostly in underground haul trucks and other mining equipment. Some surface equipment or standby emergency generator may be used. To be conservative, the estimated 10 million gallons of diesel was assumed to be burned in a generator.

[10] Working and breathing losses for shale oil storage tanks with a total project throughput of 75,348,000 gal, estimated using EPA Tanks4.0 program.

[11] Estimated $PM_{10}$ emissions from unpaved vehicle traffic on-site using USEPA AP-42, Chapter 13.2.2, *Unpaved Roads*, December 2003; assumed a total of 18,100 miles traveled during Phase 3 for a 200 ton truck to gather 2.7 million tons of shale oil (200 tons at a time) and transport it back to the ATP. Although $PM_{2.5}$ was not modeled due to lack of emission factors, even if all $PM_{10}$ emissions were in the form of $PM_{2.5}$, emissions would be well below the $PM_{2.5}$ NAAQS.

**Page 111 – Section 4.2.2**

*Text was modified to clarify potential consequences of construction-related wastes to be disposed of off-site.*

**Original Text:**

*Environmental Consequences of Construction-Related Wastes*

If disposed of on-site, there will be short-term, minor visual impacts from the placement of new wastes prior to the time that the materials are covered with spent shale. Also, if poorly managed, there could be impacts from lighter debris becoming wind-borne and transported away from the immediate construction area or from construction debris being left on the 160-acre lease following the completion of construction.

*Mitigation*

No mitigation is necessary for the short-term visual impacts from placement of construction debris in the spent shale disposal areas. If lighter debris becomes wind-borne and is transported away from the construction area, OSEC will implement measures to collect all such debris and to have it properly disposed.

**Revised Text:**

*Environmental Consequences of Construction-Related Wastes*

If poorly managed, there could be impacts from lighter debris becoming wind-borne and transported away from the immediate construction area or from construction debris being left on the 160-acre lease following the completion of construction.

*Mitigation*
If lighter debris becomes wind-borne and is transported away from the construction area, OSEC will implement measures to collect all such debris and to have it properly disposed.

**Page 121 – Section 4.2.3**
*Text was modified to accurately reflect current status of water usage agreement and existing wells/infrastructure.*

**Original Text:** There are three main sources of water that could be used to satisfy the water demand during processor operation: (1) surface water from the White River, (2) ground water from the alluvial aquifer associated with the White River, and (3) ground water from a bedrock aquifer such as the Birds Nest aquifer or Douglas Creek Member. Based on the flow volume in the White River or hydrogeologic characteristics of the aquifers, any of these water sources should be capable of supplying the needs of the project during Phase 3, although, due to aquifer heterogeneity, there is some question as to whether on-site wells in the Birds Nest aquifer will be sufficient to fully supply the water demands for Phase 3. It is also possible that a combination of these sources would be used. As part of the 1980s oil shale project, an agreement was signed with the State of Utah for the use of up to 3,000 acre-ft/yr extracted from wells in the White River alluvium. A system with two extraction wells and a pump house designed for 200 gallons per minute (gpm) was constructed in 1983. Given that this infrastructure remains in place, ground water from the White River alluvium is a likely source of at least some of the water.

**Revised Text:**
There are three main sources of water that could be used to satisfy the water demand during processor operation: (1) surface water from the White River, (2) ground water from the alluvial aquifer associated with the White River, and (3) ground water from a bedrock aquifer such as the Birds Nest Aquifer or Douglas Creek Member. Based on the flow volume in the White River or hydrogeologic characteristics of the aquifers, any of these water sources should be capable of supplying the needs of the project during Phase 3, although, due to aquifer heterogeneity, there is some question as to whether on-site wells in the Birds Nest Aquifer will be sufficient to fully supply the water demands for Phase 3. It is also possible that a combination of these sources would be used. As part of the White River Shale Project, an agreement was signed in 1983 with the State of Utah for the use of up to 3,000 acre-ft/yr extracted from wells in the White River alluvium.

However, this agreement has expired and would need to be reissued. A system with two extraction wells and a pump house designed for 200 gallons per minute (gpm) was constructed in 1983. The wells are currently sealed but the infrastructure remains in place. Ground water from the White River alluvium is a likely source of at least some of the water.

**Page 125 – Section 4.2.3**

*Text modified regarding water level monitoring requirements.*

**Original Text:**

*Water Level Monitoring*

To provide data on actual changes in water levels in the White River or the ground water systems, OSEC will establish a water level monitoring program during Phase 3 of the project.

If water is withdrawn from the White River or from the White River alluvium, the monitoring will consist of (1) establishing gauging stations and measuring flow in the White River upstream and downstream of the withdrawal point(s) and (2) measuring the ground water level in 2 piezometers located in the alluvium near the withdrawal point(s). If ground water is extracted from the Birds Nest aquifer, the monitoring will also include a piezometer in the Birds Nest aquifer and a gauging station along Evacuation Creek.

It is anticipated that such monitoring would be daily for the first two weeks of water withdrawals, weekly for the next 6 weeks, and monthly thereafter.

**Revised Text:**

*Water Level Monitoring*

To provide data on water withdrawal from the White River and changes in water levels in the ground water systems, OSEC will establish a water level monitoring program during Phase 3 of the project.

If water is withdrawn from the White River or from the White River alluvium, the monitoring will consist of (1) measuring water withdrawal from the White River and (2) measuring the ground water level in 2 piezometers located in the alluvium near the withdrawal point(s). If ground water is extracted from the Birds Nest Aquifer, the monitoring will also include a piezometer in the Birds Nest Aquifer and a gauging station along Evacuation Creek.

It is anticipated that such monitoring would be daily for the first two weeks of water withdrawals, weekly for the next 6 weeks, and monthly thereafter.

**Page 134 – Section 4.2.8**

*Text changed to reflect current information on Bald Eagles in Utah.*

**Original Text:** Impacts of the Proposed Project on bald eagles are "may affect not likely to adversely affect bald eagles" because eagles typically utilize carrion in addition to fish and waterfowl in the winter. Furthermore, there are few nesting pairs in the entire state of Utah (only four identified in 2000) (SU, NR, DWR, 2006). No bald eagles or their nests were observed within 0.5 mile of the 160-acre site or the utility rights-of-way during raptor surveys conducted in the spring of 2006.

**Revised Text:** Impacts of the Proposed Action on bald eagles have been determined through consultation with the USFWS to be "may affect not likely to adversely affect" because eagles typically utilize carrion in addition to fish and waterfowl in the winter. Furthermore, there are few nesting pairs in the entire state of Utah (only eight identified in 2006). No bald eagles or their nests were observed within 0.5 mile of the 160-acre site or the utility rights-of-way during raptor surveys conducted in the spring of 2006.

**Page 136 – Section 4.2.8**

*Text was corrected to clarify the pipeline would be installed under the White River.*

**Original Text:** Construction of the western natural gas pipeline under the Proposed Action would not directly affect the four Colorado River basin T&E fish species. The applicant is committed to use horizontal directional drilling (HDD) to install pipe beneath the White River channel. In addition, the proposed power line will span the river, thereby avoiding any potential impacts.

**Revised Text:** Construction of the western natural gas pipeline under the White River would not directly affect the four Colorado River basin T&E fish species. The applicant is committed to use horizontal directional drilling (HDD) to install pipe beneath the White River channel. In addition, the proposed power line will span the river, thereby avoiding any potential impacts.

**Page 136 – Section 4.2.8**
*Text as added to clarify potential impacts to springs and macroinvertebrates.*

**Original Text:** If alluvial wells are installed within the 100-year floodplain, there may be additional effects to the four T&E fish species. Impacts could include increased sedimentation while drilling the wells and constructing supporting structures (roads, pipelines, etc.). Increased sedimentation could reduce the quality of spawning beds for the fish and areas for insects that fish feed upon to reproduce. The applicant is committed to implementation of erosion and sediment control measures and the project SPCC Plan to limit any affects of alluvial well installation and operation on T&E fish species in consultation with the BLM and USFWS.

**Revised Text:** If alluvial wells are installed within the 100-year floodplain, there may be additional effects to the four T&E fish species. Impacts could include increased sedimentation while drilling the wells and constructing ancillary facilities (roads, pipelines, etc.). Increased sedimentation could reduce the quality of spawning beds for fish and the quality of areas, such as springs, that are important for the macroinvertebrates that fish feed upon to reproduce. The applicant is committed to implementation of erosion and sediment control measures and the project SPCC Plan to limit any affects of alluvial well installation and operation on T&E fish species in consultation with the BLM and USFWS.

**Page 136 – Section 4.2.9**
*A paragraph was added concerning the Townsend's big-eared bat.*

**Original Text:** None

**Revised Text:** Townsend's big-eared bat maternity and hibernation colonies typically are located in caves and mine tunnels (NatureServe, 2006). The bat prefers relatively cold places for hibernation, often near entrances and in well-ventilated areas. Throughout much of the known range, it commonly occurs in mesic habitats characterized by coniferous and deciduous forests, but occupies a broad range of habitats. In Utah, day roosts are associated with sagebrush steppe, juniper woodlands and mountain brush vegetation at lower available elevations (4,400-8,000 feet). Suitable habitat for the Townsend's big-eared bat could exist in the White River Mine or along large rocky cliffs above the White River and Evacuation Creek. Potential impacts to Townsend's big-eared bats could include direct mortality from re-opening the mine and temporary displacement during construction, operation, and prior to successful reclamation of utility line crossings at the White River and Evacuation Creek. Impacts could also include long-term displacement by construction of facilities such as power lines which remain in place for several years. Potential impacts from power lines include electrocution and collisions resulting in injury or death. Impacts to bats from the utility corridors should be minimal as the utility lines would be located adjacent to existing utility lines, especially where the corridors cross cliffs.

**Page 137 – Section 4.2.9**
*Text was modified to indicate that "winter range", not "crucial winter range", for the mule deer exisits at the 160-acre site and utility ROWs south of the White River.*

**Original Text: Mule deer** prefer coniferous forests, desert shrub, chaparral, and grasslands with shrubs (NatureServe, 2006). They are often associated with successional vegetation especially near agricultural lands and are often found on warmer slopes in winter. Mule deer browse on a wide variety of woody plants and graze on grasses and forbs. Suitable year-long habitat and DWR crucial winter range for the mule deer does exist at the 160-acre site and along portions of the proposed utility ROWs south of the White River. Potential impacts include temporary displacement during construction and prior to successful reclamation. Potential impacts also include long term displacement by construction of facilities which remain in place for several years. However, the Proposed Action should have minimal impact on mule deer, as there is abundant habitat adjacent to the project area.

**Revised Text: Mule deer** prefer coniferous forests, desert shrub, chaparral, and grasslands with shrubs (NatureServe, 2006). They are often associated with successional vegetation especially near agricultural lands and are often found on warmer slopes in winter. Mule deer browse on a wide variety of woody plants and graze on grasses and forbs. Suitable year-long habitat and winter range for the mule deer does exist at the 160-acre site and along portions of the proposed utility ROWs south of the White River. However, no crucial winter range exists. Potential impacts include temporary displacement during construction and prior to successful reclamation. Potential impacts also include long term displacement by construction of facilities which remain in place for several years. However, the Proposed Action should have minimal impact on mule deer, as there is abundant habitat adjacent to the project area and no crucial winter range exists.

**Page 138 – Section 4.2.9**
*Bullets were added concerning the applicant-committed measures to prevent impacts to Townsend's big-eared bats.*

**Original Text:** None

**Revised Text:**

- The White River mine shaft is not expected to be suitable bat habitat because of the presence of methane in the mine. However, if bats are found in the White River Mine, OSEC will install one-way doors or other suitable mitigation at the mine shaft entrances allowing sufficient time prior to re-opening the mine for bats to leave but not to re-enter the mine shafts.

- Once the mine is permanently closed, the mine shaft(s) should also be closed permanently to bats unless it can be demonstrated that methane no longer poses a danger to them.

**Page 141 – Section 4.2.10**
*Text was added to include a determination of affect for Ute ladies' tresses.*

**Original Text:** With implementation of the preceding applicant-committed measures, construction and operation of the Proposed Action "may affect" but is "not likely to adversely affect" Uinta Basin hookless cactus. The proposed action may affect but is not likely to lead to federal listing of Graham beardtongue and White River beardtongue.

**Revised Text:** With implementation of the preceding applicant-committed measures, construction and operation of the Proposed Action "may affect" but is "not likely to adversely affect" Uinta Basin hookless cactus. The proposed action may affect but is not likely to lead to federal listing of Graham beardtongue and White River beardtongue. In addition, the proposed action "may affect" but is "not likely to adversely affect" Ute ladies' tresses.

**Page 144 – Section 4.2.11**
*Language was deleted regarding shredding and chipping brush.*

**Original Text:**

- Shred or chip brush and salvage with topsoil on fee-lands (unless specified otherwise).

**Revised Text:** None

**Page 147 – Section 4.2.12**
*A mitigation measure was added.*

**Original Text:** None

**Revised Text:** On BLM land, a pesticide use permit would be submitted to and approved by this office prior to implementation of weed control.

**Page 160 – Section 4.2.16**
*Text was changed to clarify that BLM must be contacted if fossils are uncovered and BLM will assess the situation before work can proceed.*

**Original Text:**

- If suspected fossil materials are uncovered during construction or project operations, the operator should stop work immediately and the SMA Authorized Officer should be contacted. Activities should not resume until the authorized officer can assess the situation and advise whether additional mitigation is needed.

**Revised Text:**

- If suspected fossil materials are uncovered during construction or project operations, the operator should stop work immediately and the BLM must be contacted. Activities will not resume until the BLM can assess the situation and advise whether additional mitigation is needed.

**Page 160 – Section 4.2.16**
*Text was changed to clarify monitoring and response requirements if Alternative B is selected.*

**Original Text:**
**Alternative B (Eastern Gas Pipeline Right-of-Way)**
Ground disturbance associated with natural gas pipeline construction under Alternative B has a greater change of impacting fossils of scientific significance in BLM Condition 1 (highly sensitive) areas. Unlike the pipeline right-of-way which parallels Highway 45 under the Proposed Action, the Alternative B pipeline would require excavation through potentially shallow bedrock areas which have not been previously disturbed. If

Alternative B is chosen, the applicant commits to have a qualified paleontologist spot check surface disturbance during construction of this pipeline. Spot check monitoring will include a drive by examination of bedrock trench spoils in excavation areas where no fossils were documented during the field survey. If and when appropriate bedrock spoils are located, these spoils will be visually examined. If spot check monitoring reveals the presence of fossils of scientific significance, as directed by the SMA, a representative sample of these fossils may be collected and the data (including standard geologic descriptions) recorded for each locality.

**Revised Text:**

**Alternative B (Eastern Gas Pipeline Right-of-Way)**

Ground disturbance associated with natural gas pipeline construction under Alternative B has a greater chance of impacting fossils of scientific importance in BLM Condition 1 (highly sensitive) areas. Unlike the pipeline right-of-way which parallels Highway 45 under the Proposed Action, the Alternative B pipeline would require excavation through potentially shallow bedrock areas which have not been previously disturbed. If Alternative B is chosen, the applicant commits to have a qualified paleontologist monitor surface disturbance during construction of this pipeline. Monitoring will include a periodic examination of bedrock trench spoils in excavation areas where no fossils were documented during the field survey. If and when appropriate bedrock spoils are located, these spoils will be visually examined. If monitoring reveals the presence of fossils of scientific importance, as directed by the BLM, a representative sample of these fossils may be collected and the data (including standard geologic descriptions) recorded for each locality.

**Page 162 – Section 4.2.18**

*Language was modified to more accurately reflect potential impacts on eligible Wile & Scenic River segments.*

**Original Text:**

***Wild and Scenic Rivers***

No eligible Wild and Scenic River (WSR) segments will be impacted by the activities at the 160-acre lease.

Under the Proposed Action, the power line crossing of the White River would have minor impacts to the eligible WSR White River Segment. The power line will consist of spanning electric cable(s) over the river which will connect to power poles located in upland areas on either side of the river. The proposed power line will be a new visual distraction conflicting with wild and scenic river objectives.

Under the Proposed Action, the natural gas pipeline will cross the White River adjacent to the Bonanza Bridge (State Highway 45 right-of-way) which is located within the eligible White River WSR segment under Alternative A of the draft Vernal RMP.

The upgraded access road, water pipeline, and power line associated with the proposed alluvial wells would be located in part within an eligible White River WSR segment under the draft Vernal RMP. Impacts would include those visual impacts discussed under Visual Resources (Section 4.2.1.3.3).

The power line right-of-way associated with the Proposed Action will cross the White River and Evacuation Creek WSR segments under Alternative C of the draft Vernal RMP. The natural gas pipeline associated with the Proposed Action will cross the White River WSR segment.

Under Alternative C of the RMP, the Evacuation Creek WRS segment would be crossed by the proposed power line in two locations. A ROW would be required at one Evacuation Creek crossing where no existing utility lines are present. Installation of the power line at this location would be a new visual distraction. After the power line has been installed, the power poles and power line spanning Evacuation Creek would be visible. There is an existing power line at the other Excavation Creek WSR crossing. The new line would parallel the existing power line at this crossing location.

**Revised Text:**

***Wild and Scenic Rivers***

No eligible Wild and Scenic River (WSR) segments will be impacted by the activities at the 160-acre lease site.

Under the Proposed Action, the power line crossing of the White River would have minor impacts to the eligible WSR White River segment, which has been tentatively classified as scenic. The power line will consist of spanning electric cable(s) over the river which will connect to power poles located in upland areas on either side of the river. The proposed power line is within an existing utility corridor and will parallel an existing line at the White River crossing location thereby reducing its visual impact.

Under the Proposed Action, the natural gas pipeline will cross under the White River adjacent to the Bonanza Bridge (State Highway 45 right-of-way) which is located within the eligible White River WSR segment under Alternative A of the Draft Vernal RMP. The natural gas pipeline is within an existing utility corridor, thereby minimizing potential impacts to the outstanding remarkable values and tentative WSR scenic classification.

The upgraded access road, water pipeline, and power line associated with the proposed alluvial wells would be located in part within an eligible White River WSR segment under the Draft Vernal RMP. Impacts would include those visual impacts discussed under Visual Resources (Section 4.2.14).

The power line right-of-way associated with the Proposed Action will cross the White River and Evacuation Creek WSR segments under Alternative C of the Draft Vernal RMP. The natural gas pipeline associated with the Proposed Action will cross the White River WSR segment.

Under Alternative C of the Draft Vernal RMP, the Evacuation Creek WSR segment, tentatively classified as recreational, would be crossed by the proposed power line in two locations. A ROW would be required at one Evacuation Creek crossing where no existing utility lines are present. Installation of the power line at this location would be a new visual distraction. However, this is consistent with the management objectives for a recreational segment and would not impact the outstanding remarkable values (historic). After the power line has been installed, the power poles and power line spanning Evacuation Creek would be visible. There is an existing power line at the other Excavation Creek WSR crossing. The new line would parallel the existing power line at this crossing location.

**Page 163 – Section 4.2.18**

*Text was added to show the conclusion of impacts of Alternative A to the potential Wild and Scenic River designations*.

**Original Text:** Implementation of the above applicant-committed measures will reduce but not eliminate impacts to WSR segments under the draft Vernal RMP. Residual impacts of the Proposed Action will remain for the life of the project but will be substantially eliminated with completion of the project, removal of facilities, and reclamation of the 160 acre site and utility rights-of-way.

**Revised Text:** Implementation of the above applicant-committed measures will reduce but not eliminate impacts to WSR segments under the draft Vernal RMP. Residual impacts of the Proposed Action will remain for the life of the project but will be substantially eliminated with completion of the project, removal of facilities, and reclamation of the 160 acre site and utility rights-of-way. The proposed power line crossing of the eligible segment of the White River would be located within an existing utility corridor. Impacts would be incremental, but minor. The two power line crossings associated with Evacuation Creek would be located along the northern portion of the eligible river segment and therefore away from the historic protected values of the creek (narrow gauge railroad, towns of Watson and Rainbow). The proposed action and alternatives would not be precluded because the values for which the WSR was considered would not be impacted.

**Page 164 – Section 4.2.18**

*Text was modified to clarify that the potential nature of the White River ACEC as well as to clarify the potential impacts under Alternative C of the Draft RMP.*

**Original Text:** Under Alternative C of the draft Vernal RMP, both the gas pipeline and power line would affect the potential White River ACEC. These utility rights-of-way would have similar impacts as those described for Alternative A of the draft Vernal RMP. However, under Alternative C, the White River itself is excluded from this ACEC as explained in Section 3.3.1.2.

The applicant-committed measures to be adapted for protection of riparian areas (Section 2.2.5 and 4.2.17) will substantially reduce impacts to the potential White River ACEC.

**Revised Text:** Under Alternative C of the Draft Vernal RMP, the utility rights-of-way would have similar impacts to the potential White River ACEC as those described for Alternative A of the Draft Vernal RMP. However, under Alternative C, the White River itself is excluded from this potential ACEC as explained in Section 3.3.18.

The applicant-committed measures to be adopted for protection of riparian areas (Section 2.2.5 and 4.2.7) will substantially reduce impacts to the potential White River ACEC. The Proposed Action would not impact the historic or geological values associated with the potential ACECs.

**Page 165 – Section 4.2.18**

*Text was added to show the conclusion of impacts of Alternative B to the potential Wild and Scenic River designations*.

**Original Text:** Under Alternative B, the White River crossing location for the natural gas pipeline could have minor indirect impacts to the proposed White River Segment A WSR. The HDD technique which would be used for the pipeline crossing would reduce these potential impacts. Other potential impacts of Alternative B on the proposed WSR would be similar to those associated with the Proposed Action. Applicant-committed measures to reduce impacts of either project alternative would be the same. Residual impacts of Alternative B will be essentially the same as those associated with the Proposed Action.

**Revised Text:** Under Alternative B, the White River crossing location for the natural gas pipeline could have minor indirect impacts to the proposed White River Segment A WSR. However, the proposed pipeline crossing of the eligible segment of the White River would be located within a utility corridor. The HDD technique which would be used for the pipeline crossing would reduce these potential impacts. Other potential impacts of Alternative B on the proposed WSR would be similar to those associated with the Proposed Action. Applicant-committed measures to reduce impacts of either project alternative would be the same. Residual impacts of Alternative B will be essentially the same as those associated with the Proposed Action.

**Page 166 – Section 4.3.1**

*Text was updated to include most recent information on existing oil and gas activities.*

**Original Text:** One of the primary activities in the Vernal Planning Area is oil and gas exploration and production, which has been ongoing throughout the area since the early 1900s (BLM 2005). Since that time, a total of approximately 3600 production wells have been drilled in the Uintah Basin (BLM, 2005). As of 2002, there were 19,738 acres of total disturbance associated with oil and gas production in the Vernal Planning Area (BLM 2002). This includes acreage disturbed from actual oil or gas wells (producing, abandoned and shut in - 6,913 acres), access roads (8,688 acres), pipeline gathering and transportation pipeline systems (3,053 acres), compressors stations (66 acres), and power lines (18 acres).

**Revised Text:** One of the primary activities in the Vernal Planning Area is oil and gas exploration and production, which has been ongoing throughout the area since the early 1900s (BLM 2005). Since that time, a total of approximately 5,000 production wells have been drilled in the Uintah Basin. As of April 2007, there were approximately 26,360 acres of total disturbance associated with oil and gas production in the Vernal Planning Area. This includes acreage disturbed from oil or gas wells (9,750 acres), access roads (12,300 acres), pipeline gathering and transportation pipeline systems (4,200 acres), compressors stations (76 acres), and power lines (34 acres).

**Page 171 – Section 4.3.3**

*Text was modified to include the Townsends' big-eared bat as a species for which potential habitat may be affected.*

**Original Text:** The proposed project and associated utility corridors could remove potential habitat for the ferruginous hawk, pronghorn antelope, mule deer, and mourning dove.  This impact would add to the cumulative decrease and fragmentation in available habitat for these species resulting from energy development in the Uinta Basin. Cumulative impacts to T&E plant species could include habitat loss and fragmentation as well as loss of individuals.  Construction of the utility corridors associated with the proposed project may impact several T&E plant species. The project could contribute to cumulative impacts to these plants from past and foreseeable energy development throughout the Uinta Basin.

**Revised Text:** The proposed project and associated utility corridors could remove potential habitat for the Townsend's big-eared bat, ferruginous hawk, sensitive fish species, pronghorn antelope, mule deer, mourning dove, and migratory birds.  This impact would add to the cumulative decrease and fragmentation in available habitat for these species resulting from energy development in the Uinta Basin.  Cumulative impacts to T&E plant species could include habitat loss and fragmentation as well as loss of individuals.  Construction of the utility corridors associated with the proposed project may impact several T&E plant species. The project could contribute to cumulative impacts to these plants from past and foreseeable energy development throughout the Uinta Basin.

**Page 175 – Section 5.2**
*Text was added to show the type and result of consultations.*

**Original Text:** None

**Revised Text:** Eighteen Agencies or Tribes were identified as being consulted during the preparation of the Public Draft EA.  Consultation was not conducted with all eighteen agencies or tribes.  The result of the consultation or coordination that did occur is included below.  If the agency or tribe was not consulted as anticipated, an explanation of why they were not consulted is also included below.

*U.S. Army Corps of Engineers* – Discussions between the Applicant and the U.S. Army Corps of Engineers regarding the stream and river crossings.  Appropriate permits will be obtained by the Applicant prior to construction of the rights-of-way stream and river crossings.

*U.S. Fish and Wildlife Service* – The U.S. Fish and Wildlife Service was involved throughout the preparation of this EA through phone calls and meetings.  The Public

Draft EA was also provided to the Service during the public comment period. Formal consultation was initiated on December 19, 2006.

In the Biological Opinion dated December 20, 2006 (see Appendix H), the USFWS concurred with the "may affect, not likely to adversely affect" determinations for the Uinta Basin hookless cactus and Ute ladies'-tresses. They also concurred with the "not likely to lead to federal listing" of Graham's penstemon and White River penstemon. These species have not been found to occur, nor are they known to occur within the project area or the rights-of-way. In addition, the applicant has committed to surveying for these species along the rights-of-way prior to construction, during the appropriate survey times, and will reinitiate consultation should these plants be found.

Bald eagles are not known to nest within or near the project area; however, they do use the area for winter roosting and foraging. Based on a USFWS recommendation, bald eagle surveys will be conducted within 1.0 mile of new surface disturbance, and any documented nests will be avoided with a 1.0 mile buffer without further consultation with the USFWS. This has been included in the Conditions of Approval section of the Decision Record. The applicant has also committed to surveying for and avoiding active roost sites from November 1 though March 31 that occur within 0.5 miles of the disturbance areas. Based on the applicant-committed measures, USFWS concurred with the "may affect, not likely to adversely affect" determination for the bald eagle.

Due to water depletions, a determination was made that the project "may affect, is likely to adversely affect" the four endangered Colorado River fish species; Colorado pikeminnow, bonytail, humpback chub, and razorback sucker. A one-time monetary contribution will be paid to the USFWS by the proponents, in accordance with the provisions of the 1987 Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin.

Regarding wildlife, including migratory bird species, the USFWS recommended that fencing, flagging, or floatation balls should be thoroughly considered at water disposal sites if necessary to reduce potential adverse affects on wildlife if monitoring results conclude that the water may be toxic. This measure is included in the Conditions of Approval section of the Decision Record. An additional measure recommended the testing and analysis of water quality with regards to effects levels to wildlife, including migratory birds. However, specifics such as type of test, frequency of tests, and water quality standards were not provided. Therefore, as stated in the EA, the water quality standards set by the EPA will be met for all water released to the surface. Water not meeting those standards will be tanked and trucked to an approved disposal site.

Based on the above, consultation is closed. If circumstances change, or threatened or endangered species are found in the project area, additional analysis and re-initiation of consultation will occur as necessary.

*Utah Division of Air Quality* – Formal consultation not initiated due to the project being within the restored Uintah and Ouray Reservation Boundary. However, comments were received from the State of Utah Resource Development Coordinating Committee, which included comments from the Division of Air Quality. Those comments were addressed in the comment responses section of the Final EA.

*U.S. Environmental Protection Agency Region 8* – Formal consultation not initiated. However, comments were received from the U.S. EPA, and those comments and concerns were addressed in the comment responses section of the Final EA.

*Utah State Historic Preservation Office* - Consultation was initiated on December 19, 2006. BLM recommended a No Adverse Effect determination. On December 20, 2006, a concurrence letter with that determination was received from that office (Appendix H). Consultation will be reinitiated, as necessary, prior to surface disturbing activities.

*13 Tribes having ties to the Uinta Basin* – Formal consultation was determined to not be necessary due to 1) the lack of sites eligible for the National Register of Historic Places in the 160-acre lease area; 2) avoidance of the two eligible sites by the proposed rights-of-way: and 3) consultation was completed for the White River Shale Project Site in association with the Federal Prototype Oil Shale Leasing Program in 1973. Additional consultation will be completed during the processing of the rights-of-way associated with the Proposed Action.

| | |
|---|---|
| Ute Mountain Ute Tribe | Hopi Tribal Council |
| White Mesa Ute Council | Navajo Nation |
| Southern Ute Tribal Council | Eastern ShoshoneBusiness Council |
| Confederated Tribes the Goshute Res. | Zia Pueblo |
| Laguna Pueblo | Northwestern Band Shoshone of Nation |
| Santa Clara Pueblo | Paiute Indian Tribe of Utah |
| Ute Indian Tribe | |

The Interdisciplinary Review Team from the BLM's Vernal, Utah field office is listed on the Interdisciplinary Team Analysis Record Checklist provided in Appendix A.

# A P P E N D I X  H

**SHPO Consultation**

**and**

**USFWS Biological Opinion**

**Department of Community and Culture**

PALMER DePAULIS
*Executive Director*

**State History**

PHILIP F. NOTARIANNI
*Division Director*

**State of Utah**

JON M. HUNTSMAN, JR.
*Governor*

GARY R. HERBERT
*Lieutenant Governor*

December 20, 2006

Blaine Phillips
Bureau of Land Management
Vernal Field Office
170 South 500 East
Vernal, UT 84078

RE: OSEC Oil Shale Project

In reply, please refer to Case No. 06-1711

Dear Mr. Phillips:

The Utah State Historic Preservation Office received your request for comment on the above referenced project on December 19 and December 20, 2006.

Based on the stipulations in your cover letters, we **concur** with your determination of **No Adverse Effect.**

This letter serves as our comment on the determinations you have made, within the consultation process specified in §36CFR800.4. If you have questions, please contact me at (801) 533-3555 or mseddon@utah.gov.

Sincerely,

Matthew T. Seddon, Ph.D., RPA
Deputy State Historic Preservation Officer - Archaeology

United States Department of the Interior
FISH AND WILDLIFE SERVICE
UTAH FIELD OFFICE
2369 WEST ORTON CIRCLE, SUITE 50
WEST VALLEY CITY, UTAH 84119

| Division | | Assigned |
|---|---|---|
| Field Manager | | |
| Associate/ Support Services | | |
| Fire | | |
| Lands & Minerals | | |
| NEPA | | |
| Renewables | | |
| | | |
| | | |
| | | |
| BUREAU OF LAND MGMT, VERNAL, UTAH | | |
| ALL EMPLOYEES | | |

DEC 22 2006

In Reply Refer To
FWS/R6
ES/UT
F-0306/FA-0497
6-UT-07-F-007

December 20, 2006

Memorandum

To: Field Manager, Vernal Field Office, Bureau of Land Management, Vernal, Utah

From: Utah Field Supervisor, Ecological Services, U.S. Fish and Wildlife Service, West Valley City, Utah

Subject: The Oil Shale Research, Development, and Demonstration Project, White River Mine, Uintah County, Utah (EA #UT-080-2006-280)

We received your letter of December 19, 2006, requesting concurrence for the Oil Shale Research, Development, and Demonstration Project (OSEC Project) (EA #UT-080-2006-280). We've been coordinating with the Bureau of Land Management (BLM) on the development of the Environmental Assessment (EA) and Biological Assessment (BA) since April 2006. A complete administrative record for this project is on file in our office.

The OSEC Project is at the existing 160-acre White River Mine site in Uintah County, Utah. The project is designed to demonstrate, through three separate phases of work, the technical, economic, and environmental feasibility of the recovery of synthetic crude oil from oil shale. The White River Mine site occurs within the 5,120-acre Tract Ua of the 1974 Federal Prototype oil Shale Leasing Program. The project will also require rights-of-way for power, a natural gas pipeline, water lines, and existing roadways outside of the 160-acre lease area.

**Comments Regarding Migratory Birds**

As the mine is dewatered, OSEC will test the water quality to see if it meets or exceeds EPA water quality standards. If the water does not meet these standards, the water will be placed in tanks and hauled off-site for disposal. If the water does meet the standards, the water will be disposed of on-site.

Although water may meet the EPA water quality standards, wildlife (including migratory birds) may still be adversely affected by trace contaminants within the water supply. Therefore, we recommend that BLM test and analyze the water quality in regards to effects levels to wildlife, including migratory birds. Our contaminants specialists are available to assist with review and recommendations for monitoring. Mitigation solutions such as fencing, flagging, or floatation balls should be thoroughly considered if necessary to reduce contamination of wildlife if monitoring results in a conclusion that the water may be toxic.

**Section 7 Consultation under the Endangered Species Act**

Based on your letter of December 19, 2006, and meetings and correspondences between our offices on July 10, 2006, September 8, 2006, and September 25, 2006, we concur with your "may affect, not likely to adversely affect" determinations for the Uinta Basin hookless cactus and Ute ladies'-tresses. We also concur that the proposed action is not likely to lead to federal listing of Graham's penstemon and White River penstemon. These species have not been found to occur nor are they known to occur within the project area or the rights-of-way. In addition, the applicant has committed to surveying for these species along the rights-of-way prior to construction, during the appropriate survey times, and will reinitiate consultation with our office should these plants be found.

Bald eagles are not known to nest within or near the project area, however they do use the area for winter roosting and foraging. The U.S. Fish and Wildlife Service (Service) recommended, and it was agreed to by Ms. Torres (BLM), that bald eagle surveys will be conducted within 1.0 mile of all disturbed areas, and any documented nests will be avoided with a 1.0 mile buffer (phone conversation, December 20, 2006). The applicant has also committed to surveying for and avoiding active roost sites from November 1 through March 31 that occur within 0.5 miles of the disturbance areas. Based on the applicant committed measures, we concur with your determination of "may affect, not likely to adversely affect" for the bald eagle.

Due to water depletions, your office made the determination of "may affect, likely to adversely affect" for the four Colorado River endangered fish: Colorado pikeminnow, bonytail, humpback chub, and razorback sucker. In accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*), and the Interagency Cooperation Regulations (50 CFR 402), this document transmits the Fish and Wildlife Service's (Service) biological opinion for these four fish species.

On January 21-22, 1988, the Secretary of the Interior; the Governors of Wyoming, Colorado, and Utah; and the Administrator of the Western Area Power Administration were cosigners of a Cooperative Agreement to implement the "Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin" (USFWS 1987). An objective of the Recovery Program was to identify reasonable and prudent alternatives that would ensure the survival and recovery of the listed species while providing for new water development in the Upper Basin.

The following excerpts are pertinent to the consultation because they summarize portions of the Recovery Program that address depletion impacts, section 7 consultation, and project proponent responsibilities:

"All future Section 7 consultations completed after approval and implementation of this program (establishment of the Implementation Committee, provision of congressional funding, and initiation of the elements) will result in a one-time contribution to be paid to the USFWS by water project proponents in the amount of $10.00 per ac-ft based on the average annual depletion of the project . . . . This figure will be adjusted annually for inflation [the current figure is $17.24 per ac-ft] . . . . Concurrently with the completion of the Federal action which initiated the consultation, e.g., . . . issuance of a 404 permit, 10 percent of the total contribution will be provided. The balance will be ...due at the time the construction commences . . . ."

It is important to note that these provisions of the Recovery Program were based on appropriate legal protection of the instream flow needs of the endangered Colorado River fishes. The Recovery Program further states:

". . . it is necessary to protect and manage sufficient habitat to support self-sustaining populations of these species. One way to accomplish this is to provide long term protection of the habitat by acquiring or appropriating water rights to ensure instream flows . . . . Since this program sets in place a mechanism and a commitment to assure that the instream flows are protected under State law, the USFWS will consider these elements under Section 7 consultation as offsetting project depletion impacts." Thus, the USFWS has determined that project depletion impacts, which the USFWS has consistently maintained are likely to jeopardize the listed fishes, can be offset by (a) the water project proponent's one-time contribution to the Recovery Program in the amount of $17.24 per ac-ft of the project's average annual depletion, (b) appropriate legal protection of instream flows pursuant to State law, and accomplishment of activities necessary to recover the endangered fishes as specified under the Recovery Implementation Program Recovery Action Plan. The USFWS believes it is essential that protection of instream flows proceed expeditiously, before significant additional water depletions occur.

With respect to (a) above (i.e., depletion charge), the applicant will make a one-time payment which has been calculated by multiplying the project's average annual depletion (247 ac-ft) by the depletion charge in effect at the time payment is made. At the time of this consultation, the BLM has estimated an average usage of 220,000 gallons per day with a peak usage of 380,000 gallons per day. Based on a 365 day per year operating schedule, the resultant average depletion is estimated at approximately 247 acre feet per year associated with the proposed action; if the depletion is found to be larger than this over the two year test period, then consultation should be re-initiated. We recommend that the applicant pay the depletion charges as soon as the final depletion amount is determined. For Fiscal Year 2007 (October 1, 2007, to September 30, 2007), the depletion charge is $17.24 per ac-ft for the average annual depletion which equals a total payment of $ 4,258.28 for this project. This amount will be adjusted annually for inflation on October 1 of each year based on the previous year's Composite Consumer Price Index. The USFWS will notify the applicant of any change in the depletion charge by September 1 of each year. Ten percent of the total contribution ($425.83), or total payment, will be provided to the USFWS's designated agent, the National Wildlife Foundation at the time of issuance of the Federal approvals from the BLM. The balance will be due at the time the construction commences. The payment will be included by the BLM as a permit stipulation. Fifty percent of the funds will be used for acquisition of water rights to meet the instream flow needs of the endangered fishes (unless otherwise recommended by the Implementation Committee); the balance will be used to support other recovery activities for the Colorado River endangered fishes. All payments should be made to the National Fish and Wildlife Foundation.

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Each payment is to be accompanied by a cover letter that identifies the project and biological opinion that requires the payment, the amount of payment enclosed, check number, and any special conditions identified in the biological opinion relative to disbursement or use of the funds (there are none in this instance). The cover letter also shall identify the name and address of the payor, the name and address of the Federal Agency responsible for authorizing the project, and the address of the USFWS office issuing the biological opinion. This information will be used by the Foundation to notify the payor, the lead Federal Agency, and the USFWS that payment has been received. The Foundation is to send notices of receipt to these entities within 5 working days of its receipt of payment.

In order to further define and clarify processes outlined in sections 4.1.5, 4.1.6, and 5.3.4 of the Recovery Program, an additional section 7 agreement and Recovery Plan addressing section 7 consultation on depletion impacts was developed (USFWS 1993b). The section 7 agreement establishes a framework for conducting all future section 7 consultations on depletion impacts related to new projects and those associated with historic projects in the Upper Basin. Procedures outlined in the section 7 agreement will be used in conjunction with the Recovery Plan to determine if sufficient progress is being accomplished in the recovery of the endangered fishes to enable the Recovery Program to serve as a reasonable and prudent alternative to avoid jeopardy. The Recovery Plan was finalized on October 15, 1993, and is reviewed annually.

In accordance with the agreement, the USFWS has agreed to assess impacts of projects that require section 7 consultation and determine if progress toward recovery has been sufficient for the Recovery Program to serve as a reasonable and prudent alternative. If sufficient progress is being achieved, biological opinions will be written to identify activities and accomplishments of the Recovery Program that support it as a reasonable and prudent alternative. If sufficient progress in the recovery of the endangered fishes has not been achieved by the Recovery Program, actions from the Recovery Plan will be identified which must be completed to avoid jeopardy to the endangered fishes. For historic projects, these actions will serve as the reasonable and prudent alternative as long as they are completed according to the schedule identified in the Recovery Plan. For new projects, these actions will serve as the reasonable and prudent alternative so long as they are completed before the impact of the project occurs.

The evaluation by the USFWS to determine if sufficient progress has been achieved considered (a) actions which result in a measurable population response, a measurable improvement in habitat for the fishes, legal protection of flows needed for recovery, or a reduction in the threat of immediate extinction; (b) status of fish populations; adequacy of flows; and (d) magnitude of the project impact. In addition, the USFWS considered support activities (funding, research, information and education, etc.) of the Recovery Program if they help achieve a measurable population response, a measurable improvement in habitat for the fishes, legal protection of flows needed for recovery, or a reduction in the threat of immediate extinction. The USFWS evaluated progress separately for the Colorado River and Green River subbasins; however, it gave due consideration to progress throughout the Upper Basin in evaluating progress toward recovery.

Based on current Recovery Program accomplishments and the expectation that the Recovery Plan will be fully implemented in a timely manner, the USFWS determined that sufficient progress has been achieved under the Recovery Program so that it could serve as the reasonable and prudent alternative to avoid jeopardy to the endangered fishes by the impacts caused by the water depletion associated with this permit. For historic projects, the responsibility for implementation of all elements of the reasonable and prudent alternative rests with the Recovery Program participants, not the individual project proponent. All actions must be implemented according to the time schedule specified in the Plan. For new projects, the responsibility for implementation of elements of the reasonable and prudent alternative is shared by the Recovery Program and the applicant. Recovery Program participants are responsible for carrying out activities outlined in the Recovery Plan.

The USFWS should condition the permit to retain jurisdiction in the event that the Recovery Program is unable to implement the Recovery Plan in a timely manner. In that case, as long as the lead Federal Agency has discretionary authority over the project, reinitiation of section 7 consultation may be required so that a new reasonable and prudent alternative can be developed by the USFWS.

We appreciate your commitment in conserving endangered species. If further assistance is needed or you have any questions, please contact Bekee Megown, at (801) 975-3330 extension 146.