2 DESCRIPTIONS OF ALTERNATIVES

2.1 INTRODUCTION

This PEIS examines alternatives for making BLM-administered lands available for application for future commercial leasing of both oil shale and tar sands resources. The plan amendments would open the areas in question for leasing. The phrase "available for application for leasing" is used above, and throughout the PEIS, rather than "available for leasing" to highlight that, unlike the BLM's practice with respect to oil and gas leasing, additional NEPA analysis would be required prior to the issuance of any lease of oil shale or tar sands resources. For oil shale and tar sands, there are three alternatives each. Alternative A (the no action alternative) does not amend plans. Management prescriptions in existing plans are not modified. Alternatives B and C describe different management approaches to amending RMPs to designate certain lands as being available for application for future commercial leasing and development. The BLM's approach is designed to ensure that oil shale technologies can operate at economic and environmentally acceptable levels before the agency authorizes full-scale commercial leasing on public lands. Future oil shale and tar sands commercial development on public lands in Colorado, Utah, and Wyoming would be conducted pursuant to regulations to be promulgated by the BLM.

This chapter presents information on each of the oil shale and tar sands alternatives examined in this PEIS. Specifically, the following sections describe the existing requirements and BLM policies potentially applicable to oil shale and tar sands development, the oil shale and tar sands resources, the suite of technologies included in the scope of this PEIS, the constraints evaluated in each alternative, and the comparison of alternatives. In addition, this chapter discusses the alternatives and issues considered by the BLM in preparing this PEIS that were eliminated from detailed analysis or from further consideration at this time.

2.2 EXISTING STATUTORY REQUIREMENTS AND BLM POLICIES POTENTIALLY APPLICABLE TO OIL SHALE AND TAR SANDS DEVELOPMENT

Commercial development of oil shale or tar sands resources on public lands will be subject to existing federal, state, and local laws and regulatory requirements as well as established BLM policies. The purpose of including the following information is to convey that management of public lands is subject to a wide array of requirements that are over and above decisions that will be made in the ROD for this PEIS. These requirements are not subject to decisions in the ROD but serve as sideboards for those decisions. The standard operating procedures that have been developed by the BLM and other governmental agencies for implementing these requirements are not necessarily reproduced in this document unless there is a particular reason to do so.

2.2.1 Existing Relevant Statutory Requirements

This section discusses, in very general terms, the major laws, E.O.s, and policies that may provide environmental protection and compliance requirements for oil shale or tar sands development projects on public lands in Colorado, Utah, and Wyoming. Because these projects would vary on the basis of design, size, specific activities, and location, the requirements described here may not apply to all projects. Lists of specific E.O.s and federal and state laws are provided in Appendix D.

The BLM conducts its operations in accordance with FLPMA and with numerous statutes, regulations, and standards regarding environmental protection. In addition, E.O. 12088, "Federal Compliance with Pollution Control Standards" (U.S. President 1978), as amended by E.O. 13148, "Greening of Government through Leadership in Environmental Management" (U.S. President 2000), requires federal agencies (including the BLM) to comply with applicable administrative and procedural pollution control standards established by, but not limited to, the Resource Conservation and Recovery Act of 1976 (RCRA), Toxic Substances Control Act of 1976 (TSCA), Clean Air Act of 1990 (CAA), Noise Control Act of 1972 (NCA), Clean Water Act of 1987 (CWA), and Safe Drinking Water Act of 1974 (SDWA). Other compliance requirements may include the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), hazardous material transportation laws, ecological resources requirements (e.g., Endangered Species Act of 1973 [ESA]), and cultural and paleontological resources requirements.

In the Energy Policy Act of 2005, among many energy-related provisions, Section 369 titled the "Oil Shale, Tar Sands, and Other Strategic Unconventional Fuels Act," provided direction to the Secretary of the Interior to complete a PEIS for a commercial leasing program for oil shale and tar sands resources on public lands; publish a final regulation establishing a commercial leasing program; consult with the Governors of States with significant oil shale and tar sands resources on public lands, representatives of local governments in such states, interested Indian Tribes, and other interested persons, to determine the level of support and interest in the states in the development of tar sands and oil shale resources; and, if sufficient support and interest exists in a state, the Secretary may conduct a lease sale in that state under the commercial leasing program. This PEIS is the result of direction in this legislation.

The MLA authorizes the Secretary of the Interior to lease deposits of oil shale and the surface of public lands containing the deposits, or lands adjacent thereto, as may be required for the extraction and reduction of leased minerals. It also authorizes the issuance of ROW grants for oil and gas, synthetic fuels, and refined products gathering and distribution pipelines and related facilities not already authorized through a lease. Under the MLA, the lease may not exceed 5,760[1] acres and may be of an indeterminate period. The Secretary of the Interior may impose conditions on the lease, including requirements relative to methods of mining, prevention of waste, and productive development.

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1 The acreage limit was increased from 5,120 acres by amendment of the MLA in Section 369 (i)(1) of the Energy Policy Act of 2005.

The BLM also conducts its operations in compliance with applicable land use laws, including the Wild and Scenic Rivers Act of 1968, the National Trails System Act of 1968, and the Wilderness Act of 1964. In addition, any leasing of public lands for oil shale or tar sands development that may impinge on NPS lands would require the BLM to analyze potential impacts on the park lands, including the potential to impair park resources addressed in the National Park Service Organic Act of 1916. Under current regulations, issuance of combined hydrocarbon leases within units of the NPS shall be allowed only where mineral leasing is permitted by law, where the lands are open to mineral resource disposition in accordance with any applicable Minerals Management Plan, and the Regional Director of the NPS finds that there will be no resulting significant adverse impacts on the resources and administration of the unit or other contiguous units of the NPS.

Several other land use laws may guide development of a leasing plan for commercial oil shale or tar sands development. As discussed in Chapter 1, the BLM has authority pursuant to FLPMA, the Federal Land Exchange Facilitation Act of 1994, and the Federal Land Transaction Facilitation Act of 2000 to exchange public land or interests in it for nonfederal land or interests when the exchange serves the public good.

Oil shale and tar sands development projects may require rights-of-ways (ROWs) on or across public land for project facilities. A ROW grant is the authorization to use a particular parcel of public land for specific facilities for a definite time period. FLPMA authorizes the BLM to issue ROW grants for uses such as roads and electrical power generation, transmission, and distribution systems. The MLA authorizes the agency to issue ROW grants for oil and gas gathering and distribution pipelines and related facilities not already authorized through a lease, and oil and natural gas transmission pipelines and related facilities. ROW grants carry conditions that require compliance with applicable environmental protection standards.

State and county laws and regulations also are applicable to oil shale or tar sands development projects to the extent consistent with federal law. In some cases, states have federally approved regulatory programs that meet or exceed the environmental protections provided by statutes and regulations (such as those under the CWA). States and counties also have developed laws to address concerns specific to their locations and resources with which federally approved projects must generally comply.

The potentially applicable laws have been divided into general categories, as described alphabetically below. Although the following descriptions often cite federal laws, state and county laws can also fall into these categories. Appendix D provides a list of federal, state, and county laws and E.O.s by category.

- *Air quality.* Air emissions from a development project are subject to the CAA, as amended. The CAA provides that each state must develop and submit for approval to the U.S. Environmental Protection Agency (EPA) a State Implementation Plan (SIP) for controlling air pollution and air quality in that state, and that each state must develop its own regulations to monitor, permit, and control air emissions within its boundaries. Under Section 112(r) of the CAA, owners and operators of facilities that produce, process, handle, or store

specific hazardous substances above threshold quantities must meet certain requirements for planning and reporting and risk management planning requirements. The EPA has retained primacy over air quality within the boundaries of the Uintah and Ouray Reservation.

- *Cultural resources.* Cultural resources that may be affected by federal undertakings are subject to various requirements for identification and consideration in consultation with Tribal, state, and/or federal entities, and mitigation actions may be required. Under the auspices of the 1997 national Programmatic Agreement (PA) and individual state protocols, the BLM has an agency-specific process for complying with Section 106 of the National Historic Preservation Act of 1966 (NHPA).

- *Energy projects.* Project operations and facilities may require construction of facilities such as pipelines, gathering lines, transmission lines, or generation facilities. Depending on the nature of these facilities, siting will be subject to all applicable legal requirements.

- *Floodplains and wetlands.* The locations of project facilities will be subject to statutory requirements and regulations for protection of wetlands or floodplains, such as Section 404 of the CWA.

- *Groundwater, drinking water, and water rights.* The provision of drinking water from wells or surface water to a nontransient noncommunity water system at project facilities would require compliance with the SDWA. In addition, the withdrawal of surface or groundwater for industrial or drinking water purposes may require state and/or local approvals or permits.

- *Hazardous materials.* Hazardous materials may be used in the construction and operation of a project. Storage and use of fuels, petroleum, oils, lubricants, and other hazardous materials at approved project facilities are subject to numerous federal and state regulations.

- *Hazardous waste and polychlorinated biphenyls (PCBs).* Hazardous wastes (e.g., used solvents and paints) generated by a project must be accumulated, collected, transported, and disposed of in accordance with RCRA. If PCBs are used during the construction and operation of a project, they would have to be managed in accordance with the TSCA.

- *Noise.* The EPA issued guidelines for outdoor noise levels that are consistent with the protection of human health and welfare against hearing loss, annoyance, and activity interference (EPA 1974). Such guidelines state that annoyance and undue interference with activity will not occur if outdoor levels of noise are maintained at an energy equivalent of 55 decibels (dB). However, these levels are not to be construed as legally enforceable standards at this time.

- *Pesticides and noxious weeds.* Pesticide application during the construction and operation of a project must comply with the Federal Insecticide, Fungicide, and Rodenticide Act of 1974 and equivalent state requirements. In addition, sites will be subject to federal provisions to control noxious weeds and invasive species and may be subject to regulations governing state-established control areas.

- *Solid wastes.* Solid wastes generated during the construction, operation, and decommissioning of a project must be managed in accordance with the Solid Waste Disposal Act of 1976 and state and local requirements for solid waste accumulation, collection, transportation, and disposal.

- *Source water protection.* Under Part C of the SDWA, Protection of Underground Sources of Drinking Water, each state is to establish a wellhead protection program to delineate wellhead protection areas, identify potential sources of contamination, and establish control measures to prevent contamination of drinking water sources. If hazardous chemicals or materials are used during the construction or operation of a project that is located within a wellhead protection area, reporting or control measures may apply.

- *Water bodies and wastewater.* The discharge of wastewater (e.g., sanitary wastewater treatment systems or rinse/test waters) or the discharge of spent shale leachate into waters of the United States or waters of a state will require a National Pollutant Discharge Elimination System (NPDES) permit or the state equivalent. According to administrative and judicial interpretation, the scope of the federal CWA jurisdiction over waters of the United States depends on technical, site-specific factors. Regulated bodies of water could include, but are not limited to, interstate and intrastate lakes, rivers, and streams, and certain wetlands, playa lakes, prairie potholes, mudflats, intermittent streams, and wet meadows. In addition, the CWA requires an NPDES permit or the state equivalent for certain stormwater discharges. Spill prevention, control, and countermeasure plans may also be required to prevent oil spills from reaching regulated waters, adjoining shorelines, intermittent streams, or wet meadows, but only if these are hydrologically connected to the navigable waters of the United States. States may have their own planning requirements for other waters. Discharges of dredged or fill material into waters of the United States or any work in, over, or under regulated waters will require a Section 404 or Section 410 permit, respectively, from the U.S. Army Corps of Engineers (USACE).

- *Water quality*. The EPA enacted a regulation in December 1974 that set forth a basinwide salinity control policy for the Colorado River Basin. In 1975, the Colorado River Basin Salinity Control Forum (CRBSCF) proposed, the Basin States adopted, and the EPA approved water quality standards to control salinity increases in the Colorado River. These standards, including the

numeric criteria and plan of implementation, are to be reviewed every 3 years. Federal, state, and Tribal water quality standards may also be applicable.

- *Ecological resources.* Among the BLM's land management objectives are protection and improvement of habitat for all federally listed species, BLM-designated sensitive species (i.e., the list published by the BLM state office of species occurring on public lands whose populations or habitats are rare or in significant decline), state-listed species, and wild horse and burro herds. The BLM evaluates all projects and activities occurring on public lands to ensure that they will not contribute to the need to list species as threatened or endangered.

In addition to these categories, the construction and operation of an oil shale or tar sands development project on public land that has valid existing mining claims in place must not materially interfere with the mining claimants' rights to mine, remove, or sell the minerals from the claim (30 USC 26). Projects may also be subject to the health and safety standards of the Federal Mine Safety and Health Act of 1977 and the Occupational Safety and Health Act of 1970.

Requirements to consider impacts of leasing public land for oil shale or tar sands development on local populations, including E.O. 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (U.S. President 1994), and E.O. 13045, "Protection of Children from Environmental Health Risks and Safety Risks" (U.S. President 1997) may arise, depending on the activities, location, and other circumstances of the lease.

2.2.2 Existing Relevant BLM Policies and Mitigation Guidance

The BLM has developed many program-specific policies and guidance documents that establish requirements that may be relevant and/or applicable to oil shale or tar sands development. For example, from 1968 to 1989, the Office of the Secretary imposed stipulations on oil and gas leases for lands in oil shale areas in Colorado, Utah, and Wyoming (DOI 1968). These policies and guidance documents exist in a variety of forms, including BLM plans, manuals, handbooks, instruction memoranda, technical references, BMPs, standards, directives, and other such documents. The applicability of specific policies and guidance documents is discussed to varying degrees in this PEIS but is best assessed at the project-specific level.

While none of the existing BLM policies directly address commercial oil shale or tar sands development, many elements establish requirements that are relevant and applicable to these types of development projects. Examples of policies that will be applicable to oil shale or tar sands development include BLM policies regarding the management of sensitive species and visual, cultural, and paleontological resources.

Similarly, while the existing BLM guidance documents are not specific to oil shale or tar sands development, many of them address environmental issues that are relevant to such

development and may provide appropriate mitigation measures. Examples of those topics include land use planning, NEPA, oil and gas development, pipeline construction and waterway crossings, road construction and maintenance, wildlife management, wild horse and burro herd management, ACECs, hazardous materials and waste management, pesticide use and integrated pest management, cultural resource management, Tribal consultations, visual resource management, and occupational health and safety. A comprehensive review of these BLM program-specific mitigation documents is beyond the scope of this PEIS, although discussion of many of these documents is included in the impact analyses sections. Readers are advised to obtain the complete guidance documents if they seek more information. Electronic copies of some of the BLM directives, manuals, and handbooks are available at http://www.blm.gov/nhp/efoia/.

2.2.3 Management of BLM-Administered Lands

The BLM manages public lands within the affected field offices for a variety of land uses, including recreation, mining, oil and gas development, livestock grazing, wild horse and burro herd management, communication sites, and ROW corridors (e.g., roads, pipelines, and transmission lines). These BLM-administered lands are managed within a framework of numerous laws, the most comprehensive of which is FLPMA (43 USC 1701 et seq.). Under FLPMA, the BLM manages the public lands by using principles of multiple use and sustained yield to provide for the protection and the use of myriad resources found on the public lands. In accordance with the requirements of FLPMA, the BLM prepares RMPs to identify the resources within each planning area and to establish land use allocations, management goals, and prescriptions for the planning area.[2] The RMPs are prepared to be consistent with the plans of state and local governments to the maximum extent feasible and consistent with federal law. These plans are developed with significant public involvement and are reviewed by the governors of each state for consistency with state and local planning objectives. Under FLPMA, the BLM is required to maintain, amend, and revise its RMPs to ensure that they reflect the current conditions and management goals within the planning area.

FLPMA, and in many cases specific authorizing legislation or proclamations, guides the BLM in its management of lands included in the NLCS. The NLCS lands include NCAs, National Monuments, Wilderness Areas, WSAs, WSRs, and National Historic and Scenic Trails. Other conservation designations within the NLCS are Instant Study Areas (ISAs), Forest Reserves, National Recreation Areas (NRAs), Research Natural Areas, and Outstanding Natural Areas.

FLPMA directs the BLM to give priority to the designation of ACECs. Designated ACECs include public lands where special management attention and direction are needed to protect and prevent irreparable damage to important historic, cultural, and scenic values, fish, or wildlife resources or other natural systems or processes; or to protect human life and safety from natural hazards. The BLM designates ACECs through land use plans that outline management

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2 Current land use plans are called resource management plans (RMPs); however, in the past such plans were called management framework plans (MFPs), and some MFPs are still in use.

objectives and prescriptions for each ACEC. Table 2.2.3-1 identifies all of the existing ACECs that intersect oil shale and tar sands areas.

Wilderness Areas are designated by Congress as part of the National Wilderness Preservation System to ensure preservation and protection of their natural conditions. They are generally 5,000 acres or more in size (or of sufficient size to make administration as wilderness practicable); offer outstanding opportunities for solitude or primitive and unconfined types of recreation; and may contain ecological, geological, or other features that have scientific, scenic, or historical value. WSAs are areas identified by a federal land management agency (i.e., the BLM, USFS, NPS, or USFWS) as having wilderness characteristics, thus making them worthy of consideration by Congress for wilderness designation. While Congress considers whether to

TABLE 2.2.3-1 Existing ACECs Intersecting Oil Shale or Tar Sands Areas

ACEC	Field Office(s)	Total ACEC Acres	ACEC Acres within Oil Shale Areas	ACEC Acres within STSAs
Colorado				
Duck Creek	White River	3,425.8	3,425.8	0.0
Dudley Bluffs	White River	1,628.2	1,628.2	0.0
East Fork Parachute Creek	Glenwood Springs	6,566.1	1,289.4	0.0
Northwater Creek	Glenwood Springs	1,961.9	1,591.9	0.0
Ryan Gulch	White River	1,436.4	1,436.4	0.0
Trapper Creek	Glenwood Springs, White River	2,844.0	1,418.1	0.0
		17,862.4	10,789.7	0.0
Utah				
Copper Globe	Price	128.6	0.0	128.6
Dark Canyon	Monticello	59,755.3	0.0	14.4
I-70 Scenic Highway	Price	45,631.3	0.0	4,369.3
Lears Canyon	Vernal	1,377.8	0.0	889.7
Lower Green River	Vernal	9,430.2	7,683.6	0.0
Nine Mile Canyon	Vernal	48,151.0	539.2	12,562.8
Pariette Wetlands	Vernal	10,635.2	6,523.1	2,254.6
San Rafael Canyon	Price	54,144.7	0.0	22,227.6
San Rafael Reef	Price	84,084.6	0.0	4,760.6
Scenic Highway Corridor	Monticello	13,554.1	0.0	1,105.5
Sid’s Mountain	Price	61,430.5	0.0	215.0
Temple Mountain	Price	2,446.0	0.0	2,439.3
		1,522,274.8	199,521.1	328,938.2
Wyoming				
Greater Red Creek	Rock Springs	175,240.0	44,656.9	0.0
Greater Sand Dunes	Rock Springs	41,644.2	256.5	0.0
Pine Springs	Rock Springs	6,054.9	6,054.9	0.0
Special Status Plant Species	Rock Springs, Kemmerer	1,009.9	140.3	0.0
White Mountain Petroglyphs	Rock Springs	21.7	21.7	0.0
		223,970.6	51,130.3	0.0

designate the WSAs as permanent Wilderness Areas, the federal agency managing the WSA does so in a manner to prevent impairment of the area's suitability for wilderness designation.

Since WSAs were established in the late 1970s and 1980s, designation of wilderness lands has been extensively debated, and additional BLM lands have been identified by the public as having wilderness characteristics (WCAs). In 1996, the Secretary of the Interior directed the BLM in Utah to evaluate such lands to determine whether they possess wilderness characteristics. According to BLM policy, indicators of an area's naturalness include the extent of landscape modifications, the presence of native vegetation communities, and the connectivity of habitats. Outstanding opportunities for solitude or primitive and unconfined types of recreation may be experienced when the sights, sounds, and evidence of other people are rare or infrequent; in locations where visitors can be isolated, alone, or secluded from others; where the use of the area is through nonmotorized, nonmechanical means; and where no or minimally developed recreation facilities are encountered. A number of areas in the PEIS study area have been recognized by the BLM as having wilderness characteristics. Processes are underway in some of the BLM field offices where such lands have been identified to determine appropriate management requirements, if any, for these areas. Decisions regarding management of these areas will be made at the field office level as part of the local land use planning process, not as part of this PEIS.

A river or river section may be designated as a WSR by Congress or the Secretary of the Interior under the authority of the Wild and Scenic Rivers Act of 1968. Land management agencies conduct inventories of rivers and streams within their jurisdictions and make recommendations to Congress regarding the potential inclusion of suitable rivers into the WSR system as part of their land use planning process. These special areas are managed to protect outstanding scenic, recreational, geologic, fish and wildlife, historic, cultural, or other values, and to preserve the river or river section in its free-flowing condition. WSR boundaries are established to include a corridor of land along either side of the river as determined to be appropriate for protection of the river's values. The law recognizes three classes of rivers: wild, scenic, and recreational. It is the BLM's policy to manage potentially eligible and suitable[3] WSRs in a manner to prevent impairment of the river's suitability for WSR designation until Congress or the Secretary makes a final determination regarding the river's status. During this interim period, a corridor extending at least 0.25 mi from the "high water" mark on each bank of the river is established.

National Historic and Scenic Trails are designated by Congress under the National Trails System Act of 1968. National Historic Trails follow as closely as possible the original trails or routes of travel with national historical significance. Such designation identifies and protects historic routes and their historic remnants and artifacts for public use and enjoyment. National Scenic Trails are extended trails that offer maximum outdoor recreational potential and provide

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3 A number of land use plans are currently undergoing revision, and as part of that process WSR inventories have been undertaken. Where a river or river segment has been found to be "eligible" for inclusion in the WSR system as part of one of these inventories, the BLM Handbook directs the BLM to protect the lands along the eligible segment until a "suitability" determination has been made as part of the land use planning process. If the river or river segment is found to be "non-suitable," the lands along the river then would be available for other uses.

enjoyment of the various qualities (e.g., scenic, historical, natural, and cultural) in the areas through which they pass.

BLM-administered lands support a wide array of recreational activities important to growing numbers of local, regional, and national users. While unstructured or "dispersed" recreation uses are common on public lands, developed recreation sites, Special Recreation Management Areas (SRMAs), and off-highway vehicle (OHV) areas are all use areas found within the PEIS study area.

A significant portion of the public lands within the most geologically prospective oil shale area is undergoing mineral development, especially for oil and gas resources. Conflicts in development between resources (e.g., between oil shale or tar sands and oil and gas) may occur. Generally, the concept of prior existing rights would prevail, except in some instances when existing stipulations would take precedence; however, it is the BLM's policy to optimize recovery of natural resources in an effort to secure the maximum return to the public in revenue and energy production; prevent avoidable waste of the public's resources utilizing authority under existing statutes, regulations, and lease terms; honor the rights of lessees, subject to the terms of existing leases and sound principles of resource conservation; and protect public health and safety and mitigate environmental impacts. Conflicts among competing resource uses are generally considered and resolved when processing potential leasing actions or evaluating requests for approvals of plans of development (see also Section 4.2.1.1).

As discussed in Chapter 1, Section 369(n) of the Energy Policy Act of 2005 required the Secretary to consider and give priority to the use of land exchanges to facilitate the recovery of unconventional fuels. The Act dictates that any land exchange undertaken shall be implemented in accordance with Section 206 of FLPMA. The BLM's policy for land exchanges under Section 206 recognizes that land exchanges are a common-sense tool that enables the BLM and other landowners to improve land management and consolidate ownership. Therefore, where it can be demonstrated that the public interest will be well served, land exchanges may be considered on a case-by-case basis when the result will consolidate ownership and improve management of natural resources. Land exchanges, however, are not completed on an acre-for-acre basis, but instead are completed on an equal-value basis. One of the more challenging aspects of the land exchange process is developing an exchange proposal where the appraised values of the federal and nonfederal lands are equal. Given the complexities of achieving equal-value land exchanges, especially recognizing the difficulty in valuing a commodity like oil shale or tar sands, a viable exchange proposal may be difficult to achieve. The initial basis for considering land exchange opportunities lies within existing land use plans.

2.3 OIL SHALE

Oil shale is a term used to cover a wide range of fine-grained, organic-rich sedimentary rocks. Oil shale does not contain liquid hydrocarbons or petroleum as such but organic matter derived mainly from aquatic organisms. This organic matter, kerogen, may be converted to oil through destructive distillation or exposure to heat. The most prospective oil shale deposits in the United States are contained within sedimentary deposits of the Green River Formation in the

greater Green River Basin (including Fossil Basin and Washakie Basin) in southwestern Wyoming and northwestern Colorado, the Piceance Basin in northwestern Colorado, and the Uinta Basin in northeastern Utah. As discussed in Section 1.2, the analyses in this PEIS focus on the most geologically prospective oil shale resources in these basins (i.e., the oil shale study area) shown in Figure 2.3-1. In Colorado and Utah, these are defined as those deposits that are expected to yield 25 gal/ton or more of shale oil and that are 25 ft thick or greater. In Wyoming, where the oil shale resource is not of as high a quality as it is in Colorado and Utah, the most geologically prospective oil shale resources are those deposits that yield 15 gal/ton or more of shale oil and that are 15 ft thick or greater. Figure 2.3-1 shows the Green River Formation basins and the most geologically prospective oil shale resources within those basins. Table 2.3-1 lists the total size in acres of the Green River Formation basins and the most geologically prospective oil shale resources by state, along with the total number of acres of BLM-administered and split estate lands within the most geologically prospective area within each state.

Currently, there is no commercial production of oil from oil shale being undertaken in the United States. Considerable interest exists, however, as reflected by the numerous research and development (R&D) efforts underway, including the BLM's ongoing oil shale RD&D program. As discussed in Section 1.4.1, under the BLM's oil shale RD&D program, five RD&D leases have been issued in the Piceance Basin of Colorado (one each awarded to Chevron Shale Oil Company and EGL, and three awarded to Shell Frontier Oil & Gas), and one RD&D lease has been issued in the Uinta Basin, Utah (awarded to OSEC). The locations of the six RD&D projects are shown in Figure 2.3-1 and, in greater detail, in Figure 2.3-2. In the PEIS, these leases are recognized as prior existing rights, and development will proceed under the lease terms under all alternatives being considered. For purposes of this analysis, it was assumed that all of the sites could reach full commercial development and may utilize the full acreage available to them under their leases. The very limited decisions being considered in this PEIS regarding the areas included in the RD&D leases are described in Sections 2.3.2 and 2.3.3. Table 2.3-2 briefly describes the six RD&D projects; more detailed descriptions of these projects are contained in Appendix A.

At the time the PEIS was being prepared, there were no regulations in place that govern issuance of oil shale leases. The lack of regulations is linked to the historical lack of demand for oil shale resource development; however, the BLM, under the direction of the Energy Policy Act of 2005, began preparation of regulations that would be used to authorize commercial oil shale leasing. The BLM published a proposed rule for the management of a commercial oil shale leasing program in the *Federal Register* on July 23, 2008. However, a specific congressional limitation on expenditures prevents the preparation of final regulations until October 1, 2008, at the earliest.

2.3.1 Potential Commercial Oil Shale Development Technologies

This section briefly describes the oil shale development technologies that the BLM believes may be used commercially in the 20-year time frame assessed in this PEIS. The BLM has chosen a 20-year time frame because that is the customary time frame used in resource management planning cycles. Appendix A provides a more detailed discussion of potential

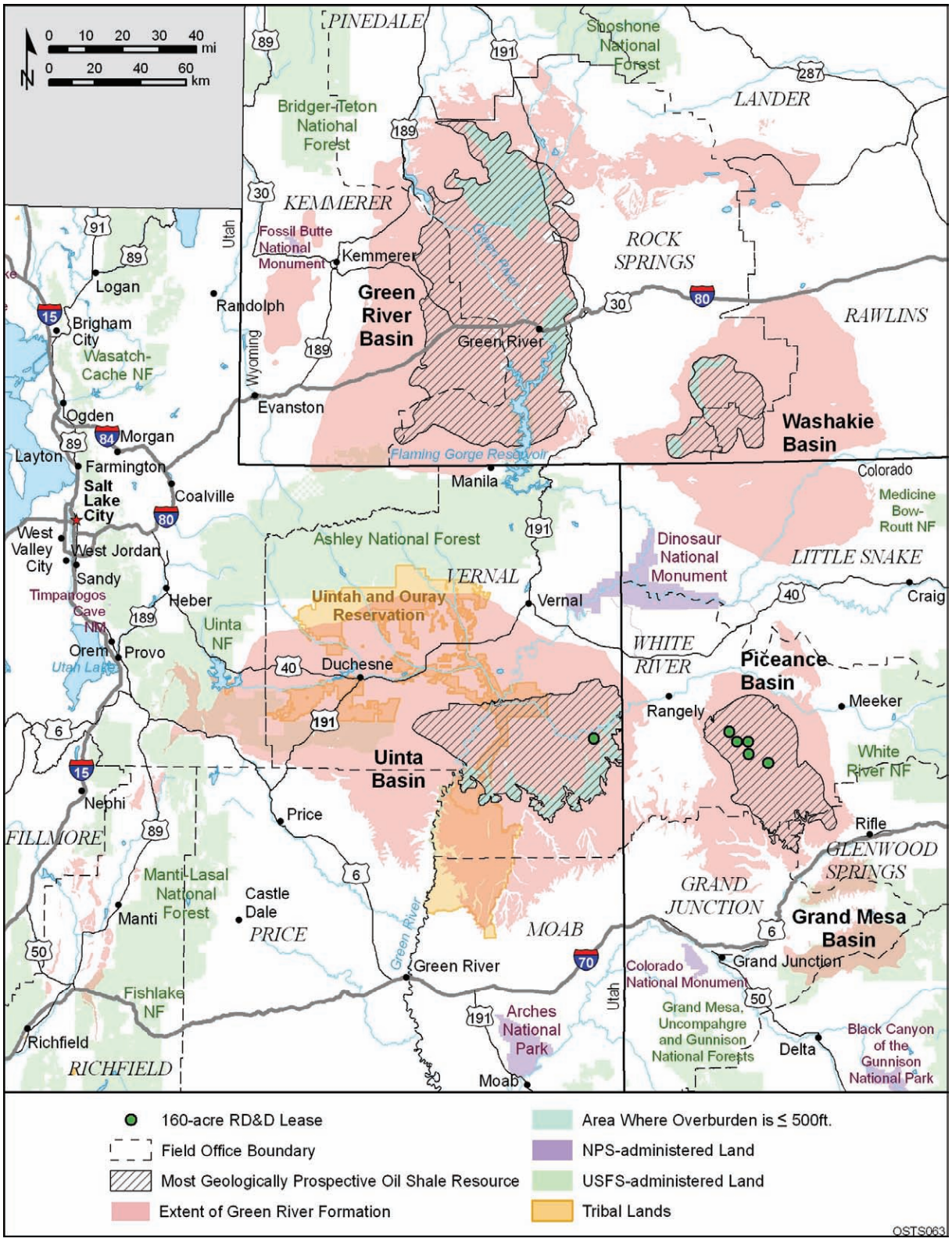

FIGURE 2.3-1 Green River Formation Basins in Colorado, Utah, and Wyoming; the Most Geologically Prospective Oil Shale Resources; the Areas Where the Overburden above the Oil Shale Resources Is ≤500 ft; and Locations of the Six RD&D Projects

TABLE 2.3-1 Total Size in Acres of the Green River Formation Basins, Most Geologically Prospective Oil Shale Areas, and Acres of BLM-Administered and Split Estate Lands within the Most Geologically Prospective Areas in Each State[a,b]

State	Total Size of Basin	Total Size of Most Geologically Prospective Area	Total BLM-Administered Lands in Most Geologically Prospective Area	Total Split Estate Lands in Most Geologically Prospective Area
Colorado				
Piceance Basin	1,185,700	503,342	319,710	41,940
Utah				
Uinta Basin[c]	2,977,900	840,213	560,972	77,220
Wyoming				
Green River and Washakie Basins	4,506,200	2,194,483	1,257,680	39,406
Total	8,669,800	3,538,038	2,138,361	158,566

[a] Totals may not be exact because of rounding. These estimates were derived from geographic information system (GIS) data compiled for the PEIS analyses. The GIS data may contain errors; therefore, these estimates should be considered to be only representative of the size of the oil shale resources and the distribution of BLM-administered and split estate lands.

[b] Split estate lands include areas where the federal government owns, and the BLM administers, the subsurface mineral rights, but the surface estate is owned by Tribes, states, or private parties.

[c] The split estate lands in the Hill Creek STSA include 57,705 acres of split estate lands within the Hill Creek Extension of the Uintah and Ouray Reservation on which the surface rights are owned by the Ute Indian Tribe.

technologies that may be used over the next 20 years, along with a brief history of oil shale development. Information presented in this section and Appendix A regarding technologies that could be used is taken from the best available published data. Because commercial oil shale development technologies are still largely in an R&D phase, many details regarding the specific technologies that may be used in the future to produce oil from oil shale are unknown. In the absence of reasonably complete information about the technologies that may be deployed, a number of assumptions have been made. These assumptions are discussed in Section 4.1.

Development of oil shale resources occurs in three major steps: (1) recovery or extraction from the natural setting, (2) processing to separate organic and inorganic constituents, and (3) upgrading the organic components in anticipation of further refining into conventional fuels. The physical and chemical features of oil shale deposits and other circumstantial factors associated with their deposition dictate the most appropriate development schemes. Typical development schemes always involve each of the above major steps, although many permutations of these steps are possible and many interim steps may also be necessary. In addition, all oil shale development projects also must stabilize and properly dispose of wastes

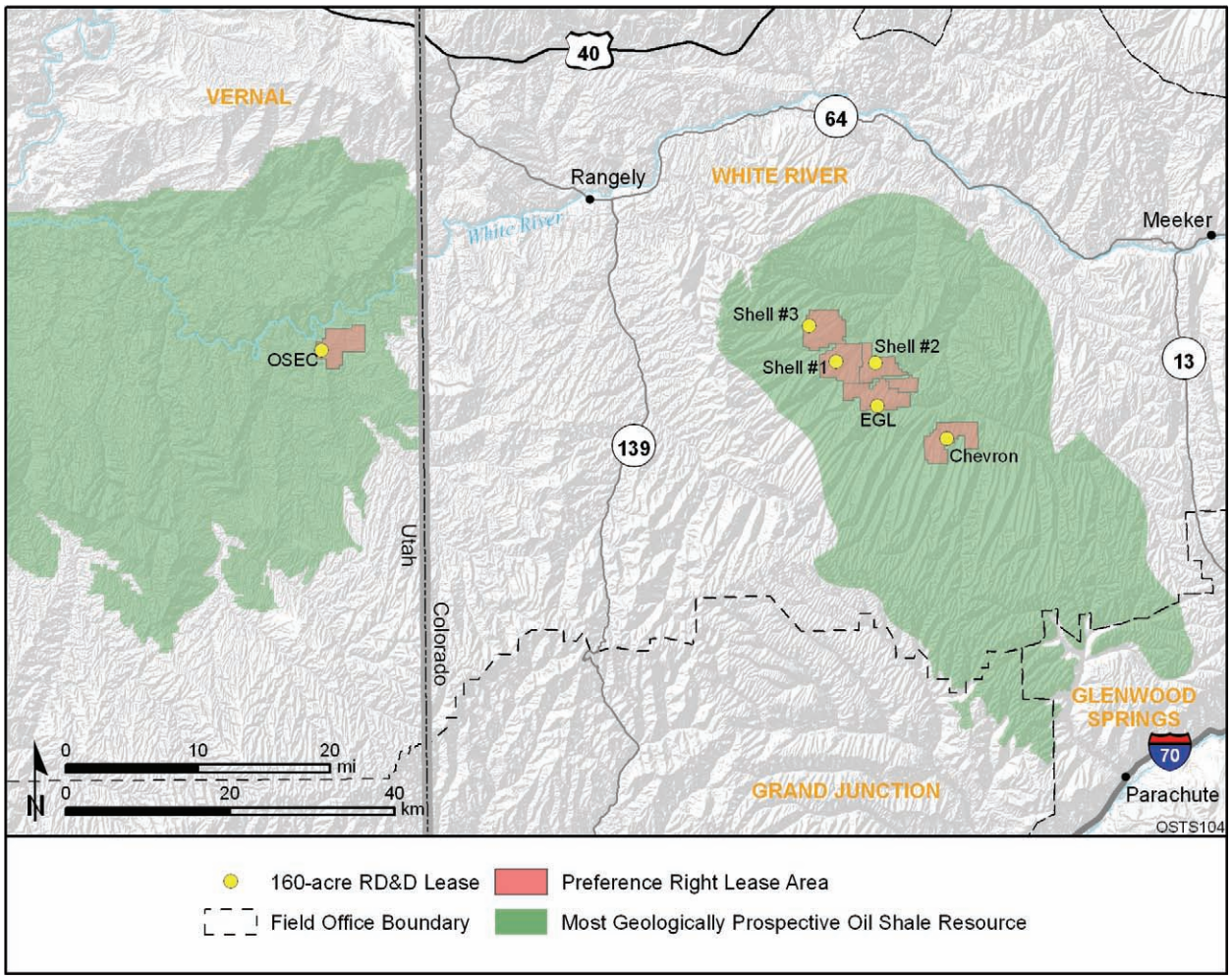

FIGURE 2.3-2 Locations of the Six RD&D Tracts and Associated PRLAs

TABLE 2.3-2 Summary Information for the Six Existing Oil Shale RD&D Projects[a]

Project[b]	Technology	Design Basis for Facility (bbl/day)	Total Annual Production (thousand bbl/yr)	Total Acreage Impacted
Shell Project 1	In situ conversion process (ICP)	500–1,500	180–550	160
Shell Project 2	Two-step ICP	500–1,500	180–550	160
Shell Project 3	Electric ICP	500–1,500	180–550	160
Chevron	In situ processes	20–50	7.3–18.25	100
EGL	In situ processes	240	87.6	90
OSEC	Underground mine with surface retort	60–3,900	23–1,400	120

[a] bbl = barrel; 1 bbl oil = 42 gal.

[b] Chevron = Chevron U.S.A., Inc; EGL = EGL Resources, Inc.; OSEC = Oil Shale Exploration Company; Shell = Shell Frontier Oil and Gas.

and by-products. For mining technologies, spent shale is a significant waste management concern.

In very simple terms, the recovery or extraction technologies can be divided into direct and indirect recovery methods. Direct recovery methods include both surface mining and underground mining technologies wherein the oil shale is removed from its physical location for processing for recovery of the hydrocarbon constituents. Indirect recovery methods recover the hydrocarbon constituents from the oil shale without requiring the excavation of the oil shale itself. Such processes can include in situ processing technologies, as well as some other enhanced oil recovery technologies developed primarily for the recovery of conventional oil and gas, in varying combinations that may be used in commercial oil shale development. Appendix A provides a detailed discussion of each of the individual technologies, some of the possible permutations, and some of the possible combinations of technologies that may be used in commercial oil shale development.

Processing technologies to separate the organic and inorganic constituents typically use retorting technologies that apply heat to the oil shale to pyrolyze the kerogen. Chemical treatment processes also may be applied. Aboveground retorting (AGR) technologies are used to process mined oil shale; the retorting processes are typically preceded by a variety of pretreatment activities, including crushing, sizing, and sorting. A number of AGR technologies have been designed in the past and are considered to be potentially applicable for future commercial oil shale development. These technologies include the Union B retort, The Oil Shale Corporation (TOSCO) II retort, Paraho retort (both direct and indirect modes), Lurgi-Ruhrgas process, Superior Oil's circular grate retort, and the Alberta Taciuk Process (ATP) technology. The indirect recovery methods mentioned above involve in situ processing to separate the organic and inorganic constituents of the oil shale. These processes typically involve the application of high temperatures to achieve pyrolysis of the kerogen and allow its in situ recovery. Information from the BLM's ongoing oil shale RD&D projects that involve in situ processes is one possible source for defining the potential in situ technologies that may be used in the future.

Irrespective of the resource recovery and retorting technologies employed, kerogen pyrolysis products are likely to require further processing or upgrading before becoming attractive to oil refineries as feedstocks for conventional fuels. Upgrading crude shale oil at commercial project sites could consist of any or all of the following steps: separation of extraneous materials from the feedstock (e.g., water, suspended solids); separation of the crude oil fractions by their boiling points in atmospheric and/or vacuum distillations; coking or cracking to thermally decompose large molecules into smaller molecules; chemical treatment (e.g., catalytic or thermal hydrocracking, hydrotreating, desulfurization, or hydrogenation); and removal of other contaminants.

This PEIS evaluates the potential impacts of commercial oil shale technologies in three primary categories:

- Surface mining projects with surface retort facilities;

- Underground mining projects with surface retort facilities; and
- In situ processing projects.

While many hypothetical development scenarios could be constructed for each of these three technology categories, it is not possible to project or analyze all of them in this PEIS. Instead, the PEIS considers the components of current technologies that could be implemented in order to analyze the range of potential impacts that could occur. It is likely that operators would consolidate a number of systems, such as power generation facilities, equipment maintenance, product storage and load-out facilities, steam and hot water production, water and wastewater treatment and recycling, and waste management, to achieve greater efficiencies and economies at a given project location.

In this PEIS, the BLM has limited its evaluation of the impacts of surface mining to those areas within the most geologically prospective oil shale areas where the overburden ranges in thickness from 0 to 500 ft. This limitation was based, in large part, on the assumption that 500 ft is about the maximum amount of overburden where surface mining can occur economically, using today's technologies. As shown in Figure 2.3-1, the areas within the most geologically prospective oil shale areas where the overburden is 0 to 500 ft thick are limited to part of the Uinta Basin in Utah and parts of the Green River and Washakie Basins in Wyoming. In Utah, about 133,194 acres of land within the most geologically prospective oil shale area have an overburden thickness of 0 to 500 ft; all of these lands fall within the Book Cliffs RMP planning area. In Wyoming, the corresponding area includes about 380,220 acres within the Green River RMP planning area. Within the most geologically prospective oil shale area defined in the Piceance Basin in Colorado, the areas where the overburden is 0 to 500 ft thick are very limited, and it would be difficult to assemble a logical mining unit.[4] The current White River RMP that includes the Piceance Basin in Colorado identifies 39,140 acres that are classified for potential open pit (surface) development, and this is part of the no action alternative in the PEIS. In Alternatives B and C, the PEIS considers making land available for lease for surface mining, only in Utah and Wyoming, in those areas shown in Figure 2.3-1.

This PEIS analyzes the amendment of nine land use plans to open certain public lands for the opportunity to allow for application for commercial oil shale development. The BLM initially intended the Final PEIS to provide the NEPA analysis and documentation not only for the amendment of the land use plans to add the development of oil shale resources to the allowable uses of the public lands in these areas, but also for the issuance of leases for commercial development. The BLM circulated a 15-project development scenario to the cooperating agencies for review and comment. The BLM developed the 15-project scenario by assuming that all 6 of the RD&D leases would convert to commercial oil shale production, and that there would be 3 additional commercial oil shale leases issued in each of the states mentioned in Section 369 of the Energy Policy Act of 2005: Colorado (two using in situ and one underground mine and surface retort); Utah (one in situ, one underground mine and surface retort, and one surface mine

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4 The areas within the most geologically prospective oil shale areas where the overburden is 0 to 500 ft thick were mapped on the basis of a variety of sources of information. In Colorado, the area was defined on the basis of data published in Donnell (1987). In Utah, the area was mapped on the basis of data provided by the Utah Geological Survey (Tabet 2007). In Wyoming, the area was mapped on the basis of data provided by Wiig (2006a,b).

and surface retort); and Wyoming (one in situ, one underground mine and surface retort, one surface mine and surface retort). The cooperating agencies commented that the BLM's analysis would be too speculative at this point to support a decision to issue any leases on the basis of this 15-project scenario.

Similarly, the BLM considered whether to present a development scenario of six projects, corresponding to the six RD&D projects currently leased, under the assumption that these RD&D projects would become viable commercial enterprises. These leases authorize research projects that will yield additional valuable insight as to the technological requirements for, and the impacts associated with commercial development of oil shale resources; however, the BLM concluded that trying to undertake this analysis at this time in order to anticipate a certain level of development would be too speculative, as well.

As a result, the BLM has elected not to attempt to issue leases for commercial development of oil shale on the basis of the NEPA analysis in this PEIS.[5] Rather, as explained in Section 2.5.1, below, this PEIS is being developed to analyze the proposed action to amend 12 existing land use plans to designate certain public lands as open for the opportunity for future oil shale and tar sands leasing. Therefore, this PEIS includes descriptions and analyses not of particular levels of development, but of the possible impacts of each type of technology currently under consideration and research, so far as this information is available to the BLM at this time. Analysis of this information will allow the BLM to determine whether or not to designate certain public lands where the resources are known to be located as open for application to lease these resources in the future.

If and when applications to lease are received and additional information becomes available, the BLM will conduct NEPA analyses, including consideration of direct, indirect, and cumulative effects, reasonable alternatives, and possible mitigation measures, as well as what level of development may be anticipated. On the basis of that NEPA analysis to be conducted at the lease stage, the BLM will consider further amendment of one or more plans, if necessary, including, but not limited to, the establishment of general lease stipulations and BMPs.

2.3.2 Alternative A, No Action Alternative, Continuation of Current Management

Alternative A is the no action alternative. In this alternative, no amendments to existing land use plans to identify lands available for application for commercial oil shale leasing would be completed. Existing land use plans would continue to provide direction for management of public lands. Under this alternative for oil shale, there are 294,680 acres currently classified in the White River RMP (BLM 1997b) in Colorado as available for oil shale leasing, and there are 58,100 acres classified as available for leasing in the Book Cliffs RMP (BLM 1985) in Utah. These areas are shown in Figures 2.3.2-1 and 2.3.2-2, respectively.

The classified lands in Colorado are located in the Piceance Basin and include 223,860 acres classified as available for underground mining; 39,140 acres that are included as

[5] Commercial leasing in this PEIS refers to commercial leases, future RD&D leases, or both.

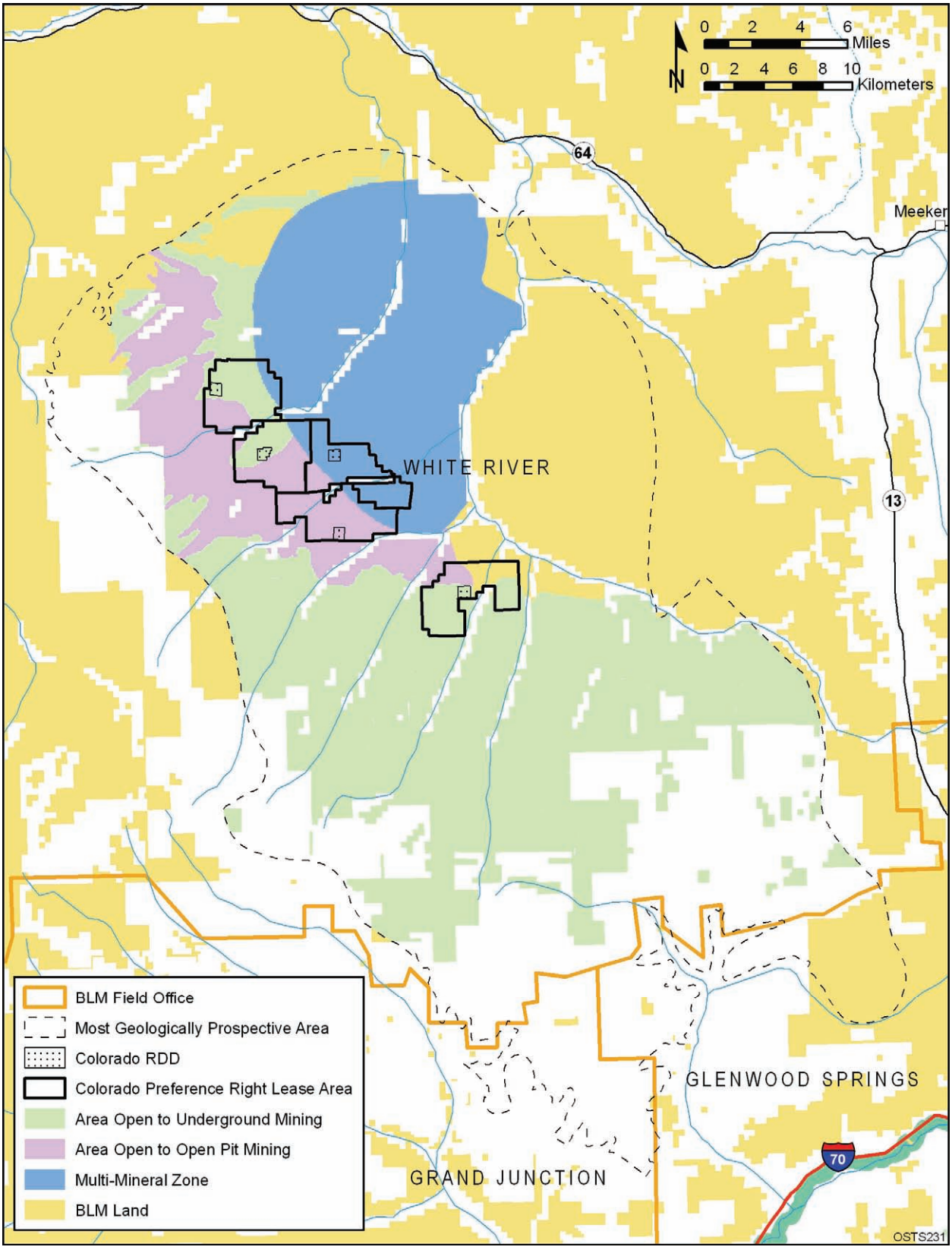

FIGURE 2.3.2-1 Lands Available for Oil Shale Leasing under Alternative A in Colorado

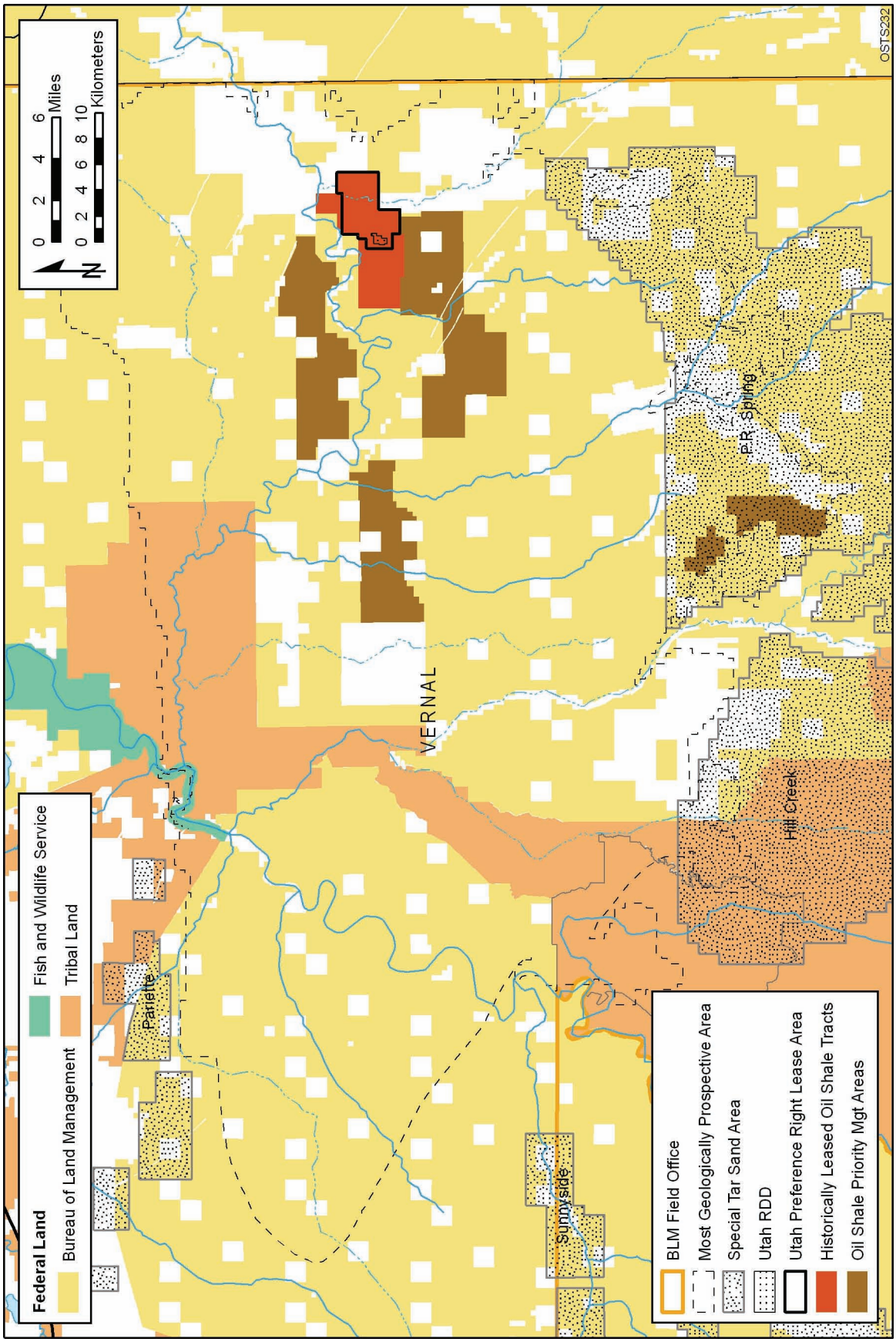

FIGURE 2.3.2-2 Lands Available for Oil Shale Leasing under Alternative A in Utah

part of the 223,860 acres that are also classified as available for open pit (surface mining); and 70,820 acres classified as Multimineral Zone that contain oil shale and other minerals and that are also available for leasing. Lands within the Multimineral Zone would be made available for commercial lease only if the applicant can demonstrate that it would use technologies that allow recovery of oil shale resources without preventing the recovery of, or otherwise destroying, other minerals (e.g., nahcolite and dawsonite). Five of the BLM-issued RD&D leases are located largely within the acreage identified in the White River RMP as available for oil shale development and are also shown in Figure 2.3.2-1. Each of the RD&D leases includes an initial lease area of 160 acres and an additional associated PRLA of 4,960 acres that could be developed if the terms of the lease are met. Table 2.3.2-1 provides a summary of the activities and constraints assumed to occur under Alternative A.

The 58,100 acres identified in Utah include 48,000 acres divided into five parcels designated in the Book Cliffs RMP as oil shale priority management areas. Of these five areas, three areas totaling 42,000 acres are classified for underground mining and two areas, totaling 6,000 acres, are classified for in situ mining. The remaining approximately 10,100 acres were originally leased for oil shale development in the 1970s as Tracts Ua and Ub. These leases were relinquished in 1985. The sixth BLM RD&D lease and its associated PRLA are located on portions of these two previously leased tracts (see Figure 2.3.2-2).

While these areas in both Colorado and Utah have been classified as available for oil shale leasing for many years, there has been little interest in commercial oil shale development. During that time there also were no leasing regulations in place that could be used to process any applications. The Secretary of the Interior has discretion to lease tracts for commercial oil shale development without regulations, but regulations such as those currently being promulgated by the BLM would have advantages for potential lessees, the public, and the BLM. Both of the existing land use plans that identify lands as available for oil shale leasing have a requirement for additional NEPA analysis before a lease could be issued.

The six RD&D leases that have been issued contain terms that allow development of the original leases and could allow development of the associated PRLAs, totaling 30,720 acres. A summary of the key lease terms regarding the PRLAs is provided in Section 1.4.1. For purposes of analysis and comparison, under Alternative A, it is assumed that each of the leases could reach commercial production utilizing the technologies being tested on the leases and may utilize the whole PRLA leased area. Where the RD&D leases overlay lands classified for open pit (surface), underground, or multimineral development, it is assumed that only the technologies being tested on the individual leases will be utilized in the development. Under this alternative, if an individual RD&D lease holder relinquishes its lease, the area may be leased to another operator consistent with the decisions in the RMP existing at the time of application.

Under Alternative A, no land use plans would be amended to allow for additional leasing for commercial development of oil shale. The White River and Book Cliffs RMPs would remain as the only RMPs authorizing oil shale leasing. Decisions embedded in the current land use plans in the study area would not be modified by a ROD for this PEIS.

TABLE 2.3.2-1 Summary of Activities and Conditions Assumed for Each of the Oil Shale Alternatives

Condition	Alternative A (No Action)	Alternative B (Proposed Plan Amendment)	Alternative C
Land use plans amended	No land use plans would be amended.	9 land use plans in Colorado, Utah, and Wyoming will be amended.	Same as Alternative B.
Potential area available for application for leasing (RD&D and commercial leases)	352,780 acres currently classified as available for leasing in existing RMPs: Colorado, 294,680 acres Utah, 58,100 acres Under this alternative, the 30,720 acres included in the existing RD&D leases are available for future leasing if the current leaseholders relinquish their existing leases.	1,991,222 acres would be made available for application for commercial lease: Colorado, 359,798 acres Utah, 630,971 acres Wyoming, 1,000,453 acres Under this alternative, the 30,720 acres included in the existing RD&D leases will be available for future leasing if the current leaseholders relinquish their existing leases.	830,296 acres would be made available for application for commercial lease: Colorado, 40,325 acres Utah, 490,460 acres Wyoming, 299,511 acres Under this alternative, of the 30,720 acres included in the existing RD&D leases, if current leaseholders relinquish their leases, only 8,205 acres within the current RD&D lease areas would be available for future leasing.
Technologies considered	RD&D: 5 in situ projects in Colorado and 1 underground mine with surface retort in Utah. In existing land use plans: Colorado – in situ, underground, and surface mining technologies. Utah – underground and in situ technologies.	In situ processes Underground mining with surface retort Surface mining with surface retort (only in Utah and Wyoming in areas where the overburden is 0 to 500 ft thick)	Same as Alternative B.

TABLE 2.3.2-1 (Cont.)

Condition	Alternative A (No Action)	Alternative B (Proposed Plan Amendment)	Alternative C
Lands excluded from commercial leasing	Only lands identified in the White River and Book Cliffs RMPs are available for leasing.	– Wilderness Areas, WSAs, and other areas that are part of the NLCS. – Existing ACECs that are currently closed to mineral development. – The MMTA in Wyoming. – Segments of rivers determined to be eligible for WSR status by virtue of a WSR inventory. – Historic trails. – Monument Valley Management Area in Wyoming. – Management Area 3, Jack Morrow Hills Planning Area in Wyoming. – Incorporated town and city limits.	Same as Alternative B plus: – All existing ACECs would be excluded from application for commercial leasing. – All lands where surface-disturbance restrictions or seasonal limitations are in place in existing land use plans in order to protect known sensitive resources would be excluded from application for commercial leasing (see Section 2.3.3.2).
Regulatory and operational constraints	All commercial development would be conducted in compliance with existing federal, state, and local regulatory requirements and established BLM policies. Leases would be subject to constraints in the existing RMPs.	All commercial development would be conducted in compliance with existing federal, state, and local regulatory requirements and established BLM policies.	Same as Alternative B.
Additional NEPA requirements	Additional NEPA analysis would be required before any leases for commercial development can be issued. Site-specific NEPA analyses also would be conducted during the review and approval of project plans of development.	Same as Alternative A.	Same as Alternative A.

2.3.3 Commercial Oil Shale Program Alternatives[6]

The BLM has developed two programmatic allocation alternatives. Under both programmatic alternatives, nine land use plans would be amended to (1) identify the most geologically prospective oil shale resources within each planning unit, (2) designate lands within these most geologically prospective areas available for application for leasing, (3) identify any technology restrictions, (4) establish requirements for future NEPA analyses and consultation activities, and (5) specify that the BLM will consider and give priority to the use of land exchanges to facilitate commercial oil shale development pursuant to Section 369(n) of the Energy Policy Act of 2005. The contents of the two alternatives are summarized in Table 2.3.2-1. The plans that would be amended include the following:

- Colorado
  - Glenwood Springs RMP (BLM 1988, as amended by the 2006 Roan Plateau Plan Amendment [BLM 2006b, 2007a, 2008])
  - Grand Junction RMP (BLM 1987)
  - White River RMP (BLM 1997b, as amended by the 2006 Roan Plateau Plan Amendment [BLM 2006b, 2007a, 2008])

- Utah
  - Book Cliffs RMP (BLM 1985)
  - Diamond Mountain RMP (BLM 1994)
  - Price River Resource Area MFP, as amended (BLM 1989)

- Wyoming
  - Great Divide RMP (BLM 1990)
  - Green River RMP (BLM 1997a, as amended by the Jack Morrow Hills Coordinated Activity Plan [BLM 2006a])
  - Kemmerer RMP (BLM 1986).

The potential impacts from oil shale development and the possible mitigation measures discussed in the Chapter 4 impact analyses could be considered, as appropriate, during the site-specific NEPA analyses identified in program element (4) above.

In both programmatic alternatives, it is recognized that the six existing RD&D leases contain terms and conditions that could allow commercial development of the original leases and the associated PRLAs totaling 30,720 acres to occur. A summary of the key lease terms and conditions regarding the PRLAs is provided in Section 1.4.1. For purposes of analysis and comparison, under both programmatic alternatives, it is assumed that each of the leases could reach commercial production utilizing the technologies being tested on the leases and may utilize the whole leased area. If an initial RD&D lease holder relinquishes its lease, the different acreages within the existing RD&D and PRLA lease areas that then would be available for future leasing under each alternative are defined.

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6 The title of this section and subsections has been modified from that of the Draft PEIS. The two alternatives remain the same.

Also, in both programmatic alternatives, new RD&D leases could be issued in any areas opened to commercial oil shale leasing. Both programmatic alternatives would alter the boundaries of areas presently open to RD&D leasing as specified in the White River and Book Cliffs RMPs (BLM 1997b, 1985). New RD&D projects might precede commercial oil shale leasing, or might be conducted contemporaneously with commercial leasing and operations. Impacts from new RD&D projects are anticipated to be qualitatively similar but smaller in scale than those of commercial projects, at least until any RD&D lease might be converted to a commercial oil shale lease and expanded to include preference right acreage. Additional NEPA analysis would be required prior to issuance of any RD&D lease, and prior to conversion of an RD&D lease to a commercial oil shale lease and expansion into a PRLA.

As discussed in Section 1.2, the BLM has determined that certain lands within the most geologically prospective oil shale resource areas are excluded from commercial leasing, under all alternatives, on the basis of existing laws and regulations, E.O.s, land use plan designations, and other administrative designations or withdrawals. As a result, commercial leasing is excluded from all designated Wilderness Areas, WSAs, and other areas that are part of the NLCS administered by the BLM (e.g., National Monuments, NCAs, WSRs, and National Historic and Scenic Trails), existing ACECs that are currently closed to mineral development, and lands within incorporated town and city limits. The BLM has also determined that additional areas would be closed and would not be available for future opportunity to lease for commercial development of oil shale resources under both programmatic alternatives. These additional areas include:

- *Mechanically Mineable Trona Area (MMTA)*. This area, which is located in the Green River Basin in Wyoming, falls within a portion of the Known Sodium Leasing Area (KSLA) that encompasses the world's largest known trona deposits.[7] Trona leases have been issued within this area, and production occurs from a number of underground mines. The BLM has determined that the MMTA would be excluded from oil shale leasing until technology or other factors exist to allow development of the oil shale resource without jeopardizing the safe operation of underground trona mines.

- *Segments of rivers that the BLM has determined to be potentially eligible for WSR status by virtue of a WSR inventory*. These river segments and a corridor extending at least 0.25 mi from the high water mark on either side of these segments would be excluded from commercial leasing (see footnote 3 on p. 2-9 for a discussion of this restriction.

- *Historic trails*. Historic trails identified by the BLM Wyoming State Office and a corridor extending at least 0.25 mi on either side of the trail would be excluded from commercial leasing.[8]

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7 Trona is a hydrous sodium carbonate mineral that is refined into soda ash, sodium bicarbonate, sodium sulfite, sodium tripolyphosphate, and chemical caustic soda.

8 For the purposes of analysis in this PEIS, the centerline of trails mapped in the GIS was used to define the 0.25 mi buffer.

- *Monument Valley Management Area.* Oil shale development within this management area, which is located in the Rock Springs Field Office area, is prohibited in the Green River RMP (BLM 1997a). Specifically, the RMP directs that these lands remain withdrawn from oil shale development until a comprehensive study of the area has been conducted, including an assessment of the potential designation of this area as an ACEC on the basis of the need to protect cultural and paleontological resources.

- *Management Area 3, Jack Morrow Hills Planning Area.* In accordance with the Jack Morrow Hills Coordinated Activity Plan (BLM 2006a), extensive restrictions on surface-disturbing activities have been established for Area 3 within the Jack Morrow Hills Planning Area because of the presence of sensitive natural and cultural resources. The portion of Area 3 that overlaps with the most geologically prospective oil shale resources in the Green River Basin is restricted to No Surface Occupancy (NSO) and has been excluded from future leasing on the basis of input from the field office.

- *Expansion Areas around Rock Springs and Green River, Wyoming.* The BLM has determined that it will not issue leases within the "expansion areas" agreed upon with the cities of Rock Springs and Green River, Wyoming.

Public lands outside of the most geologically prospective area are not being excluded from consideration for leasing for any environmental or other specific reason and could be considered for application for leasing at a later time but would require consideration in a new NEPA analysis and a land use plan amendment before leasing could be authorized. Areas within the most prospectively valuable area that are excluded from consideration for application for leasing in the current PEIS, or environmentally and economically sound proposals employing different technologies, could also be considered in the future.

Leasing would occur pursuant to regulations that are not yet final. This PEIS is not dependent upon the provisions of the final regulations. It does anticipate that decisions regarding leasing and approval of plans of development will be informed by appropriate analysis documents as required by NEPA.

For information purposes, however, under the proposed regulations, the BLM would issue a call for applications for commercial leases that may be restricted to certain areas. In response, companies would be required to identify the specific lands that they are interested in as part of their lease application package. It is also possible that the BLM would identify specific tracts to be leased in the call for applications. The proposed process would require that NEPA analyses be conducted prior to lease issuance. Information collected as part of the lease application process would be incorporated into the NEPA analysis. Applicants would be required to identify key information regarding aspects of the proposed development needed to support a complete NEPA review (e.g., technologies to be employed, level of planned development, anticipated off-site impacts, strategies to comply with regulatory requirements, etc.). During that NEPA review, the BLM would identify and establish appropriate lease stipulations to mitigate anticipated impacts. In addition, the subsequent approval of project-specific plans of development would require NEPA review to (1) consider site-specific and project-specific

factors and (2) identify and require appropriate mitigation measures as needed to control impacts beyond those established in the lease stipulations. The NEPA review for the plan of development may be incorporated into the NEPA review conducted for the lease application, at BLM's discretion, and if adequate operational data are provided by the applicant(s).

Under both programmatic alternatives (i.e., Alternatives B and C), the BLM would require that the operator conduct commercial development in compliance with existing federal, state, and local regulatory requirements and established BLM policies, as generally described in Section 2.2 and Appendix D. This compliance would include, as appropriate, obtaining and complying with all required permits (e.g., air, water, and waste management) as required by regulatory agencies; operating within the permit constraints; completing consultation with the USFWS under Section 7 of the ESA; completing consultation with State Historic Preservation Officers (SHPOs), Tribal Historic Preservation Officers, and other consulting parties under Section 106 of the NHPA (P.L. 89-665); and compliance with any other relevant and applicable requirements. Compliance-related conditions would be developed on a project-by-project basis during site-specific analyses.

Under both programmatic oil shale alternatives, in Colorado, lands within the Multimineral Zone identified in the White River RMP (BLM 1997b) would be made available for application for commercial lease only if the applicant can demonstrate that it would use technologies that allow recovery of oil shale resources without preventing the recovery of or otherwise destroying other minerals (i.e., nahcolite and dawsonite). This is consistent with existing provisions in the White River RMP. However, the BLM has determined that other decisions in the White River RMP relevant to oil shale leasing would be modified under both programmatic alternatives. The decisions that would be modified include the (1) designation of specific areas as available for commercial oil shale leasing, (2) designation of a subset of this area as available for commercial development by surface mining (e.g., open pit), and (3) prohibition of oil shale leasing with the Piceance Creek Dome area. Specific information about the White River RMP decisions relevant to oil shale is discussed in greater detail in Section 3.1.1.3 and shown in Figure 3.1.1-3.

In Utah, the BLM has determined that the decisions in the Book Cliffs RMP identifying lands as available for oil shale leasing would be modified under both programmatic alternatives. The decisions that would be modified include the (1) designation of specific areas available for commercial oil shale leasing, and (2) identification of specific areas as suitable for development using underground or in situ methods. Specific information about the Book Cliffs RMP decisions relevant to oil shale is discussed in greater detail in Section 3.1.1.8 and shown in Figure 3.1.1-13.

2.3.3.1 Alternative B for a Commercial Oil Shale Program, the Proposed Plan Amendment

Under Alternative B, the BLM proposes to designate a total of 1,991,222 acres[9] available for application for commercial oil shale leasing by amending nine land use plans. Specifically, the lands that would be available for application include all lands within the most geologically

9 This amount includes the total potential RD&D lease acreage of 30,720 acres.

prospective oil shale areas that are BLM-administered public lands, including split estate lands where the federal government owns the mineral rights, but excluding those lands described in Section 2.3.3. The public lands that would be available for application for lease Alternative B are shown in Figures 2.3.3-1, 2.3.3-2, and 2.3.3-3 for Colorado, Utah, and Wyoming, respectively. Table 2.3.3-1 lists the approximate number of acres of BLM-administered lands available for application for commercial leasing under Alternative B by state.[10]

As shown in Figure 2.3.3-2, split estate lands within the Hill Creek Extension of the Uintah and Ouray Reservation are included in the lands proposed to be available for leasing under Alternative B. These lands total 57,657 acres.

Also, as discussed in Section 2.3.1, commercial leases for surface mining projects would be allowed only on those lands in Utah and Wyoming where the overburden is 0 to 500 ft thick. In Utah, under Alternative B, lands available for application for leasing for surface mining projects total about 85,640 acres in the Book Cliffs RMP planning area. In Wyoming, under Alternative B, these lands total about 248,000 acres in the Green River RMP planning area.

In Alternative B, the PRLAs for the five RD&D projects in Colorado coincide entirely with the area proposed to be available for application for commercial leasing. For the OSEC RD&D project in Utah, however, a portion of the PRLA is not identified as available for application for commercial leasing under Alternative B because of the presence of a potentially eligible WSR, Evacuation Creek (see Section 2.3.3).[11] Under the terms of the existing RD&D leases, the federal government has a commitment to grant the RD&D lessees leases for commercial development within the PRLAs, provided that all terms and conditions of the leases are met (see Section 1.4.1). As a result, all lands within the PRLAs would be available for issuance of commercial leases to the current RD&D lessees, subject to lease requirements. For commercial oil shale development to occur on lands excluded from Alternative B along Evacuation Creek, the Book Cliffs RMP (or successor RMP) would need to be amended to consider the excluded area for potential leasing.

The federal government is not under an obligation to grant leases for commercial development within the existing RD&D lease areas to any other applicants; however, under this alternative, if an existing RD&D leaseholder relinquishes its lease, the area would be available for consideration for future leasing.

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10 The maps and acreage estimates were constructed by applying the leasing restrictions discussed in the text to the best available geographic information system (GIS) datasets available to the BLM. These maps and acreage estimates may contain errors and should be considered to be only representative of the proposed leasing area for this alternative. As specific areas are considered for commercial leasing, a detailed evaluation of land status would be required.

11 Although a power line will cross Evacuation Creek at two locations as part of the RD&D project development, OSEC will not be able to locate other surface facilities within 0.25 mi of the creek during commercial operations if the creek has been determined to be suitable for designation as a WSR at the time the commercial lease is issued. The Vernal Field Office is in the process of amending the land use plan for this area and will make a final determination on whether the river segment will be recommended to Congress for designation.

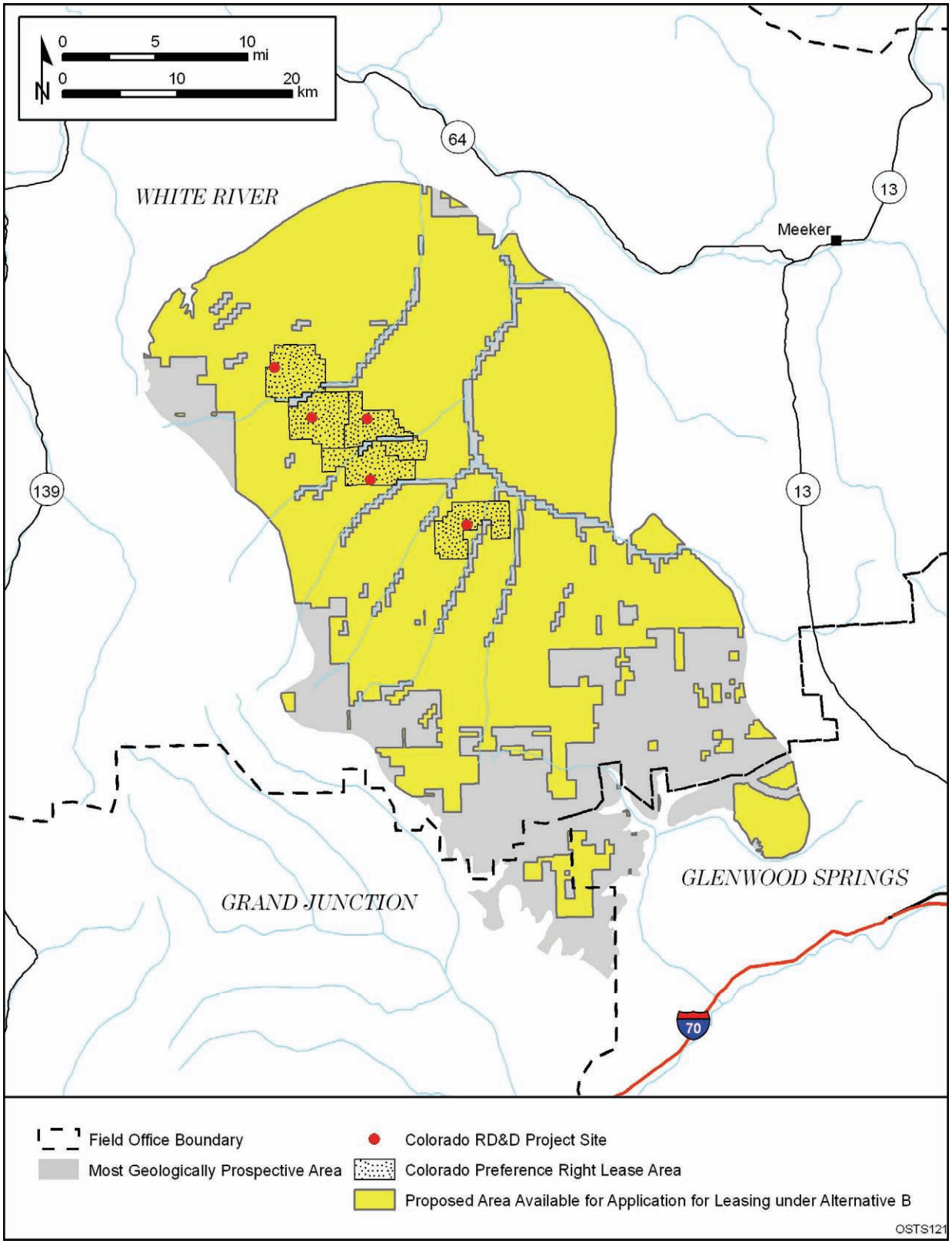

FIGURE 2.3.3-1 Lands Available for Application for Leasing under Alternative B for Commercial Oil Shale Development within the Most Geologically Prospective Areas in Colorado

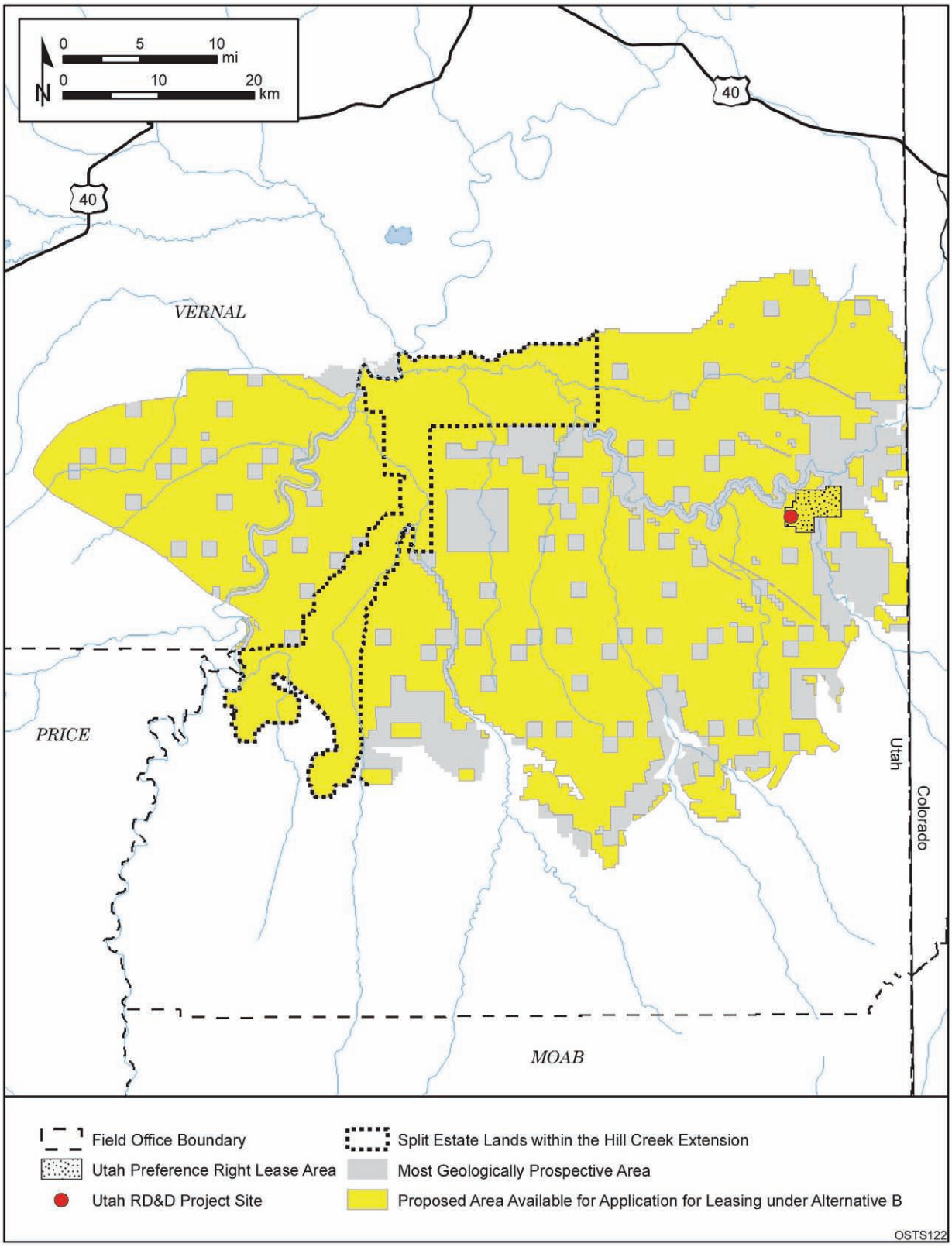

FIGURE 2.3.3-2 Lands Available for Application for Leasing under Alternative B for Commercial Oil Shale Development within the Most Geologically Prospective Areas in Utah

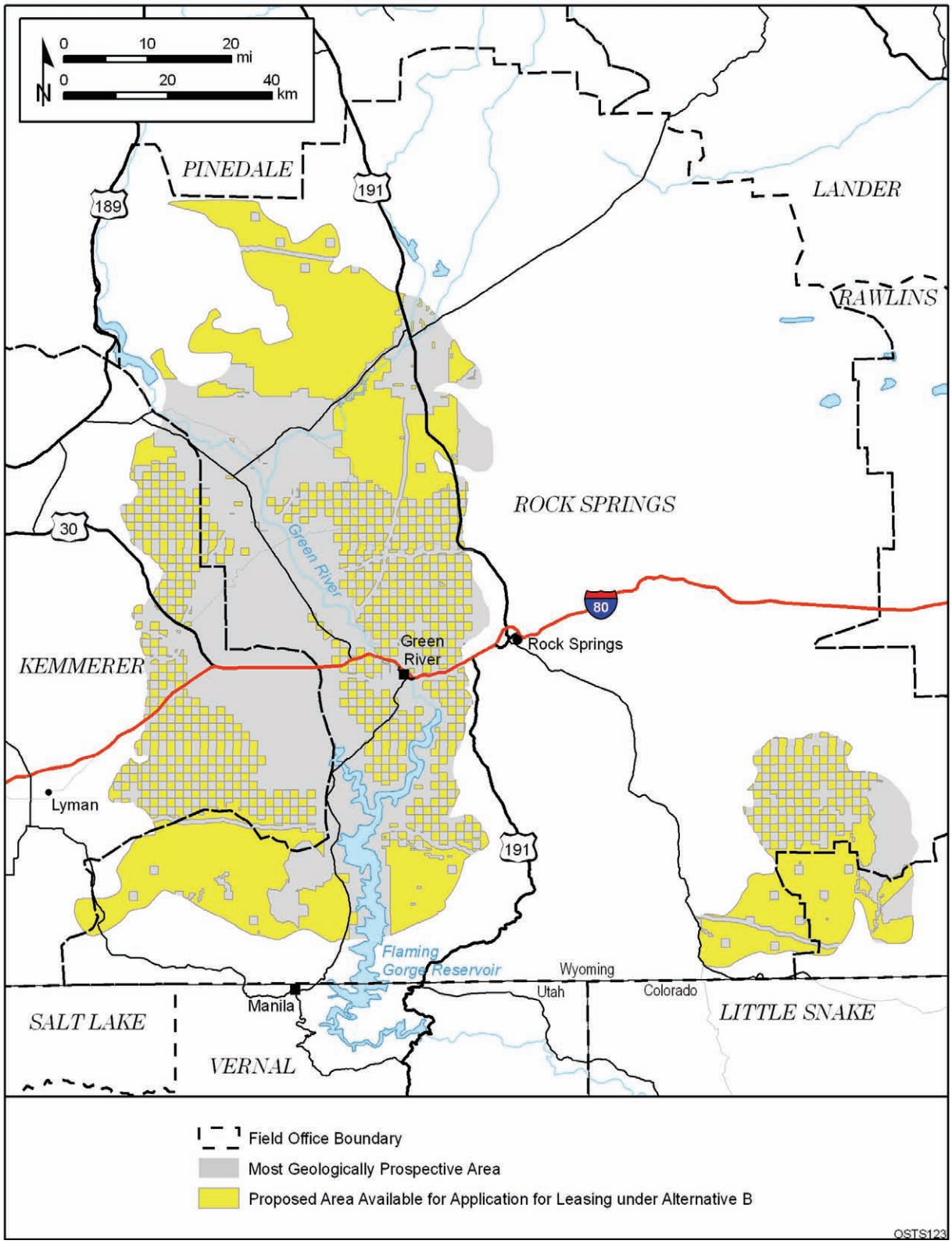

FIGURE 2.3.3-3 Lands Available for Application for Leasing under Alternative B for Commercial Oil Shale Development within the Most Geologically Prospective Areas in Wyoming

TABLE 2.3.3-1 Estimated Acres Potentially Available in Each State for Application for Leasing for Commercial Oil Shale Development under Alternative B[a]

State	BLM-Administered Lands	Split Estate Lands	Total
Colorado	317,882	41,916	359,798
Utah[b]	554,977	75,995	630,971
Wyoming	992,682	7,771	1,000,453
Total for Alternative B	1,865,542	125,681	1,991,222

[a] Totals may not be exact because of rounding. These estimates were derived from GIS data compiled for the PEIS. The GIS data may contain errors; therefore, these estimates should be considered to be only representative of the proposed leasing area.

[b] The split estate lands in Utah include 57,657 acres of split estate lands within the Hill Creek Extension of the Uintah and Ouray Reservation on which the surface rights are owned by the Ute Indian Tribe.

Under Alternative B, land use plans in the study area would be amended to adopt the conditions and constraints discussed above. Specifically, the plans would be amended to:

- Identify the most geologically prospective oil shale areas within the planning unit;
- Designate 1,991,222 acres of land within the most geologically prospective oil shale area as available for application for leasing for commercial oil shale development in accordance with applicable federal, state, and local regulations and BLM policies;
- Identify that surface mining technologies will be allowed only in areas in Utah and Wyoming where the overburden is 0 to 500 ft thick;
- For the White River RMP, specify that some of the existing decisions related to oil shale leasing will be modified;
- For the Book Cliffs RMP, specify that the existing decisions related to oil shale leasing will be modified.
- Specify that additional NEPA analyses will be required before leases will be issued for commercial development;

- Specify that approval of project-specific plans of development will require additional NEPA review to consider site-specific and project-specific factors; and

- Specify that the BLM will consider and give priority to the use of land exchanges, where appropriate and feasible, to consolidate land ownership and mineral interests within the oil shale basins.

The proposed land use plan amendments are included in Appendix C.

2.3.3.2 Alternative C for a Commercial Oil Shale Program

Alternative C is similar to Alternative B except that additional lands are excluded from the area identified as available for application for commercial leasing. Under Alternative C, the BLM proposes to designate a total of 830,296 acres[12] available for application for commercial oil shale leasing. The lands that would be available for application under Alternative C include some of the lands that are available under Alternative B, but exclude lands that are identified as requiring special management or resource protection in existing land use plans.

To identify those lands that would be excluded on the basis of existing land use plan decisions, the BLM considered the possible impacts associated with commercial oil shale development. On the basis of these impact analyses, described in Chapter 4, it was determined that commercial oil shale development could be in conflict with existing land use plan decisions that require surface-disturbance restrictions or seasonal limitations on activities in order to adequately protect a specific resource. Alternative C excludes from application for leasing all lands where such surface-disturbance and seasonal limitations are in place to protect known sensitive resources. The BLM made the determination that the most effective means of identifying lands that should be excluded was to exclude those lands within each field office where stipulations for no surface disturbance or seasonal limitations are in place for oil and gas leasing. Under this alternative, the BLM would place a priority on protecting known sensitive resources within each field office by excluding these lands from application for leasing.

The lands that would be available for application for leasing under Alternative C are shown in Figures 2.3.3-4, 2.3.3-5, and 2.3.3-6 for Colorado, Utah, and Wyoming, respectively. Table 2.3.3-2 lists, by state, the approximate number of acres of BLM-administered lands available for application for commercial leasing under Alternative C.[13] Table 2.3.3-3 identifies the types of stipulations and restrictions in place for oil and gas leasing in each state that are being used to identify those lands that would not be available for application for leasing for commercial oil shale development under Alternative C.

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12 This amount includes the total potential RD&D lease acreage of 30,720 areas.

13 The maps and acreage estimates were constructed by applying the leasing restrictions discussed in the text to the best available GIS datasets available to the BLM. These maps and acreage estimates may contain errors and should be considered to be only representative of the proposed leasing area for this alternative. As specific areas are considered for commercial leasing, a detailed evaluation of land status would be required.

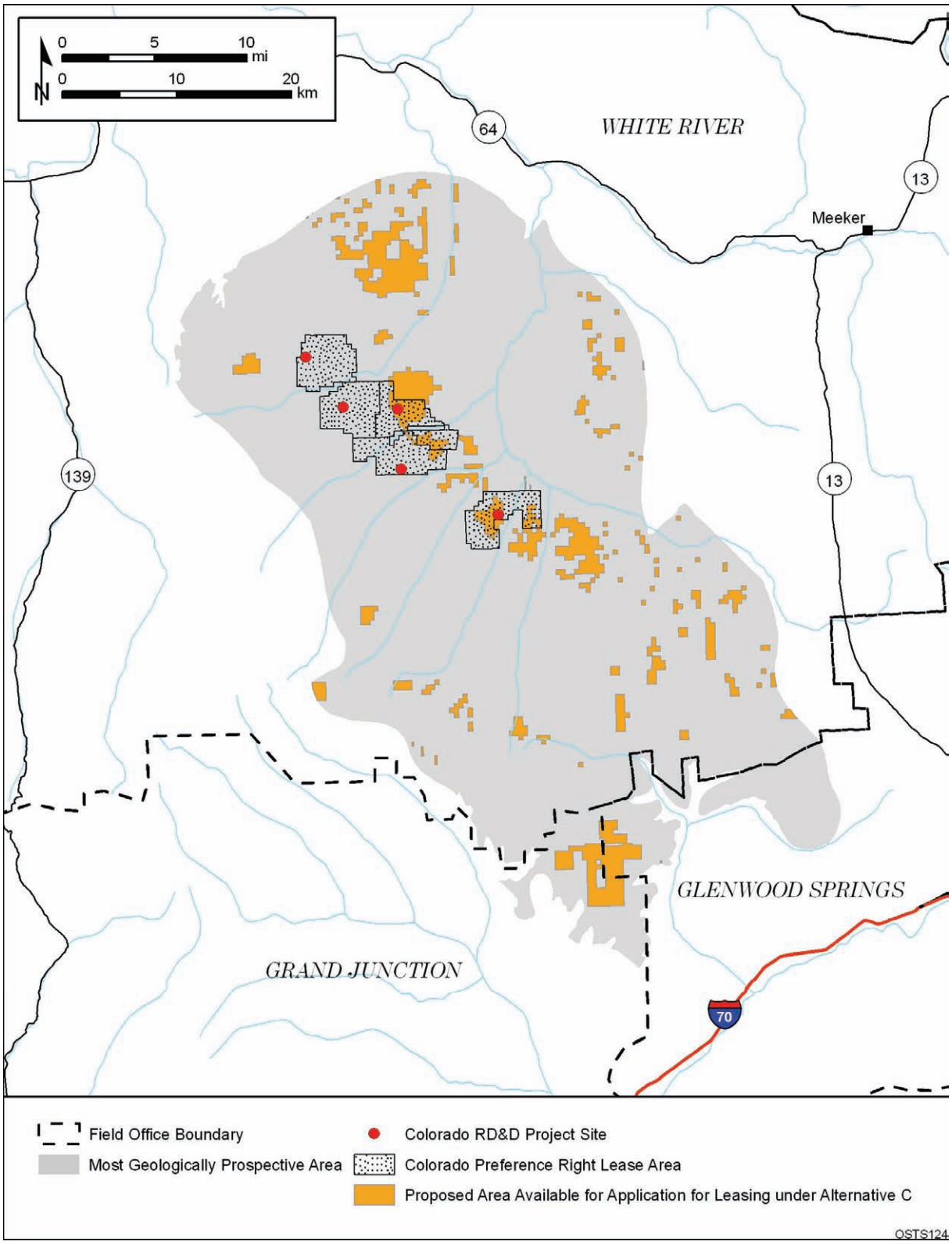

FIGURE 2.3.3-4 Lands Available for Application for Leasing under Alternative C for Commercial Oil Shale Development within the Most Geologically Prospective Areas in Colorado

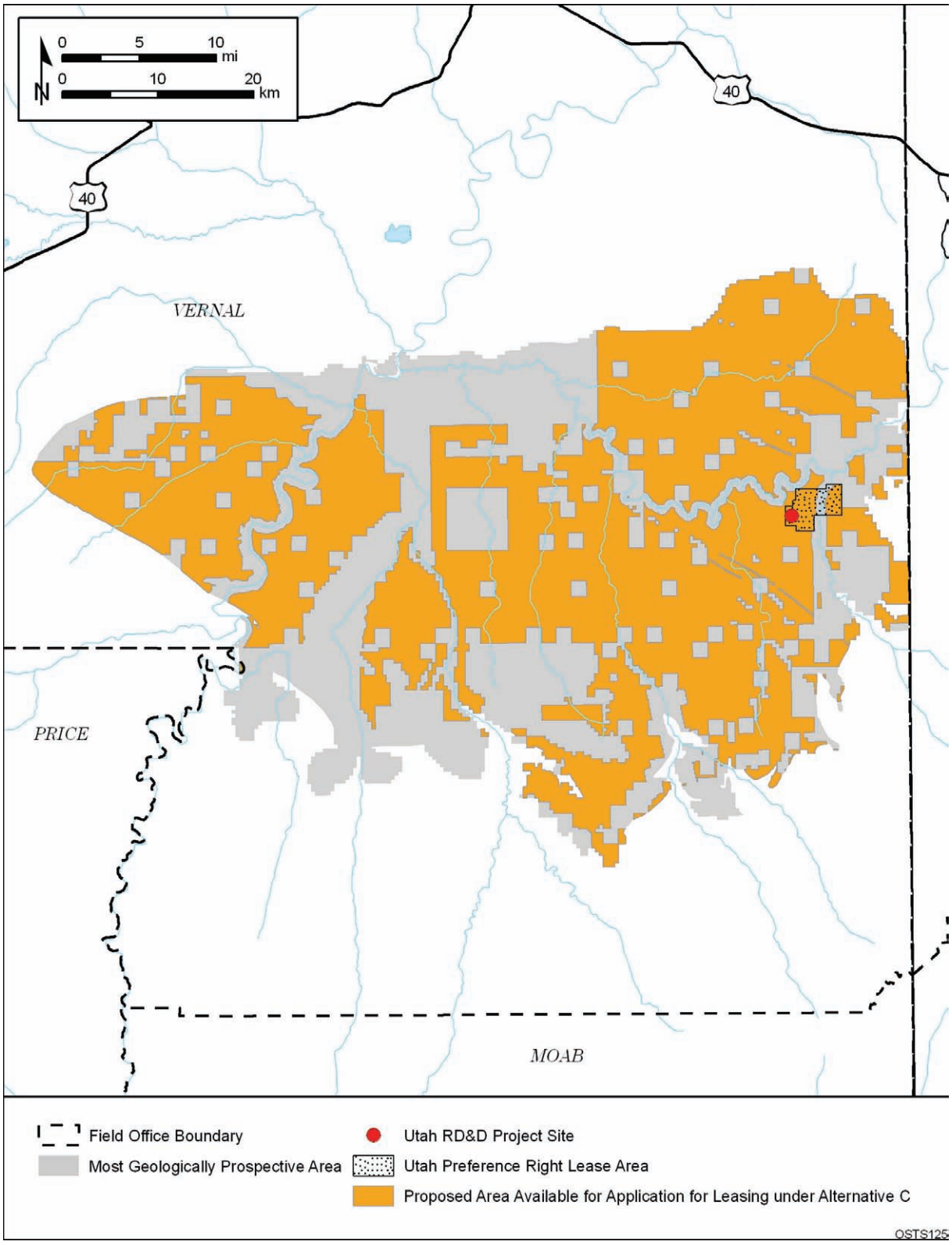

FIGURE 2.3.3-5 Lands Available for Application for Leasing under Alternative C for Commercial Oil Shale Development within the Most Geologically Prospective Areas in Utah

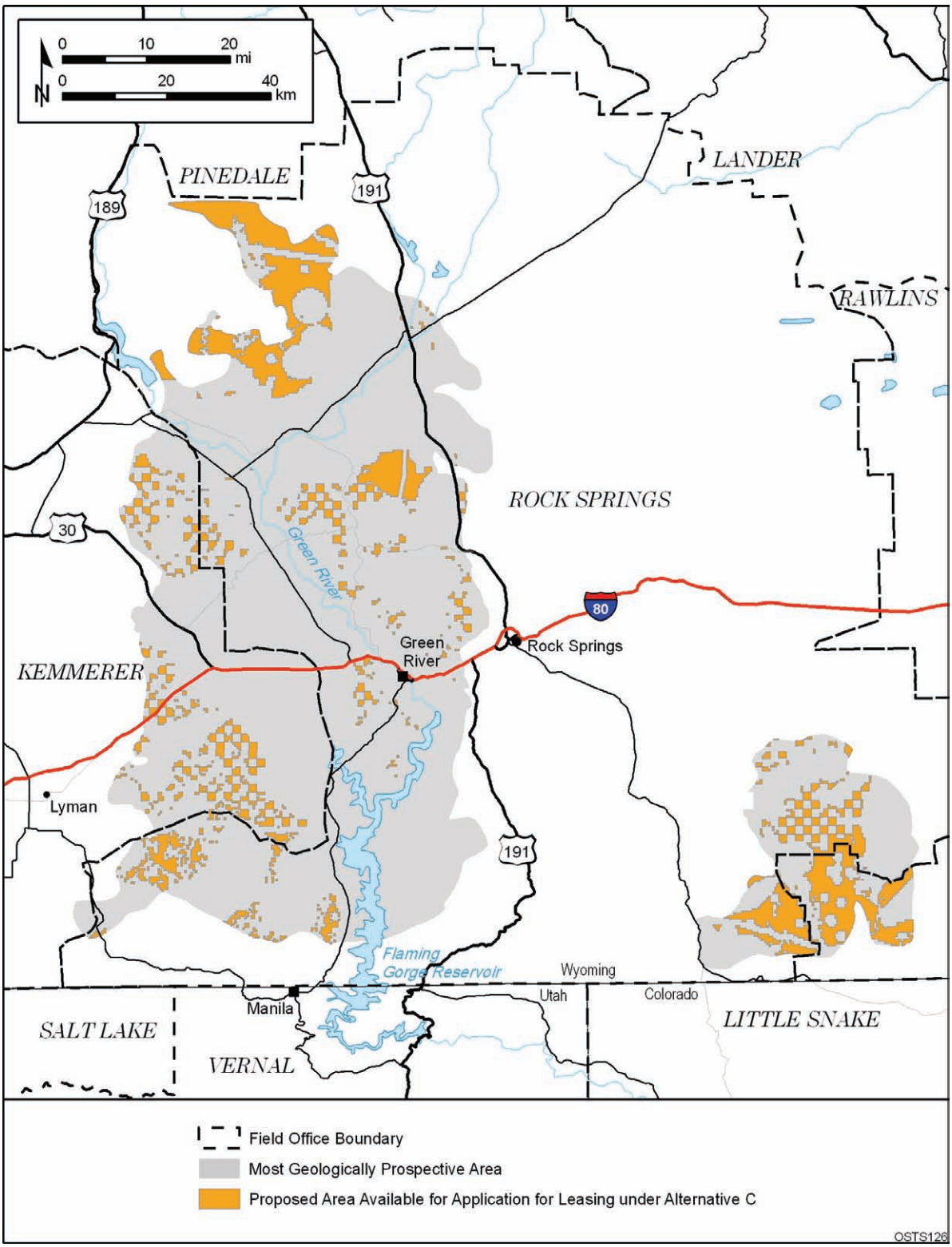

FIGURE 2.3.3-6 Lands Available for Application for Leasing under Alternative C for Commercial Oil Shale Development within the Most Geologically Prospective Areas in Wyoming

TABLE 2.3.3-2 Estimated Acres Potentially Available in Each State for Application for Leasing for Commercial Oil Shale Development under Alternative C[a]

State	BLM-Administered Lands	Split Estate Lands	Total
Colorado	26,109	14,217	40,325
Utah	472,443	18,017	490,460
Wyoming	297,434	2,077	299,511
Total for Alternative C	795,986	34,311	830,296

[a] Totals may not be exact because of rounding. These estimates were derived from GIS data compiled for the PEIS analyses. The GIS data may contain errors; therefore, these estimates should be considered to be only representative of the proposed leasing area.

As shown in Figures 2.3.3-4, 2.3.3-5, and 2.3.3-6 and reflected in Table 2.3.3-2, a large amount of land (i.e., 1,160,926 acres) available for application for leasing under Alternative B is excluded under Alternative C. In addition, particularly in Colorado and Wyoming, a large portion of the lands proposed to be available for application for leasing is composed of relatively small, isolated tracts of land. These factors could result in limiting the amount of commercial oil shale development to some level below that which might be realized under Alternative B.

Also, as discussed in Section 2.3.1, commercial leases for surface mining projects would be allowed only in Utah and Wyoming on those lands where the overburden is 0 to 500 ft thick. In Utah, under Alternative C, lands available for application for leasing for surface mining projects total about 46,900 acres in the Book Cliffs RMP planning area. In Wyoming, under Alternative C, these lands total about 68,200 acres in the Green River RMP planning area.

In Alternative C, portions of three of the five PRLAs for the Colorado RD&D leases are not identified as available for application for commercial leasing. These include portions of the areas associated with the Chevron, EGL, and Shell Site 2 RD&D projects. For the other two Colorado RD&D projects, Shell Sites 1 and 3, none of the PRLAs coincide with the area identified as available for application for commercial leasing. As is the case for Alternative B, for the OSEC RD&D project in Utah, the same portion of the area that is not identified as available for lease also is not available for application for commercial leasing under Alternative C because of the presence of a potentially eligible WSR, Evacuation Creek (see discussion on this in Section 2.3.3.1).

Under the terms of the RD&D program, the federal government has a commitment to grant the RD&D companies leases for commercial development within the PRLAs, provided that all terms and conditions of the leases are met (see Section 1.4.1). As a result, all lands within the

TABLE 2.3.3-3 Resources Covered by Stipulations and Restrictions in Place for Oil and Gas Leasing in Each State That Are Being Used to Identify Lands Not Available for Application for Leasing under Alternative C

Colorado
Slopes and fragile/erosive soils
Riparian zones and wetlands
Sage grouse leks and nesting habitat
Raptor nests, roosts, fledgling habitat, and concentration areas
Wildlife habitat[a]
Colorado River cutthroat trout habitat
Listed, proposed, or candidate threatened or endangered and BLM-designated sensitive species
Sensitive plants and remnant vegetation associations
Wild horses and wild horse management areas
Visual Resource Management (VRM) Class II areas
ACECs
Paleontological and cultural resources
Utah
Erosive soils
Floodplains, watersheds, and live water
Sage grouse leks and nesting habitat
Raptor nests and habitat
Wildlife habitat[a]
Black-footed ferret habitat
Special status plants
ACECs
Paleontological resources
Other[b]
Wyoming
Slopes and fragile/erosive soil
Sage grouse and greater sage grouse leks and nesting habitat
Raptor nests and concentration areas
Wildlife habitat[a]
Sensitive species
VRM Class I and II areas
Historic trails
ACECs
Cultural resources
Other[b]

[a] Wildlife habitat includes a combination of winter range, crucial winter range, summer range, and calving areas for antelope, deer, elk, and moose, as well as seclusion areas for other wildlife.

[b] Other resources include Special Management Areas (SMAs), recreation areas, and areas restricted from leasing for reasons not specified in the GIS data.

PRLAs would be available for issuance of commercial leases to the current RD&D lessees, subject to their lease requirements. For commercial oil shale development to occur on lands excluded by Alternative C, the specific land use plans would need to be amended to consider the excluded area for potential leasing.

The federal government is not under an obligation to grant leases for commercial development within the currently leased RD&D areas to any other applicants. Under this alternative, if existing RD&D lessees relinquish their leases, only 8,205 acres of the 30,720 acres included in the current RD&D leases would be available for application for future leasing. The areas that would be available for lease are shown in Figures 2.3.3-4 and 2.3.3-5.

Under Alternative C, land use plans in the study area would be amended to:

- Identify the most geologically prospective oil shale areas within the planning unit;
- Designate 830,296 acres of land within the most geologically prospective oil shale area as available for application for leasing for commercial oil shale development in accordance with applicable federal and state regulations and BLM policies;
- Identify that surface mining technologies will be allowed only in areas in Utah and Wyoming where the overburden is 0 to 500 ft thick;
- For the White River RMP, specify that some of the existing decisions related to oil shale leasing will be modified;
- For the Book Cliffs RMP, specify that the existing decisions related to oil shale leasing will be modified.
- Specify that additional NEPA analyses will be required before leases will be issued for commercial development;
- Specify that approval of project-specific plans of development will require additional NEPA review to consider site-specific and project-specific factors; and
- Specify that the BLM will consider and give priority to the use of land exchanges, where appropriate and feasible, to consolidate land ownership and mineral interests within the oil shale basins.

The proposed land use plan amendments are included in Appendix C.

2.4 TAR SANDS

Tar sands are sedimentary rocks containing bitumen, a heavy hydrocarbon complex. Lighter, more volatile hydrocarbons once present in these rocks have escaped to the environment, leaving the heavier, less volatile bitumen in place. Because of the very viscous nature of the bitumen, tar sands cannot be processed by normal petroleum production techniques.

More than 50 tar sands deposits occur in Utah. Limited data are available on many of these deposits, and most of the known bitumen occurs in just a few of the deposits. The deposits that are being evaluated in this PEIS are those classified in the 11 sets of geologic reports (minutes) prepared by the USGS in 1980 (USGS 1980a–k) and formalized by Congress in the Combined Hydrocarbon Leasing Act of 1981 (P.L. 97-78).[14] The 11 STSAs, which define the tar sands study area, are shown in Figure 2.4-1 and listed in Table 2.4-1, along with their total size in acres and the number of acres of BLM-administered and split estate lands within each STSA. These STSAs are considered to be the most geologically prospective areas for tar sands development.

Although no tar sands development is currently taking place on public lands in Utah, in the mid-1980s, a number of CHLs were issued in the Pariette and P.R. Spring STSAs under the authority of the Combined Hydrocarbon Leasing Act (P.L. 97-78). These include four leases in the Pariette STSA and two leases in the P.R. Spring STSA; these leases remain in existence. Also in the mid-1980s, a number of operators holding oil and gas leases or tar sands claims within designated STSAs applied to convert their leases to CHLs. In most instances, the conversion of these leases has not been completed; thus, a number of pending conversion applications remain within the study area, specifically within the Circle Cliffs, Tar Sand Triangle, and P.R. Spring STSAs.[15] The BLM is currently engaged in adjudication of these leases.[16] Tar sands deposits outside the areas designated by the Secretary of the Interior in the 11 sets of minutes are not available for leasing under the CHL Program, but are available for development under a conventional oil and gas lease.

Potential tar sands development could occur on the existing CHLs or on pending conversion leases should they be converted to CHLs. However, because there has been no tar sands development to date on any of the CHLs and no project proposals have been submitted, the BLM cannot reasonably foresee any development of tar sands on public lands within the STSAs over the next 20 years under the CHL Program.

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14 The boundaries of the designated STSAs were determined by the Secretary of the Interior's orders of November 20, 1980 (45 FR 76800–76801), and January 21, 1981 (46 FR 6077–6078).

15 While the Circle Cliffs STSA is a designated STSA, the BLM-administered portion of it falls entirely within the GSENM and has been excluded from consideration for being designated as open to application for leasing in this PEIS.

16 Decisions in this PEIS and its accompanying ROD regarding the availability of lands within the STSAs for future commercial leasing and the constraints under which such future leases would be issued would not affect the existing CHLs or any of the pending applications that are converted to CHLs.

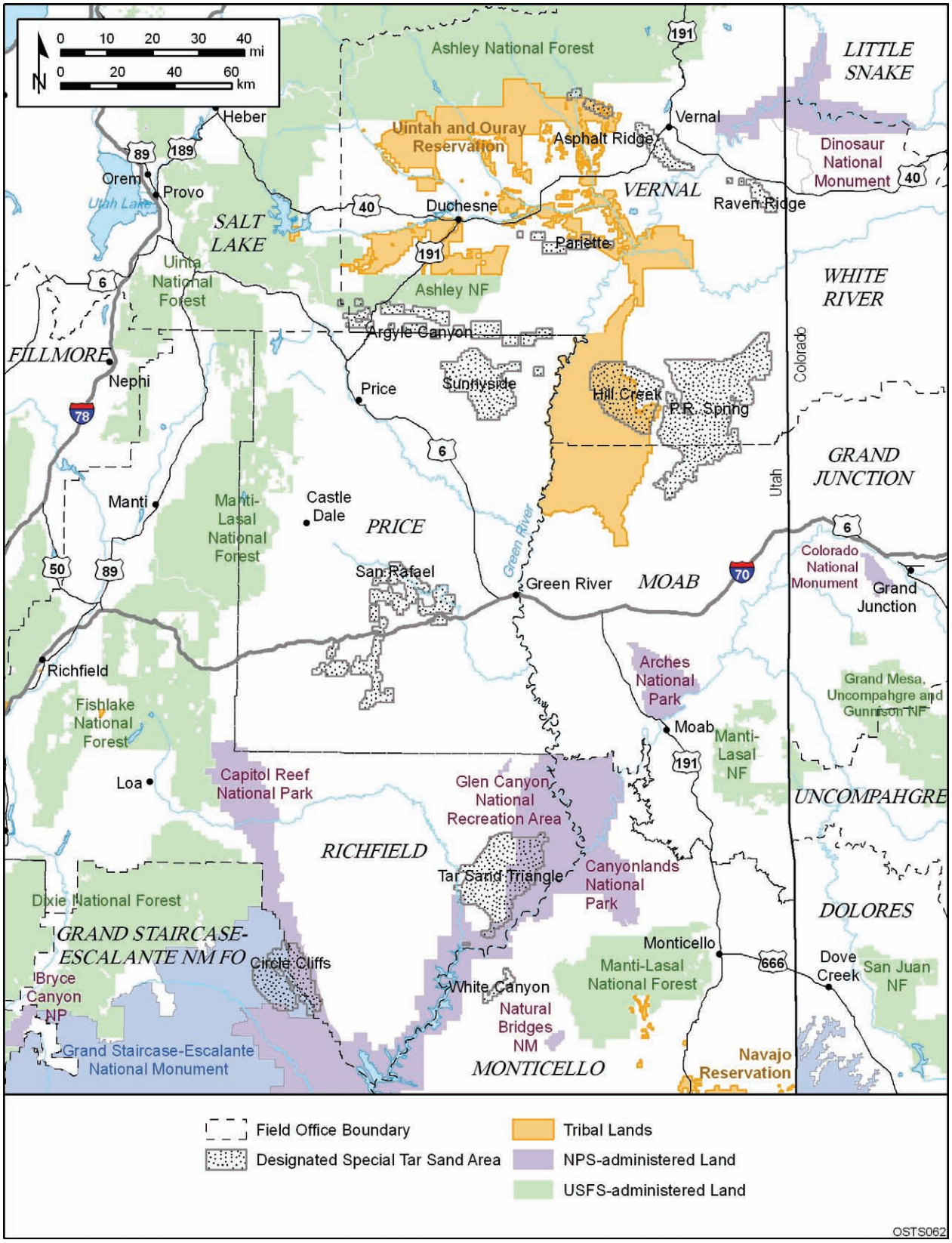

FIGURE 2.4-1 Special Tar Sand Areas in Utah

TABLE 2.4-1 Total Size in Acres of the 11 STSAs and Acres of BLM-Administered and Split Estate Lands within Each STSA[a,b]

STSA	Total Size	Total BLM-Administered Lands within STSA	Total Split Estate Lands within STSA
Argyle Canyon	22,259	1,224	11,869
Asphalt Ridge	39,151	5,323	128
Circle Cliffs[c]	91,303	51,226	6,707
Hill Creek[d]	106,795	19,923	36,583
Pariette	22,622	12,337	78
P.R. Spring	273,922	184,558	8,192
Raven Ridge	16,533	14,352	16
San Rafael Swell	130,737	115,667	0
Sunnyside	157,406	78,657	18,575
Tar Sand Triangle	155,049	83,040	0
White Canyon	10,490	8,050	0
Total	1,026,266	574,357	82,148

[a] Totals may not be exact because of rounding. These estimates were derived from GIS data compiled for the PEIS analyses. The GIS data may contain errors; therefore, these estimates should be considered to be only representative of the size of the STSAs and the distribution of BLM-administered and split estate lands.

[b] Split estate lands include areas where the federal government owns, and the BLM administers, the subsurface mineral rights, but the surface estate is owned by Tribes, states, or private parties.

[c] The Circle Cliffs STSA is included for information purposes only; it has been excluded from consideration for being designated as open to application for leasing in this PEIS. The BLM-administered lands fall entirely within the GSENM.

[d] The split estate lands in the Hill Creek STSA include 35,472 acres of split estate lands within the Hill Creek Extension of the Uintah and Ouray Reservation on which the surface rights are owned by the Ute Indian Tribe.

2.4.1 Potential Commercial Tar Sands Development Technologies

This section briefly describes the tar sands development technologies that have been considered in the scope of the PEIS analyses. Appendix B provides a more detailed discussion of potential technologies that may be used over the next 20 years and includes a discussion of oil sands development in Canada. Information presented in this section and Appendix B on technologies that might be used is taken from the best available published data. Because commercial tar sands development is still evolving, many details regarding the specific technologies that will be used in the future to produce oil from tar sands are unknown. In the

absence of complete and definitive information about the technologies that may be deployed, a number of assumptions have been made. These assumptions are discussed in Section 5.1.

Commercial development of a tar sands resource occurs in three major steps: (1) recovery of the bitumen in its natural setting, (2) processing of the bitumen to extract it from the inorganic matrix (largely sand and silt) in which it occurs, and (3) upgrading of the bitumen to produce a synthetic crude oil suitable as a feedstock for a conventional refinery. The physical and chemical features of the tar sands deposits and other circumstantial factors associated with their deposition dictate the most appropriate development schemes. Typical development schemes always involve each of the above major steps, although many permutations of these steps are possible and many interim steps may also be necessary.

Recovery methods can be categorized as either mining activities or in situ processes, although some techniques involve a combination of recovery methods. Mining consists of using surface or subsurface mining techniques to excavate the tar sands with subsequent recovery of the bitumen by washing, flotation, or retorting.[17] True in situ methods generally involve either heating the tar sands (referred to as in situ combustion) or injecting materials (e.g., steam, hot water, gas, or solvents) into them to mobilize the bitumen for recovery. Depending on production costs and the price of the synthetic crude produced, surface mining operations are generally cost-effective only where the overburden is no more than about 45 m (150 ft) (Meyer 1995). In situ processes requiring high pressures are generally considered to require a thick overburden of about 150 m (500 ft) to contain the pressure. Between these depths, bitumen must be recovered by other means.

The choice of recovery method affects which extraction and processing operations are used. In mining operations, the mined bitumen must be processed to recover or separate it from the inorganic matrix (largely sand, silt, and clay) in which it occurs. Nonmining recovery methods produce bitumen mixed with water, steam, other gases, or solvent from which it must be separated. If combustion recovery is used, the viscosity of the recovered bitumen may need to be reduced prior to further processing. In all cases, the viscosity of the bitumen might need to be changed prior to further processing and upgrading (BLM 1984). Depending on the recovery method, mining operations may also need to perform similar separations. The recovery processes evaluated in this PEIS include those discussed in Appendix B: the hot water process, cold water process, solvent extraction process, and thermal recovery processes, including retorting.

Irrespective of the recovery and processing technologies employed, it is assumed that at most commercial projects the recovered bitumen would need to be upgraded in order for it to be accepted by oil refineries as feedstocks for conventional fuels. Although there are variations among different production operations, four main processes are used to upgrade bitumen: coking (thermal conversion), catalytic conversion, distillation (fractionation), and hydrotreating.

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[17] The PEIS does not evaluate the application of underground mining technologies for the commercial development of tar sands because, at this time, underground mining to develop tar sands does not appear to be commercially viable.

Four technology combinations are evaluated in this PEIS for commercial tar sands development:

- Surface mining projects with surface retorting,
- Surface mining projects with solvent extraction,
- In situ steam injection projects, and
- In situ combustion projects.

While many hypothetical development scenarios could be constructed for various technology combinations, it is not possible to project or analyze all of them in this PEIS.

For the same reasons the BLM has elected not to attempt to issue leases on the basis of the NEPA analysis in this PEIS (see Section 2.5.1, below), this PEIS does not include analysis of a particular development scenario. Because the tar sands industry in the United States still lacks a commercially viable technology, the BLM concluded that trying to anticipate a certain level of development would be too speculative.

Therefore, this PEIS includes description and analysis not of a particular level of development, but of the possible impacts of each type of technology that has been considered and researched, so far as this information is available to the BLM at this time.

In both programmatic alternatives, RD&D leases could be issued in any areas opened to commercial tar sands leasing. RD&D projects might precede commercial tar sands leasing or might be conducted contemporaneously with commercial leasing and operations. Impacts from RD&D projects are anticipated to be qualitatively similar but smaller in scale than those of commercial projects, at least until any RD&D lease might be converted to a commercial tar sands lease and expanded to include preference right acreage. Additional NEPA analysis would be required prior to issuance of any RD&D lease and prior to conversion of an RD&D lease to a commercial tar sands lease and expansion into a PRLA.

If and when applications to lease are received and additional information becomes available, the BLM will conduct NEPA analyses, including consideration of direct, indirect, and cumulative effects, reasonable alternatives, and possible mitigation measures, as well as what level of development may be anticipated. On the basis of that NEPA analysis to be conducted at the lease stage, the BLM will consider the establishment of general lease stipulations and BMPs, either by further plan amendment, if necessary, or by other means.

This PEIS considers the components of current technologies that could be implemented in order to analyze the range of potential impacts that could occur. The scope of the PEIS analyses is intended to be broad enough to include the potential array of technologies that might be used to commercially develop tar sands resources on public lands. It is possible, however, that additional technologies may be identified as viable in the next 20 years. The application of such

technologies on public lands may be allowed by the BLM; however, these technologies would need to be evaluated on a case-by-case basis.

2.4.2 Alternative A, No Action Alternative, Continuation of Current Management

Under this alternative for tar sands, the BLM has assumed that there would be no commercial leasing or development of tar sands on public lands. As discussed in Section 2.4, although a number of CHLs were issued in the mid-1980s (and there are additional pending applications to convert oil and gas leases or tar sands claims to CHLs), there has been no tar sands development on public lands in the last 20 years or more. Furthermore, at the time this PEIS was prepared, no commercial tar sands project proposals had been submitted to the BLM. Based on this history, the BLM has determined that it is unlikely that commercial tar sands development would occur under the existing CHL Program. Under Alternative A, land use plans would not be amended to allow for leasing for commercial tar sands development under any program other than the CHL Program. Table 2.4.2-1 provides a summary of the activities and conditions assumed to occur under Alternative A.

2.4.3 Commercial Tar Sands Program Alternatives[18]

The two separate alternatives that the BLM has developed for establishing a commercial tar sands program are summarized in Table 2.4.2-1. These programmatic alternatives, labeled Alternatives B and C, consist of different management approaches to future commercial tar sands leasing. Under each programmatic alternative, the BLM proposes to make certain lands within the STSAs available for application for commercial leases. Under both alternatives, additional NEPA analyses would be conducted prior to the issuance of commercial leases. In addition, site-specific NEPA analyses would be conducted during evaluation and approval of plans of development during the project development phase. These site-specific analyses, which potentially could be combined into a single NEPA evaluation, would identify potential project-specific impacts and define appropriate lease stipulations and required mitigation measures. The potentially applicable mitigation measures discussed in the Chapter 5 impact analyses would be applied during the site-specific analyses, as appropriate.

As discussed in Section 1.2, the BLM has determined that certain lands within the STSAs are excluded from commercial leasing under all alternatives, on the basis of existing laws and regulations, E.O.s, land use plan designations, and other administrative designations or withdrawals. As a result, commercial leasing is excluded from all designated Wilderness Areas, WSAs, and other areas that are part of the NLCS administered by the BLM (e.g., National Monuments, NCAs, WSRs, and National Historic and Scenic Trails). Leasing also would be excluded from all existing ACECs and lands within incorporated town and city limits. The BLM has also determined that additional areas would be closed and would not be available for future

18 The title of this section and subsections has been modified from that of the Draft PEIS. The two alternatives remain the same.

TABLE 2.4.2-1 Summary of Activities and Conditions Assumed for Each of the Tar Sands Alternatives

Condition	Alternative A (No Action)	Alternative B (Proposed Plan Amendment)	Alternative C
Land use plans amended	No plans would be amended.	Six plans would be amended.	Same as Alternative B.
Potential area made available for application for leasing (RD&D and commercial leases)	STSAs consistent with existing land use plans	431,224 acres would be made available for application for commercial lease. Argyle Canyon: 11,226 acres Asphalt Ridge: 5,435 acres Circle Cliffs: 0 acres Hill Creek: 56,506 acres Pariette: 10,161 acres P.R. Spring: 153,003 acres Raven Ridge: 14,364 acres San Rafael: 70,475 acres Sunnyside: 78,116 acres Tar Sand Triangle: 24,938 acres White Canyon: 7,001 acres	229,038 acres would be made available for application for commercial lease. Argyle Canyon: 0 acres Asphalt Ridge: 1,464 acres Circle Cliffs: 0 acres Hill Creek: 19,934 acres Pariette: 830 acres P.R. Spring: 56,728 acres Raven Ridge: 9,950 acres San Rafael: 54,492 acres Sunnyside: 62,741 acres Tar Sand Triangle: 22,511 acres White Canyon: 386 acres
Technologies considered	None	Surface mining with surface retort Surface mining with solvent extraction In situ steam injection In situ combustion	Same as Alternative B.
Lands excluded from commercial leasing	Wilderness Areas, WSAs, other areas that are part of the NLCS. Segments of rivers determined to be eligible for WSR status by virtue of a WSR inventory. Any leasing would be consistent with existing land use plan decisions.	– Wilderness Areas, WSAs, other areas that are part of the NLCS. – All existing ACECs. – The Circle Cliffs STSA. – Historic trails. – Segments of rivers determined to be eligible for WSR status by virtue of a WSR inventory. – Incorporated town and city limits.	Same as Alternative B, plus all lands where surface-disturbance restrictions or seasonal limitations are in place in existing land use plans in order to protect known sensitive resources would be excluded from application for commercial leasing (see Section 2.4.3.2).

TABLE 2.4.2-1 (Cont.)

	Alternative A (No Action)	Alternative B (Proposed Plan Amendment)	Alternative C
Regulatory and operational constraints	All commercial development would be conducted in compliance with existing federal, state, and local regulatory requirements and established BLM policies.	Same as Alternative A.	Same as Alternative A.
Additional NEPA requirements	Additional NEPA analyses would be required before any leases for commercial development could be issued. Site-specific NEPA analyses also would be conducted during the review and approval of project plans of development.	Same as Alternative A.	Same as Alternative A.
Applicable leasing regulations	Leasing would be conducted pursuant to the CHL regulations contained in 43 CFR Part 3140.	Leasing would be conducted pursuant to the interim final rules for tar sands leasing in STSAs published in 70 FR 58610–58516, and CHLs could be considered as provided in 43 CFR Part 3140.	Same as Alternative B.

opportunity to lease for commercial development of tar sands resources under both programmatic alternatives. These additional areas include:

- *Circle Cliffs STSA.* Most of the Circle Cliffs STSA falls entirely within the GSENM and Capitol Reef National Park. The issuance of new leases for mineral development within each of these units is prohibited. Also, a small portion of the Circle Cliffs STSA underlies the Glen Canyon NRA; this area is part of the "Natural Zone" within which mineral leasing and development are prohibited.

- *Segments of rivers that have been determined to be potentially eligible for WSR status by virtue of a WSR inventory*. These river segments and a corridor extending at least 0.25 mi on either side of these segments would be excluded from commercial leasing.

Leasing would occur as set forth in 43 CFR Part 3140. For information purposes, the process could be summarized as follows. The BLM would hold a competitive lease sale as provided in 43 CFR 3141.1. A potential lessee could submit a request or expression of interest in one or more tracts for competitive lease offering as provided in 43 CFR 3141.6-1. The BLM anticipates that it will need additional information about potential technologies for, and impacts from, commercial production of tar sands in order to complete an analysis under NEPA for issuing leases or approving plans of developments. That information does not presently exist and would likely need to come from the industry before the BLM would proceed with leasing or approval of operations.

Under both programmatic alternatives, the BLM would ensure that the operator conducts commercial development in compliance with existing federal, state, and local regulatory requirements and established BLM policies, as generally described in Section 2.2 and Appendix D. That compliance would include, as appropriate, obtaining all permits (e.g., air, water, and waste management) as required by regulatory agencies; operating within the permit constraints; completing consultation with the USFWS under Section 7 of the ESA; completing consultation with SHPOs, Tribal Historic Preservation Officers, and other consulting parties under Section 106 of the NHPA; and compliance with any other relevant and applicable requirements. Compliance-related conditions would be developed on a project-by-project basis during site-specific analyses.

Under both programmatic tar sands alternatives, six land use plans in Utah would be amended to (1) designate lands within the STSAs available for application to lease, (2) stipulate requirements for future NEPA analyses and consultation activities, and (3) specify that the BLM will consider and give priority to the use of land exchanges to facilitate commercial tar sands development pursuant to Section 369(n) of the Energy Policy Act of 2005. The plans that would be amended to address commercial tar sands leasing and development include the following:

- Book Cliffs RMP (BLM 1985);

- Diamond Mountain RMP (BLM 1994);

- Henry Mountain MFP (BLM 1982);
- Price River Resource Area MFP, as amended (BLM 1989);
- San Rafael Resource Area RMP (BLM 1991a); and
- San Juan Resource Area RMP (BLM 1991b).

Public lands outside of the STSAs are not being excluded from consideration for leasing for any environmental or other specific reason and could be considered for application for leasing at a later time but would require consideration in a new NEPA analysis and a land use plan amendment before leasing could be authorized. Areas within the STSAs that are excluded from consideration for application for leasing in the current PEIS, or environmentally and economically sound proposals employing different technologies, could also be considered in the future.

The following sections describe the programmatic alternatives evaluated in this PEIS. The sections identify the additional leasing exclusions that the BLM has identified for each alternative and the proposed land use plan amendments. The specific land use plan amendments are discussed in greater detail in Appendix C.

2.4.3.1 Alternative B for a Commercial Tar Sands Program, the Proposed Plan Amendment

Under Alternative B, the BLM proposes to designate a total of 431,224 acres available for commercial tar sands leasing by amending six land use plans. Specifically, the lands that would be available for application include all BLM-administered public lands within the STSAs, including split estate lands where the federal government owns the mineral rights, except those lands described in Section 2.4.3. The lands that would be available for application for lease are shown in Figure 2.4.3-1. Table 2.4.3-1 lists the approximate number of acres available for application for commercial leasing under Alternative B by STSA.[19]

As indicated in Table 2.4.3-1, split estate lands within the Hill Creek Extension of the Uintah and Ouray Reservation where the surface estate is owned by the Tribes and the minerals are owned by the federal government, are included in the lands proposed to be available for leasing under Alternative B. These lands encompass 35,472 acres.

Under Alternative B, land use plans in the study area would be amended to adopt the conditions and constraints discussed above. Specifically, the plans would be amended to:

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19 The maps and acreage estimates were constructed by applying the leasing restrictions discussed in the text to the best available GIS datasets available to the BLM. These maps and acreage estimates may contain errors and should be considered to be only representative of the proposed leasing area for this alternative. As specific areas are considered for commercial leasing, a detailed evaluation of land status would be required.

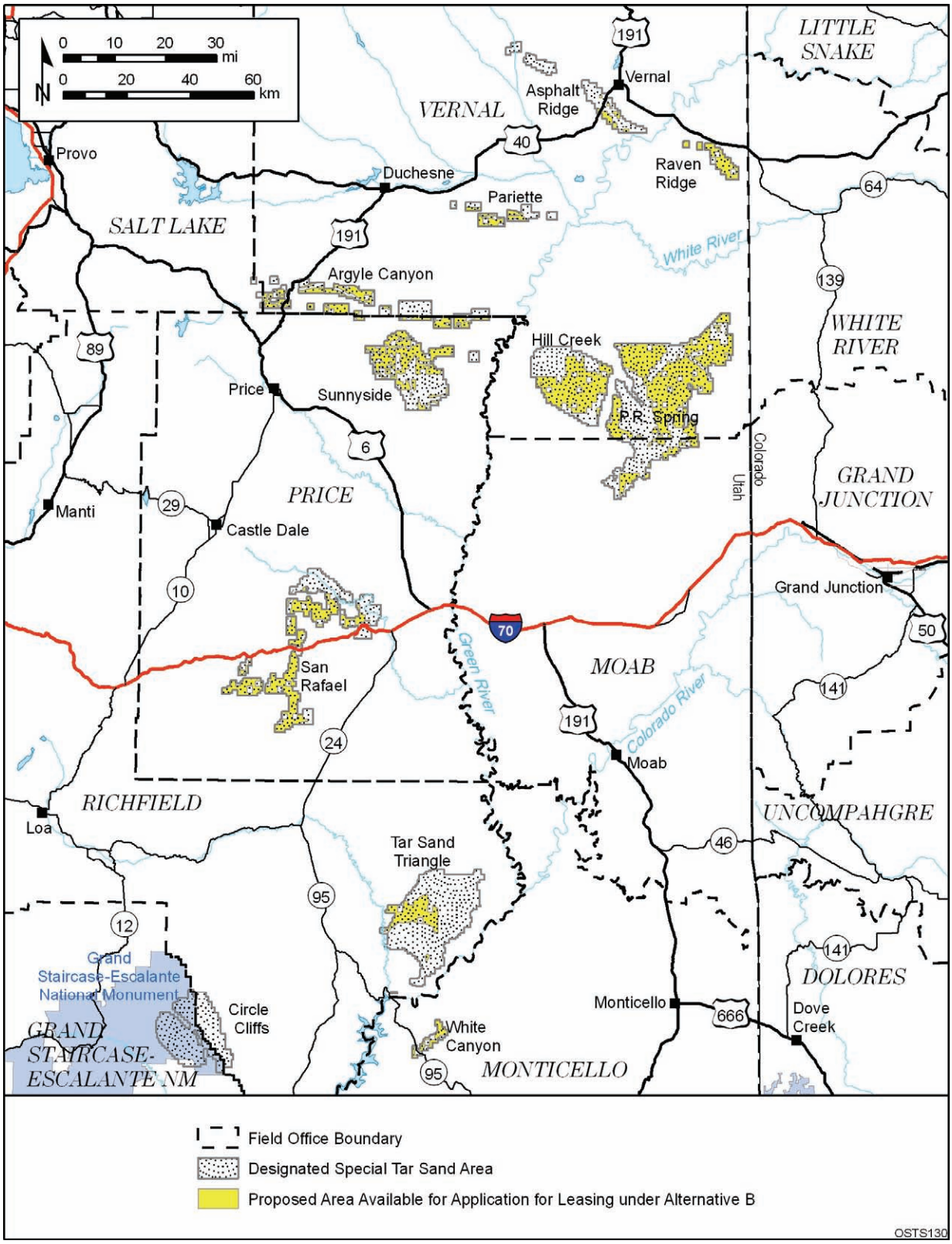

FIGURE 2.4.3-1 Lands Available for Application for Leasing under Alternative B for Commercial Tar Sands Development within the STSAs in Utah

TABLE 2.4.3-1 Estimated Acres Potentially Available under Alternative B for Application for Leasing in Each STSA for Commercial Tar Sands Development[a]

STSA	BLM-Administered Lands	Split Estate Lands	Total
Argyle Canyon	1,022	10,204	11,226
Asphalt Ridge	5,310	125	5,435
Circle Cliffs[b]	0	0	0
Hill Creek[c]	19,923	36,583	56,506
Pariette	10,083	78	10,161
P.R. Spring	145,922	7,081	153,003
Raven Ridge	14,348	16	14,364
San Rafael	70,475	0	70,475
Sunnyside	61,093	17,023	78,116
Tar Sand Triangle	24,938	0	24,938
White Canyon	7,001	0	7,001
Total for Alternative B	360,115	71,110	431,224

[a] Totals may not be exact because of rounding. These estimates were derived from GIS data compiled for the PEIS analyses. The GIS data may contain errors; therefore, these estimates should be considered to be only representative of the proposed leasing area.

[b] Leasing for commercial tar sands development in the Circle Cliffs STSA is excluded under all alternatives because it falls entirely within the GSENM and units managed by the NPS on which mineral leasing and development are prohibited.

[c] The split estate lands in the Hill Creek STSA include 35,472 acres of split estate lands within the Hill Creek Extension of the Uintah and Ouray Reservation on which the surface rights are owned by the Ute Indian Tribe.

- Designate 431,224 acres of land within the STSAs as available for application for leasing for commercial tar sands development in accordance with applicable federal, state, and local regulations and BLM policies;
- Specify that additional NEPA analyses will be required before leases will be issued for commercial development;
- Specify that approval of project-specific plans of development will require additional NEPA review to consider site-specific and project-specific factors; and
- Specify that the BLM will consider and give priority to the use of land exchanges where appropriate and feasible to consolidate land ownership and mineral interests within the STSAs.

2.4.3.2 Alternative C for a Commercial Tar Sands Program

Alternative C is similar to Alternative B except that additional lands are excluded from the area made available for application for commercial leasing. Under Alternative C, the BLM proposes to identify a total of 229,038 acres available for application for commercial tar sands leasing. The lands that would be available for application under Alternative C include some of the lands that are available under Alternative B, but exclude lands that are identified as requiring special management or resource protection in existing land use plans.

To identify those lands that would be excluded on the basis of existing land use plan decisions, the BLM considered the possible impacts associated with individual commercial tar sands development projects. On the basis of these impact analyses, described in Chapter 5, it was determined that commercial tar sands development could be in conflict with existing land use plan decisions that require surface-disturbance restrictions or seasonal limitations on activities in order to adequately protect a specific resource. It was decided to exclude from Alternative C all lands where such surface-disturbance and seasonal limitations are in place to protect known sensitive resources. The BLM made the determination that the most effective means of identifying lands that should be excluded on this basis was to exclude those lands within each field office where stipulations for no surface disturbance, controlled surface use, or seasonal limitations are in place for oil and gas leasing. Under this alternative, the BLM would place a priority on protecting known sensitive resources within each field office by excluding certain lands from application for leasing.

The lands that would be available for application for lease under Alternative C are shown in Figure 2.4.3-2. Table 2.4.3-2 lists the approximate number of acres of BLM-administered lands, including areas where the federal government owns only the mineral estate, available for application for commercial leasing under Alternative C by STSA.[20] Table 2.4.3-3 identifies the types of stipulations and restrictions in place for oil and gas leasing in each state that are being used to identify those lands that would not be available for application to lease for commercial tar sands development under Alternative C.

As shown in Figure 2.4.3-2 and reflected in Table 2.4.3-2, 202,186 acres available for application for leasing under Alternative B are excluded under Alternative C; several STSAs become entirely unavailable for application for lease. In addition, in some of the STSAs, a large portion of the lands proposed to be available for leasing is composed of relatively small, isolated tracts of land. These factors could result in limiting the potential amount of commercial tar sands development to a level below that which might be realized under Alternative B.

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[20] The maps and acreage estimates were constructed by applying the leasing restrictions discussed in the text to the best available GIS datasets available to the BLM. These maps and acreage estimates may contain errors and should be considered to be only representative of the proposed leasing area for this alternative. As specific areas are considered for commercial leasing, a detailed evaluation of land status would be required.

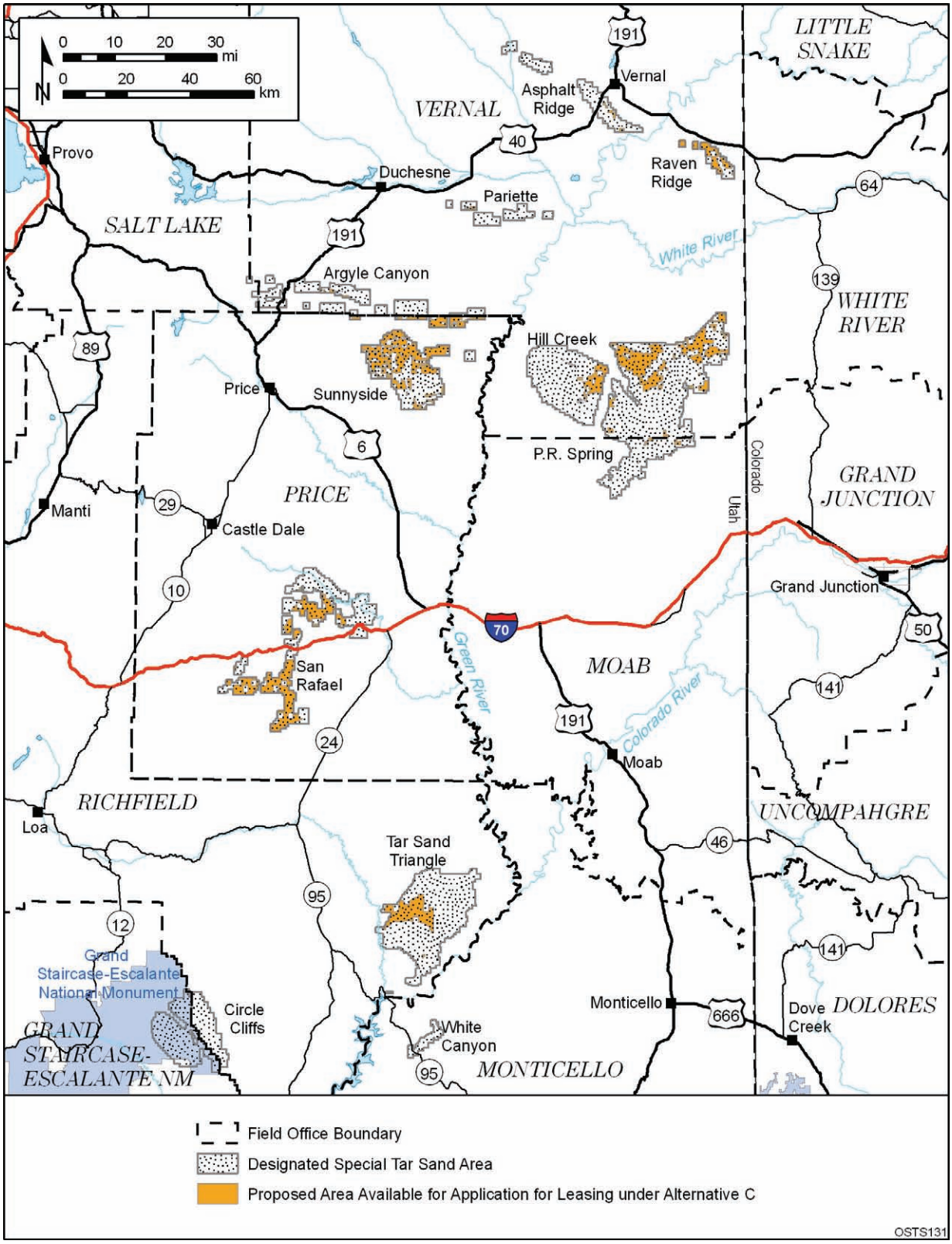

FIGURE 2.4.3-2 Lands Available for Application for Leasing under Alternative C for Commercial Tar Sands Development within the STSAs in Utah

TABLE 2.4.3-2 Estimated Acres Potentially Available under Alternative C for Application for Leasing in Each STSA for Commercial Tar Sands Development[a]

STSA	BLM-Administered Lands	Split Estate Lands	Total
Argyle Canyon	0	0	0
Asphalt Ridge	1,372	93	1,464
Circle Cliffs[b]	0	0	0
Hill Creek	19,455	480	19,934
Pariette	830	0	830
P.R. Spring	50,727	6,001	56,728
Raven Ridge	9,935	16	9,950
San Rafael	54,492	0	54,492
Sunnyside	48,731	14,010	62,741
Tar Sand Triangle	22,511	0	22,511
White Canyon	386	0	386
Total for Alternative C	208,438	20,600	229,038

[a] Totals may not be exact because of rounding. These estimates were derived from GIS data compiled for the PEIS analyses. The GIS data may contain errors; therefore, these estimates should be considered to be only representative of the proposed leasing area.

[b] Leasing for commercial tar sands development in the Circle Cliffs STSA is excluded under all alternatives because it falls entirely within the GSENM and units managed by the NPS on which mineral leasing and development are prohibited.

Under Alternative C, land use plans in the study area would be amended to adopt the conditions and constraints discussed above. Specifically, the plans would be amended to:

- Designate 229,038 acres of land within the STSAs as available for application for leasing for commercial tar sands development in accordance with applicable federal, state, and local regulations and BLM policies,

- Specify that additional NEPA analyses will be required before leases will be issued for commercial development,

- Specify that approval of project-specific plans of development will require additional NEPA review to consider site-specific and project-specific factors, and

- Specify that the BLM will consider and give priority to the use of land exchanges where appropriate and feasible to consolidate land ownership and mineral interests within the STSAs.

TABLE 2.4.3-3 Resources Covered by Stipulations and Restrictions in Place for Oil and Gas Leasing in the STSAs That Are Being Used to Identify Lands That Would Not Be Available for Application for Commercial Tar Sands Development Leasing under Alternative C

Slopes and erosive/critical soils
Floodplains, watersheds, and live water
Sage grouse leks and nesting habitat
Raptor nests and habitat
Wildlife habitat[a]
Special status plants and relict vegetation
VRM Class II areas and other high-quality visual resources
ACECs
Paleontological resources
Other[b]

[a] Wildlife habitat includes a combination of winter range, crucial winter range, summer range, and calving areas for antelope, bighorn sheep, deer, and elk, as well as seclusion areas for other wildlife.

[b] Other resources include SMA, recreation areas, and areas restricted from leasing for reasons not specified in the GIS data.

2.5 ALTERNATIVES AND ISSUES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

During the initial public comment period regarding the scope of the PEIS (see Section 7.1), a number of comments were submitted regarding the analysis of specific alternatives or issues. A number of the suggestions for specific alternatives were incorporated into alternatives assessed in the PEIS. These include suggestions regarding the development of (1) a credible no action alternative against which leasing alternatives could be assessed, (2) alternatives that would consider delaying decisions regarding leasing until definitive information is available describing what commercial development will entail, (3) alternatives that would consider the full range of alternate uses of public lands and the total impacts of proposed RMP amendments, and (4) an alternative that avoids impacts on wetlands or other waters of the United States. The BLM believes that one or more of the alternatives assessed for oil shale or tar sands leasing incorporate these concerns.

As discussed below, some of the suggested alternatives and key issues were determined to be either outside the scope of the PEIS, inconsistent with the requirements established for the BLM by the Energy Policy Act of 2005, or inappropriate to incorporate as recommended in the comment. As a result, these alternatives and issues were eliminated from detailed analysis in the PEIS. In addition, the BLM, during initial stages of the PEIS process, formulated several alternatives that ultimately were not analyzed in the Draft PEIS in detail. The following sections

discuss these alternatives and issues, why they were eliminated, and, where applicable, how parts of the PEIS process address the general points raised by commentors.

2.5.1 Alternatives Approving Issuance of Commercial Leases

The BLM initially considered alternatives that would approve the issuance of commercial leases on the basis of analyses included in the PEIS. This intent was presented to the cooperating agencies and public stakeholders during the initial discussions and scoping meetings. A number of leasing alternatives were considered but, ultimately, the BLM concluded that critical information on the basis of which to assess potential impacts, define required mitigation measures, and issue commercial leases, is not available at this time. Specifically, the BLM determined that it does not have, at this time, adequate information on the (1) magnitude of commercial development and pace of that development, (2) potential locations for commercial leases, (3) technologies that will be employed, (4) size or production level of individual commercial projects, and (5) development time lines for individual projects to support decisions about lease issuance.

Because there are no commercial operations extracting fuel from oil shale or tar sands in the United States, the published information, though informative, cannot be relied on to accurately describe future commercial technologies. Although the BLM potentially could construct scenarios for commercial oil shale development on the basis of the information available for the six RD&D projects underway, conversations with the companies holding the RD&D leases provided little definitive information about future commercial development beyond the locations of the PRLAs. For example, the companies are uncertain exactly what processes commercial development will involve, what the power requirements are for individual components of their technologies, whether there are ways to generate needed power on-site via the commercial process itself, how much water will be required per barrel of shale oil produced, how many employees will be required during the construction and operations phases, and how much land will be disturbed during different phases of development. Without this information, it is not possible to define what related impacts will be, such as how power needs will be met, where water resources will come from, and where employees will be housed.

The BLM considered constructing development scenarios for both oil shale and tar sands by developing assumptions in the absence of available information. It concluded, however, that the amount of information that was available was too meager, that analyses would have to be based on an unacceptably large number of assumptions, and that such analyses would be unreliable and possibly misleading. Initial analyses indicated that, on the basis of certain conservative assumptions, potential impacts on many resources, especially air, water, and socioeconomic conditions, could be significant depending upon the location and number of commercial projects and the pace of development. The uncertainty associated with the preliminary analyses indicated that the BLM should defer approving the issuance of commercial leases until adequate information is available to define what the development will entail. This PEIS only analyzes the impacts of amending RMPs to make public lands available for application for leasing, whether that be for additional RD&D projects or commercial development or both. Unlike the BLM's practice with respect to oil and gas leasing, additional

NEPA analysis would be required prior to the issuance of any lease of oil shale or tar sands resources. Therefore, the BLM must defer more detailed and site-specific analyses until the time of leasing and/or review and approval of a project-specific plan of development.

2.5.2 Alternatives That Preclude Oil Shale and Tar Sands Leasing or Development

Several comments were received during the public scoping process that suggested that the BLM should not move forward to establish commercial leasing programs for oil shale or tar sands development on public lands. A variety of concerns were cited as reasons for not establishing commercial programs, including concerns regarding (1) the sensitivity of specific resources within the three-state study area, such as lands with wilderness characteristics, visual resources, ecological resources, and cultural resources; (2) the lack of definitive information about the technologies that will be employed in commercial operations; (3) the need for the nation to focus on alternative sources of energy, such as renewable resources; and (4) in the case of oil shale, the potential recurrence of adverse socioeconomic impacts resulting from a possible boom/bust cycle of development. Nonetheless, Section 369 of the Energy Policy Act of 2005 requires the BLM to evaluate establishment of commercial leasing programs for oil shale and tar sands development, and any alternatives in the PEIS other than the no action alternative that did not evaluate initiating a program for opening public lands for commercial leasing would not be consistent with the Energy Policy Act of 2005 or with the Purpose and Need for the PEIS.

2.5.3 Alternatives Considering Alternate Energy Sources and Carbon Sequestration

Several comments were received during public scoping that suggested that the BLM should evaluate the development of alternate energy sources, including renewable energy (e.g., wind and solar power systems), nuclear energy, and conventional oil and gas resources instead of or in comparison with the development of oil shale or tar sands. In addition, several comments suggested that the BLM should evaluate ways to displace the nation’s dependence on oil through conservation and market- and innovation-based strategies. The BLM has determined that such evaluations, although worthwhile with respect to national energy policy development, do not fulfill the purpose of this PEIS, which is to evaluate opening public lands for commercial oil shale and tar sands development.

In addition, several comments suggested that the BLM should evaluate oil shale and tar sands technologies that incorporate carbon sequestration. The BLM believes this is an issue that would be best examined in detail at the time of site-specific NEPA analyses of a specific plan of development.

2.5.4 Alternatives That Prohibit Leasing in Specific Areas

A number of scoping comments requested that the BLM develop alternatives prohibiting commercial leasing in specific areas, including all NPS units, the GSENM, existing WSAs, and wilderness-quality lands in Utah. Since the scoping meetings were conducted, the BLM has

determined that the scope of this PEIS will be limited to BLM-administered lands only and will not evaluate commercial leasing on USFS- and NPS-administered lands.

As discussed in Sections 2.3.3 and 2.4.3, Wilderness Areas, WSAs, other lands within the NLCS (including National Monuments), and existing ACECs currently closed to mineral development are excluded from consideration for leasing under all alternatives in the PEIS.

The BLM has not explicitly excluded leasing within lands it believes may have one or more characteristics of wilderness under any of the alternatives. Processes are underway in each of the field offices where such lands have been identified to determine appropriate management requirements for these areas. The PEIS identifies the location of such lands in Chapter 3 (see Section 3.1) and, in general terms, assesses the impacts of development on these lands in Chapters 4 and 5. When future site-specific NEPA analyses are conducted on the issuance of commercial leases, the presence of any lands with wilderness characteristics will be considered at that time. The presence of wilderness characteristics on lands otherwise available for multiple use, however, does not necessarily preclude mineral development.

2.5.5 Off-Site Processing of Oil Shale

At least one comment suggested that the BLM develop an alternative that examines off-site processing of oil shale in locations where environmental impacts may be mitigated by site-specific factors. The BLM has concluded that it does not have the authority to require that such steps be taken by lessees. In addition, constructing adequate scenarios that could evaluate all the possible locations and site-specific factors contributing to the magnitude (or mitigation) of impacts would be speculative and, potentially, misleading. Such considerations might be appropriate at the site-specific level when more information is known about the project location, specific technologies, and other factors. Potential mitigation opportunities could be incorporated into the project plan of development at that time.

2.5.6 Establishment of Federal Subsidies

Several comments suggested that the BLM evaluate the potential for federal subsidies and the level of subsidy required to facilitate leasing and development. This suggestion was considered to be outside the scope of the PEIS and BLM's authority, and beyond the mandate established by the Energy Policy Act of 2005.

2.5.7 Carrying-Capacity Thresholds

A number of commentors suggested that the BLM consider the potential impacts of oil shale development within the context of the carrying capacity of the regional and local environment and economies. The carrying capacity of a system is the maximum level of activity that can be sustained within a specific area without significant, detrimental impact. The White River RMP (BLM 1997b) established carrying-capacity thresholds specific to oil shale

development and potential impacts on air quality, socioeconomic impacts, big game habitat, and water quality. Carrying-capacity thresholds have not been established elsewhere within the three-state study area. Although the programmatic alternatives do not explicitly consider carrying-capacity thresholds nor propose that commercial leasing levels be constrained in the future by these thresholds, they do require that additional site-specific NEPA analyses be conducted prior to the issuance of commercial leases. At that time, when complete information is available defining the location of the commercial development, technologies to be employed, scale of operations, and time line for development, analyses can more reliably define appropriate carrying-capacity thresholds and evaluate potential impacts.

2.5.8 Establishment of Trust Funds

Several commentors requested that the PEIS consider the establishment of a trust fund to provide financial support to local communities early in the development process. While the PEIS socioeconomic impact analyses consider the potential benefits of a trust fund in terms of impact mitigation, requiring lessees to establish such a fund is beyond the jurisdiction of the BLM and, therefore, is not included in any of the alternatives. If an applicant proposes such a fund as part of its plan of development, perhaps as potential mitigation for socioeconomic impacts, the BLM would analyze it in site-specific NEPA analyses of the plan of development.

2.6 COMPARISON OF ALTERNATIVES

The alternatives presented in this PEIS were evaluated for potential environmental impacts associated with the amendment of land use plans to identify BLM-administered lands in Colorado, Utah, and Wyoming that would be made available for application for leasing for commercial oil shale or tar sands development. The PEIS also identifies the types of environmental impacts that could accompany commercial oil shale and tar sands development. More quantitative and detailed impact analysis, including the identification of the magnitude and extent of potential impacts on specific social, cultural, economic, and natural resources, will be conducted at the leasing and project levels. Table 2.6-1 summarizes the impacts of oil shale alternatives, and Table 2.6-2 summarizes the impacts of the tar sands alternatives that are more fully described in Chapter 6 of the PEIS.

TABLE 2.6-1 Summary Comparison of Potential Environmental Impacts of Amending Land Use Plans to Identify Lands Available for Application for Leasing for the Commercial Development of Oil Shale, Including RD&D, in Colorado, Utah, and Wyoming, and Environmental Impacts of Future Construction and Operation of Commercial Projects under the Three Alternatives

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Impacts Common To All	The six existing 160-acre RD&D projects are valid existing rights and the impacts are the same for each of the alternatives. Each of the existing RD&D projects may be expanded to include a total of 5,120 acres if the terms and conditions of their existing leases are met. Commercial development could occur on a total acreage of 30,720 acres based on these existing leases. Impacts identified under Alternative A for the RD&D leases will be the same in Alternatives B and C. On the basis of the analysis in this PEIS, the BLM has determined that, with the exception noted in the socioeconomic analysis regarding potential impacts on property values, land use plan amendments would not result in any impacts on the environment or socioeconomic setting. However, the future development of commercial oil shale projects that could be approved after subsequent NEPA analysis identified in both of these alternatives would have impacts on these resources. The types of impacts that could be associated with future commercial oil shale development are described in Chapter 4 of the PEIS. The magnitude of these potential impacts cannot be quantified at this time because key information about the location of commercial projects, the technologies that may be employed, the project size or production level, development time lines, and mitigation measures that would be applied, are unknown.		

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Land Use	RD&D project development and operations are not expected to affect land use on adjacent parcels except where vehicular traffic, noise, and construction and operations activities could alter the quality of recreational activities. Current land uses such as grazing, irrigated agriculture, recreation, oil and gas production, and mineral extraction would be affected at locations where commercial oil shale projects (and supporting infrastructure) would be located within the 352,780 acres designated as available for commercial leasing. These lands include 3 ACECs totaling 4,853 acres, approximately 26,732 acres of potential ACECs, and 6,973 acres of lands with wilderness characteristics. Potential impacts on these areas are subject to decisions in the existing RMPs Additional land use changes would occur on nonfederal lands where project support infrastructure (e.g., power plants and employer-provided housing) would be constructed.	Same as Alternative A. Current land uses such as grazing, irrigated agriculture, recreation, oil and gas production, and mineral extraction would be affected at locations where commercial oil shale projects (and supporting infrastructure) would be located within the 1,991,222-acre proposed lease area. These lands include 10 ACECs totaling 23,000 acres, approximately 185,000 acres of potential ACECs, and 170,000 acres of lands with wilderness characteristics. Additional land use changes would occur on nonfederal lands where project support infrastructure (e.g., power plants and employer-provided housing) would be constructed.	Same as Alternative A. Potential impacts of commercial development would be similar to the impacts identified for commercial development under Alternative B, but excludes 23,000 acres of existing ACECs; would have less impact on oil and gas activities, especially in the Piceance Basin; and would include 110,000 acres of lands with wilderness characteristics and 137,000 acres of lands with potential for designation as ACECs.

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Soil and Geologic Resources	Geologic resources could be affected by construction and operation activities at the six 160-acre RD&D locations and at areas where support infrastructure (e.g., utility ROWs and access roads) would be located.	Same as Alternative A.	Same as Alternative A.
	Impacts on soil and geologic resources at the RD&D locations would be associated with soil removal and compaction, subsurface disturbance of geologic resources during drilling and mining, and increased erosion potential of exposed soils and geologic materials.	Same as Alternative A	Same as Alternative A
	Future commercial oil shale development could affect soil and geologic resources in the Alternative A potential lease areas and at locations on nonfederal lands where project-related infrastructure (e.g., power plants and employer-provided housing) would be located. Potential impacts would be associated with the construction and operation of project facilities and related infrastructure and would include soil disturbance, soil removal and compaction, subsurface disturbance of geologic resources during drilling and mining, and increased erosion potential of exposed soils and geologic materials.	Future commercial oil shale development could affect soil and geologic resources in the Alternative B potential lease areas and at locations on nonfederal lands where project-related infrastructure (e.g., power plants and employer-provided housing) would be located. Potential impacts would be associated with the construction and operation of project facilities and related infrastructure and would include soil disturbance, soil removal and compaction, subsurface disturbance of geologic resources during drilling and mining, and increased erosion potential of exposed soils and geologic materials.	Potential project impacts from future project development would be similar to those identified for Alternative B but could occur at fewer locations and in less geologically sensitive locations.

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Paleontological Resources	The construction and operation of the RD&D projects is not expected to significantly impact paleontological resources in the six project areas.	Same as Alternative A.	Same as Alternative A.
	Within the 352,780 acres available for oil shale development under existing RMPs, including the lands in the PRLAs for the RD&D projects, approximately 97% of the area in Colorado and 99% of the area in Utah are considered as having high potential for containing significant paleontological resources (i.e., conditional Potential Fossil Yield Classification 4/5).	About 1.8 million acres (90%) of the proposed lease areas have the potential to contain important paleontological resources, and future commercial oil shale development could affect paleontological resources in these areas. Project-related impacts would be associated with construction and mining activities and could result in the damage or destruction of resources in or near the development areas.	Potential impacts of commercial project development on paleontological resources in these areas would be similar to those identified for Alternative B but could occur in fewer locations. About 750,000 acres (90%) of the Alternative C lease areas have the potential to contain important paleontological resources.
	Commercial oil shale development could impact paleontological resources at locations on nonfederal lands where project-related infrastructure (e.g., power plants and employer-provided housing) would be located.	Same as Alternative A.	Same as Alternative A.

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Water Resources	Water resources could incur localized impacts as a result of construction and operation activities of the six RD&D projects. Surface disturbance at the sites could lead to increased erosion and subsequent runoff and sedimentation to local streams, while groundwater could be affected by dewatering or contamination from accidental releases of hazardous materials (e.g., fuels and industrial solvents).	Same as Alternative A.	Same as Alternative A.

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Water Resources (Cont.)	Commercial oil shale development could impact water resources in the Alternative A potential lease areas and at locations on nonfederal lands where project-related infrastructure (e.g., power plants and employer-provided housing) would be located. About 152 mi of perennial streams (or about 76% of the total perennial streams in the basin) are within the geologically prospective oil shale area, plus a 2-mi buffer zone in the Piceance Basin. In Utah, about 57 mi of perennial streams (or about 22% of the total streams in the Uinta Basin) are within areas available for lease. Seventeen acres of protected floodplains, wetlands, and riparian areas occur within the lease areas in Colorado and Utah.	Commercial oil shale development could impact water resources in the Alternative B potential lease areas and at locations on nonfederal lands where project-related infrastructure (e.g., power plants and employer-provided housing) would be located. The Alternative B potential lease areas include about 248 mi of perennial streams and 45,000 acres of lands with sensitive hydrologic features, which could be affected by the future construction and operation of commercial oil shale facilities in the potential lease areas. Potential project-related impacts may include reduced water quality due to erosion and sedimentation, dewatering of local aquifers, modification of surface and groundwater flow, and contamination of surface water or groundwater by accidental releases of hazardous materials.	Potential impacts from future construction and operation of commercial oil shale projects would be similar to those identified for Alternative B. Alternative C includes only 65 mi of perennial streams that could be affected by commercial project development. In addition, Alternative C excludes lands that are currently identified in BLM land use plans as having steep slopes and/or fragile or highly erosive soils included in Alternative B. Thus, there is a reduced potential for erosion-related impacts with commercial oil shale development under this alternative.

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Air Quality	Air quality is not expected to be adversely affected by the construction and operation of the six RD&D projects. Minor, localized impacts could result from vehicle emissions, fugitive dust generation from construction and mining areas and along some access roads, and oil shale processing emissions.	Same as Alternative A.	Same as Alternative A.
	Commercial oil shale development could impact air quality in the Alternative A potential lease areas and at locations on nonfederal lands where project-related infrastructure would be located. The construction and operation of future commercial oil shale projects could result in local and regional impacts on air quality. Local impacts could result from vehicle emissions, fugitive dust generation from construction and mining areas and along some access roads, and oil shale processing emissions.	Commercial oil shale development could impact air quality in the Alternative B potential lease areas and at locations on nonfederal lands where project-related infrastructure would be located. The construction and operation of future commercial oil shale projects could result in local and regional impacts on air quality. Local impacts could result from vehicle emissions, fugitive dust generation from construction and mining areas and along some access roads, and oil shale processing emissions.	Potential impacts on air quality would be similar to those identified for Alternative B. However, Alternative C has approximately 1.2 million fewer acres of land than Alternative B where future commercial oil shale development could occur and affect local or regional air quality.

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Noise	Localized noise impacts (i.e., increased noise levels) could occur at each of the RD&D project locations as a result of construction activities, mining, operating machinery (e.g., crushers and conveyors) and other equipment (generators and compressors), and vehicular traffic.	Same as Alternative A.	Same as Alternative A.
	Commercial oil shale development could affect noise levels in the Alternative A potential lease areas and at locations on nonfederal lands where project-related infrastructure (e.g., power plants and employer-provided housing) would be located.	Potential noise impacts would be similar to those identified for Alternative A. However, Alternative B has approximately 1.6 million more acres of land than Alternative A where future commercial oil shale development could occur and affect local noise levels.	Potential noise impacts would be similar to those identified for Alternative A. However, Alternative C has approximately 480,000 more acres of land than Alternative A where future commercial oil shale development could occur and affect local noise levels.
	Local noise levels could be affected by operating construction, mining and processing equipment, pipeline compressor stations, and vehicle traffic. Such impacts could occur within the Alternative A potential lease areas wherever a project would be developed.		

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Ecological Resources (resource subgroups summarized below)	Ecological resources could be affected at each of the six RD&D locations. RD&D project-related impacts may include wildlife disturbance, habitat loss, exposure to accidental releases of hazardous materials, the spread or establishment of invasive species, and the loss or injury of biota within physically disturbed areas related to the projects (e.g., utility ROWs and access roads).	Same as Alternative A.	Same as Alternative A.
	Commercial oil shale development could impact ecological resources in the Alternative A potential lease areas and at locations on nonfederal lands where project-related infrastructure (e.g., power plants and employer-provided housing) would be located.	Commercial oil shale development could impact ecological resources in Alternative B potential lease areas in the same manner as Alternative A but on 1.6 million more acres.	Commercial oil shale development within the Alternative C potential lease areas could adversely affect ecological resources in these areas in the same manner as in Alternative A but would occur on 480,000 more acres of land, some of which has been excluded because of the presence of sensitive ecological resources.
	Indirect impacts such as those related to surface and groundwater withdrawals could occur in more distant, but hydrologically connected, areas.	Same as Alternative A.	Same as Alternative A.

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Aquatic Resources	The Alternative A lease areas overlap portions of 19 perennial streams totaling about 209 mi of stream habitat. Aquatic resources could be affected by changes in water quality due to erosion and runoff and accidental releases of hazardous materials from project areas. Surface water depletion resulting from groundwater and surface water use could negatively affect aquatic resources. Some aquatic biota could be impacted as a result of the physical disturbance of aquatic habitats during construction and by utility and ROW crossings. Project-related ROWs could also increase public access to aquatic habitats.	The Alternative B potential lease areas include 50 perennial streams totaling 680 mi, and the construction and operation of commercial oil shale projects within the lease areas could adversely affect aquatic resources in these streams. Potential types of impacts would be similar to those identified for Alternative A and could result in habitat loss or degradation, which could affect the abundance and distribution of aquatic biota in the affected habitats.	The Alternative C potential lease areas include 41 perennial streams totaling 426 mi, and aquatic resources in these streams could be impacted by commercial oil shale development. Potential impacts would be similar in nature to those identified for Alternative B but could occur in fewer locations.

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Plant Communities and Habitats	The construction and operation of commercial oil shale projects in areas available for leasing under Alternative A could affect plant communities and habitats, including oil shale endemics on or near project sites and in areas where associated infrastructure would be located. Impacts could include direct loss of vegetation from site clearing and grading; reduced habitat quality due to soil compaction, dewatering, water quality reduction, erosion, sedimentation, or accidental releases of hazardous materials; and the introduction or spread of invasive species. Utility and access road ROWs could also result in the fragmentation of some habitats. The areas available for lease application include about 17 acres that have been identified for the protection of wetlands, riparian habitat, and floodplains. Direct impacts on the six RD&D project sites would include the loss of about 700 acres of habitat.	The construction and operation of commercial oil shale projects could impact plant communities and habitats that are present in the Alternative B potential lease areas. These potential lease areas include about 41,000 acres that have been identified for the protection of wetlands, riparian habitats, and floodplains. Potential impacts would be similar in nature to those identified for Alternative A but could occur in many more locations.	The construction and operation of commercial oil shale projects could impact plant communities and habitats that occur in the Alternative C potential lease areas. These potential lease areas do not include the 41,000 acres of land currently identified for the protection of wetlands, riparian habitats, and floodplains. Potential impacts would be similar in nature to those identified for Alternative B but could occur in fewer locations.

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Wildlife	The construction and operation of commercial oil shale projects could disturb wildlife and their habitats where individual projects are located within the 352,780 acres that have already been allocated for leasing application. Wildlife habitats identified for protection in BLM land use plans that would be present in the lease application areas include nearly 40,000 acres of sage grouse nesting habitat, about 11,500 acres of raptor nests, more than 46,000 acres of big game severe winter range, more than 155,000 acres of deer and elk summer range, and nearly 56,000 acres of wild horse Herd Management Areas (HMAs).	The construction and operation of commercial oil shale projects could disturb wildlife and their habitats where individual projects are located within the 1,991,222 acres identified as available for leasing application. Wildlife habitats identified for protection in BLM land use plans that would be present in the lease application areas include more than 400,000 acres of greater sage-grouse nesting habitat, more than 100,000 acres of raptor nests, about 89,000 acres of big game severe winter range, more than 163,000 acres of deer and elk summer range, and more than 65,000 acres of wild horse HMAs. Potential impacts on wildlife and their habitats would be similar in nature to those identified for Alternative A but could occur in more locations.	The construction and operation of commercial oil shale projects could disturb wildlife and their habitats where individual projects are located within the 830,296 acres identified as available for leasing application. Those lease areas do not include the acres of land currently identified for the protection of wildlife habitats and wild horse HMAs. Potential impacts on wildlife and their habitats would be similar in nature to those identified for Alternative B but could occur in fewer locations.

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Wildlife (Cont.)	Potential impacts on these habitats and their wildlife would be associated with site clearing and grading, operational noise and activities, accidental releases of hazardous materials, and increased human access to some habitats, and could result in reduced abundance and distribution of affected species. The construction and operation of the six RD&D projects would eliminate about 666 acres of wildlife habitat as a result of clearing activities at each of the six sites. Construction and operation activities could also disturb wildlife in nearby locations and also fragment habitats along the RD&D project-related ROWs.	Same as Alternative A.	Same as Alternative A.

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Threatened and Endangered Species	Sixty-eight federal candidate, BLM-designated sensitive, and state-listed species, and 14 federally listed threatened or endangered species could occur in areas that are available for application for leasing under Alternative A. Of these, 31 federal candidate, BLM-designated sensitive, and state-listed species, and 8 federally listed threatened or endangered species could occur in RD&D areas. Approximately 61,000 acres of land with existing lease stipulations for the protection of listed species would be available for leasing under Alternative A. Impacts on threatened and endangered species would be similar to or the same as those described for impacts on aquatic resources, plant communities and habitats, and wildlife. Specific impacts associated with development would depend on the locations of projects relative to species populations and the details of project development.	One hundred and seventy federal candidate, BLM-designated sensitive, and state-listed species, and 14 federally listed threatened or endangered species could occur in areas that are available for leasing application under Alternative B. Approximately 382,000 acres of land with existing lease stipulations for the protection of listed species would be available for leasing under Alternative B. Potential types of impacts would be similar to those for Alternative A.	One hundred and seventy federal candidate, BLM-designated sensitive, and state-listed species, and 14 federally listed threatened or endangered species could occur in areas that are available for leasing application under Alternative C. Lands with existing lease stipulations for the protection of listed species would not be available for leasing under Alternative C. Potential types of impacts would be similar to those for Alternative A.

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Visual Resources	The construction and operation of the six RD&D projects and projects elsewhere in the potential lease areas would have visual impacts at each project location. Short- and long-term visual impacts may result with the construction and operation of the projects and would be associated with construction activities at each site and along associated ROWs. Additional visual impacts may be associated with the presence of site facilities within viewsheds and with lighting pollution. Construction impacts would be short-term, while impacts associated with facility presence and site lighting would continue through the life of each project.	Same as Alternative A.	Same as Alternative A.

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Visual Resources (Cont.)	Commercial oil shale development could impact visual resources on the Alternative A lease areas and at locations on nonfederal lands where project-related infrastructure (e.g., power plants and employer-provided housing) would be located. Potential impacts from project construction and operation would be similar to those identified for Alternative A. Visually sensitive areas within the potential lease areas include 2 ACECs, 2 potential ACECs, and 2 river segments eligible for WSR designation. Sensitive areas occurring within 5 mi of the potential lease areas include 1 WSA, 6 ACECs, 4 potential ACECs, and 4 WSR-eligible river segments. These visually sensitive areas could be affected by future commercial oil shale development within the Alternative A lease areas.	Commercial oil shale development could impact visual resources on the Alternative B potential lease areas and at locations on nonfederal lands where project-related infrastructure (e.g., power plants and employer-provided housing) would be located. Potential impacts from project construction and operation would be similar to those identified for Alternative A. Visually sensitive areas within the potential lease areas include 10 ACECs, 10 potential ACECs, and 2 river segments eligible for WSR designation. Sensitive areas occurring within 5 mi of the proposed lease areas include 7 WSAs, 11 ACECs, 13 potential ACECs, 9 WSR-eligible river segments, 1 National Scenic Highway, and 9 National Historic Trails. These visually sensitive areas could be affected by future commercial oil shale development within the Alternative B lease areas.	Potential impacts from project construction and operation would be similar to those identified for Alternative B. Visual impacts from commercial project development could occur, depending on individual project location, within the 830,296 acres made available for leasing under Alternative C. Visually sensitive areas within the potential lease areas include 10 potential ACECs, while sensitive areas within 5 mi of the lease areas include 7 WSAs, 12 ACECs, 13 potential ACECs, 9 WSR-eligible river segments, 1 National Scenic Highway, and 9 National Historic Trails.

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Cultural Resources	The six RD&D sites have been surveyed for cultural resources, and two of the sites contain cultural resources. Because mitigation is required for these sites, the construction and operation of the six projects are not expected to significantly impact cultural resources. However, approximately 298,000 acres of the available area have the potential to contain important cultural resources. Some of these resources could be affected by construction and operation of commercial projects within the potential lease areas. Potential impacts may include damage or destruction, and increased potential for vandalism or theft due to increased human access.	Commercial oil shale development could impact cultural resources in the Alternative B potential lease areas and at locations on nonfederal lands where project-related infrastructure (e.g., power plants and employer-provided housing) would be located. Approximately 1.6 million acres that would be available for leasing application have the potential to contain important cultural resources. Some of these resources could be affected by construction and operation of commercial projects within the potential lease areas. Potential impacts may include damage or destruction, and increased potential for vandalism or theft due to increased human access.	Approximately 719,000 acres have the potential to contain important cultural resources. Potential impacts on these resources from commercial oil shale development within the Alternative C lease areas would be similar to those identified for Alternative B but could occur in fewer locations.
Socioeconomics	Construction and operation associated with individual oil shale technologies, including the RD&D facilities would have small to moderate impacts on employment, income, population, housing, public finances, and public service employment in the ROI in each state. Small to moderate impacts on property.	Same as Alternative A.	Same as Alternative A.
		Socioeconomic impacts could occur within the study area from amending land use plans; specifically, changes in property values could occur.	Socioeconomic impacts could occur within the study area from amending land use plans; specifically, changes in property values could occur.

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Environmental Justice	Environmental and human health impacts on the general population are expected to be low. Construction and operation of the six RD&D projects could have minor disproportionate impacts on minority and low-income populations, depending on their location, primarily associated with changes in quality of life and social disruption. Property value and visual impacts would depend on the location of land parcels impacted by oil shale projects, their importance for subsistence, their cultural and religious significance, and possible alternate economic uses.	Same as Alternative A.	Same as Alternative A.
	Larger scale oil shale project construction and operation could disproportionately impact minority and low-income populations depending on their location. Changes in quality of life and social disruption caused by rapid in-migration of population into rural communities would likely occur,	Same as Alternative A.	Same as Alternative A.

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Environmental Justice (Cont.)	thereby undermining local community social structures and requiring a transition to more urban life styles. The impacts of facility operations on air and water quality and on the demand for water for agriculture in the region could also cause environmental justice impacts. Land use and visual impacts would depend on the location of land parcels impacted by oil shale projects, their importance for subsistence, their cultural and religious significance, and possible alternate economic uses.		
		Minority or low-income populations within the study area would not incur any impacts from amending land use plans.	Minority or low-income populations within the study area would not incur any impacts from amending land use plans.

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Hazardous Materials and Waste Management	The six RD&D projects would use and generate similar types of hazardous materials and wastes. Hazardous materials would include fuels for equipment and heating, lubricating oils, solvents, and other industrial chemicals, as well as materials produced during oil shale processing. Herbicides may also be used to clear and/or control vegetation at project locations and along utility ROWs. Waste materials would also be similar among the six RD&D projects; these would include solids such as construction debris. Liquid wastes would include both sanitary and industrial wastewater.	The use and generation of hazardous materials and wastes from the six RD&D projects would be the same as those identified for Alternative A.	The use and generation of hazardous materials and wastes from the six RD&D projects would be the same as those identified for Alternative A.
	Future commercial oil shale development within the potential lease areas would use and generate similar types of hazardous materials and wastes as would be generated for the RD&D projects. Spent shale may also be generated in large quantities if development by mining occurs; the shale would require management as a waste. The specific types and amounts and their handling and treatment would depend on the specific design of each commercial project.	Same as Alternative A.	Same as Alternative A.

TABLE 2.6-1 (Cont.)

Resource	Alternative A: No Action. 352,780 Acres Currently Classified as Available for Leasing in the Existing White River and Book Cliffs RMPs. No Land Use Plans Would Be Amended to allow for Additional Oil Shale Development[a]	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 1,991,222 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]	Alternative C: Amend Land Use Plans to Identify 830,296 Acres of Federal Land in Colorado, Utah, and Wyoming as Available for Application for Commercial Oil Shale Development[b]
Health and Safety	The construction and operation of the six RD&D projects could result in health and safety impacts on workers. These impacts would be associated with accidents causing injuries and fatalities, possible hearing loss from high noise levels, and inhalation of particulates and/or volatiles emitted from the facilities. Injuries from all RD&D projects are estimated at about 75 per year during construction and 40 per year during operations; less than 1 fatality per year is estimated for both construction and operations.	Potential health and safety impacts from the six RD&D projects would be the same as those identified for Alternative A.	Potential health and safety impacts from the six RD&D projects would be the same as those identified for Alternative A.
	The commercial development of oil shale projects in the potential lease areas would have the same types of health and safety impacts as would occur in association with the RD&D projects, but the potential incidence of those impacts would be greater.	Same as Alternative A.	Same as Alternative A.

[a] The adverse impacts of the RD&D projects will be addressed through mitigation measures described in the environmental assessments (EAs) for those projects. All the EAs resulted in Findings of No Significant Impact (BLM 2006c-j; 2007b,c).

[b] Under both Alternatives B and C, the nature, magnitude, and extent of project-related impacts of commercial development on all resource areas would depend on the type, location, and design of the individual projects.

TABLE 2.6-2 Summary Comparison of Potential Environmental Impacts of Amending Land Use Plans to Identify Lands Available for Application for Leasing for the Commercial Development of Tar Sands, Including RD&D, in Colorado, Utah, and Wyoming, and Environmental Impacts of Future Construction and Operation of Commercial Projects under the Three Alternatives

Resource	Alternative A: No Action	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 431,224 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]	Alternative C: Amend Land Use Plans to Identify 229,038 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]
Impacts Common to Alternatives B and C	NA[a]	On the basis of the analysis in the PEIS, the BLM has determined that, with the exception noted in the socioeconomic analysis regarding potential impacts on property values, land use plan amendments would not result in any impacts on the environment or socioeconomic setting. However, the future development of commercial oil shale projects that could be approved after subsequent NEPA analysis identified of these alternatives would have impacts on these resources. The types of impacts that could be associated with future tar sands development are described in Chapter 5 of the PEIS. The magnitude of these potential impacts cannot be quantified at this time because key information about the location of commercial projects, the technologies that may be employed, the project size or production level, development time lines, and mitigation measures that would be applied, are unknown.	

TABLE 2.6-2 (Cont.)

Resource	Alternative A: No Action	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 431,224 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]	Alternative C: Amend Land Use Plans to Identify 229,038 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]
Land Use	NA	Future commercial tar sands development could affect current land use in the Alternative B proposed lease areas. Current land uses such as grazing, irrigated agriculture, recreation, oil and gas production, and mineral extraction would be affected at locations where commercial tar sands projects (and supporting infrastructure) would be located. Additional land use changes would occur on nonfederal lands where project support infrastructure (e.g., employer-provided housing) would be constructed. The areas available for application for lease include approximately 180,000 acres of potential ACECs and 100,000 acres of lands with wilderness characteristics.	Potential impacts on land use from commercial development would be similar to those identified for Alternative B but would be restricted to about 200,000 fewer acres of federal land. The lands available for lease application under Alternative C include approximately 85,000 acres of potential ACECs and approximately 68,000 acres identified as having wilderness characteristics.

TABLE 2.6-2 (Cont.)

Resource	Alternative A: No Action	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 431,224 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]	Alternative C: Amend Land Use Plans to Identify 229,038 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]
Soil and Geologic Resources	NA	Future commercial tar sands development could affect soil and geologic resources in the Alternative B potential lease areas and at locations on nonfederal lands where project-related infrastructure (e.g., employer-provided housing) would be located. Potential impacts would be associated with the construction and operation of project facilities and related infrastructure and would include soil disturbance, soil removal and compaction, subsurface disturbance of geologic resources during drilling and mining, and increased erosion potential of exposed soils and geologic materials.	Potential impacts on soil and geologic resources from commercial tar sands development would be similar to those identified for Alternative B, but under Alternative C impacts could occur at fewer locations and in less geologically sensitive locations.

TABLE 2.6-2 (Cont.)

Resource	Alternative A: No Action	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 431,224 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]	Alternative C: Amend Land Use Plans to Identify 229,038 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]
Paleontological Resources	NA	About 335,000 acres of the proposed lease areas have the potential to contain important paleontological resources, and future commercial tar sands development could affect paleontological resources in these areas. Project-related impacts would be associated with construction and mining activities and could result in the damage or destruction of resources in or near the development areas. Commercial tar sands development could impact paleontological resources in the Alternative B potential lease areas and at locations on nonfederal lands where project-related infrastructure (e.g., employer-provided housing) would be located.	Potential impacts on paleontological resources from commercial project development in these areas would be similar to those identified for Alternative B but could occur in significantly fewer locations. About 148,000 acres of the Alternative C potential lease areas have the potential to contain important paleontological resources.

TABLE 2.6-2 (Cont.)

Resource	Alternative A: No Action	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 431,224 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]	Alternative C: Amend Land Use Plans to Identify 229,038 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]
Water Resources	NA	Commercial tar sands development could impact water resources in the Alternative B potential lease areas and at locations on nonfederal lands where project-related infrastructure (e.g., employer-provided housing) would be located. Potential project-related impacts may include reduced water quality due to erosion and sedimentation, dewatering of local aquifers, and contamination of surface water or groundwater by accidental releases of hazardous materials. The Alternative B potential lease areas include about 28 mi of perennial streams that could be affected by commercial project development.	Potential impacts on water resources from future construction and operation of commercial tar sands projects in the Alternative C potential lease areas would be similar to those identified for Alternative B. Alternative C excludes from lease application about 200,000 acres of land that is currently identified in BLM land use plans as having steep slopes and/or fragile or highly erosive soils and included under Alternative B. Thus, there is a reduced potential for erosion-related impacts with commercial tar sands development under Alternative C. Alternative C potential lease areas include about 19 mi of perennial streams that could be affected by commercial project development.

TABLE 2.6-2 (Cont.)

Resource	Alternative A: No Action	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 431,224 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]	Alternative C: Amend Land Use Plans to Identify 229,038 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]
Air Quality	NA	Commercial tar sands development could impact air quality in the Alternative B potential lease areas and at locations on nonfederal lands where project-related infrastructure (e.g., employer-provided housing) would be located. The construction and operation of future commercial tar sands projects could result in local and regional impacts on air quality. Local impacts could result from vehicle emissions, fugitive dust generation from construction and mining areas and along some access roads, and tar sands processing emissions. Because of the need for project- and site-specific information, it is not possible to identify the nature and magnitude of regional air quality impacts from commercial development within the Alternative B potential lease areas.	Potential impacts on air quality from the construction and operation of commercial tar sands projects would be similar to those identified for Alternative B. However, Alternative C has approximately 202,000 fewer acres of land than Alternative B where future commercial tar sands development could occur and affect local or regional air quality.

TABLE 2.6-2 (Cont.)

Resource	Alternative A: No Action	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 431,224 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]	Alternative C: Amend Land Use Plans to Identify 229,038 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]
Noise	NA	Commercial tar sands development could affect noise levels in the Alternative B potential lease areas and at locations on nonfederal lands where project-related infrastructure (e.g., employer-provided housing) would be located. Local noise levels could be affected by operating construction, mining and processing equipment, pipeline compressor stations, and vehicle traffic. Such impacts could occur within the Alternative B potential lease areas wherever a project would be developed.	Potential noise impacts from commercial tar sands development would be similar to those identified for Alternative B. However, Alternative C has approximately 202,000 fewer acres of land than Alternative B where future commercial tar sands development could occur and affect local noise levels.
Ecological Resources (resource subgroups summarized below)	NA	Commercial tar sands development could impact ecological resources in the Alternative B potential lease areas and at locations on nonfederal lands where project-related infrastructure (e.g., employer-provided housing) would be located. Indirect impacts such as those related to surface and groundwater withdrawals could occur in more distant, but hydrologically connected, areas.	Commercial tar sands development impacts would be similar to those identified for Alternative B but would occur on 202,000 fewer acres of land, some of which has been excluded because of the presence of sensitive ecological resources. Indirect impacts, such as those related to surface and groundwater withdrawals, could occur in more distant, but hydrologically connected areas.

TABLE 2.6-2 (Cont.)

Resource	Alternative A: No Action	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 431,224 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]	Alternative C: Amend Land Use Plans to Identify 229,038 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]
Aquatic Resources	NA	The Alternative B allocation areas include 9 perennial streams totaling about 29 mi of aquatic habitat. The construction and operation of commercial tar sands projects within the potential leases areas could adversely affect aquatic resources in these streams. Surface water depletions resulting from groundwater and surface water use could adversely affect aquatic resources. Potential impacts could result in habitat loss or degradation, affecting the abundance and distribution of aquatic biota in the affected habitats.	The Alternative C allocation areas include 8 perennial streams totaling about 20 mi of aquatic habitat. Aquatic resources in these streams could be impacted by the commercial tar sands development. When aquatic habitat within 2 mi of the allocation areas is considered, Alternative C has the potential to affect less aquatic habitat than Alternative B.

TABLE 2.6-2 (Cont.)

Resource	Alternative A: No Action	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 431,224 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]	Alternative C: Amend Land Use Plans to Identify 229,038 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]
Plant Communities and Habitats	NA	The construction and operation of commercial tar sands projects could impact plant communities and habitats that are present in the Alternative B potential lease areas. The potential lease areas include about 1,599 acres that have been identified for the protection of floodplains. Impacts could include direct loss of vegetation from site clearing and grading; reduced habitat quality due to soil compaction, dewatering, water quality reduction, erosion, sedimentation, or accidental releases of hazardous materials; and the introduction or spread of invasive species. Utility and access road ROWs could also result in the fragmentation of some habitats.	The construction and operation of commercial tar sands projects could impact plant communities and habitats that occur in Alternative C potential lease areas. The areas where commercial development could occur do not include land currently identified for protection of floodplains. Potential impacts would be similar in nature to those identified for Alternative B but could occur in fewer locations.

TABLE 2.6-2 (Cont.)

Resource	Alternative A: No Action	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 431,224 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]	Alternative C: Amend Land Use Plans to Identify 229,038 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]
Wildlife	NA	The construction and operation of commercial tar sands projects could disturb wildlife and their habitats where individual projects are located within the 431,224 acres identified as available for leasing. Wildlife habitats identified for protection in BLM land use plans that would be present in the lease application areas include more than 2,500 acres of greater sage-grouse lek sites, 7 acres of raptor nests, about 18,000 acres of deer fawning and elk calving crucial habitat, more than 3,800 acres of desert bighorn sheep crucial habitat, more than 12,000 acres of elk crucial winter habitat, and nearly 5,900 acres of pronghorn crucial kidding habitat. Potential impacts on these habitats and their wildlife would be associated with site clearing and grading, operational noise and activities, accidental releases of hazardous materials, and increased human access to some habitats, and could result in reduced abundance and distribution of affected species.	The construction and operation of commercial tar sands projects could disturb wildlife and their habitats where individual projects are located within the 229,038 acres identified as available for leasing. Potential impacts would be similar to those identified for Alternative B but could occur in fewer locations. However, lands with existing lease stipulations for the protection of wildlife would not be available for application for leasing under Alternative C.

TABLE 2.6-2 (Cont.)

Resource	Alternative A: No Action	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 431,224 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]	Alternative C: Amend Land Use Plans to Identify 229,038 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]
Threatened and Endangered Species	NA	Ninety-five federal candidate, BLM-designated sensitive, and state-listed species, and 20 federally listed threatened or endangered species could occur in areas that are available for leasing under Alternative B. Approximately 15,450 acres of land with existing lease stipulations for the protection of listed species would be available for application for leasing under Alternative B. Impacts on threatened and endangered species would be similar to or the same as those described for impacts on aquatic resources, plant communities and habitats, and wildlife. Specific impacts associated with development would depend on the locations of projects relative to species populations and the details of project development.	Ninety-five federal candidate, BLM-designated sensitive, and state-listed species, and 20 federally listed threatened or endangered species could occur in areas that are available for application for leasing under Alternative C. Lands with existing lease stipulations for the protection of listed species would not be available for leasing under Alternative C. Potential types of impacts on these species, which are the same identified for Alternative B, would be similar to those for Alternative B.
Visual Resources	NA	Commercial tar sands development could impact visual resources in the Alternative B lease areas and at locations on nonfederal lands where project-related infrastructure (e.g., employer-provided housing) would be located. Short- and long-term visual impacts may result with	Visually sensitive areas within the proposed lease areas include 11 ACECs and 1 WSR-eligible river segment. Sensitive areas within 5 mi of the lease areas include 18 WSAs, 13 ACECs, 18 potential ACECs, 18 WSR-eligible river segments, 1 National Park, 1 NRA, and 2 scenic highways. Because of

TABLE 2.6-2 (Cont.)

Resource	Alternative A: No Action	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 431,224 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]	Alternative C: Amend Land Use Plans to Identify 229,038 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]
Visual Resources (Cont.)		the construction and operation of the projects and would be associated with construction activities at each site and along associated ROWs. Additional visual impacts may be associated with the presence of site facilities within viewsheds and lighting pollution. Visually sensitive areas within the proposed lease areas include 11 potential ACECs, 1 river segment eligible for WSR designation, and 1 national scenic highway. Sensitive areas occurring within 5 mi of the proposed lease areas may include as many as 19 WSAs, 11 ACECs, 18 potential ACECs, 18 WSR-eligible river segments, 1 National Park, 1 NRA, and 2 national scenic highways. These visually sensitive areas could be affected by future commercial tar sands development within the Alternative B lease areas.	the similarity in sensitive visual resource areas within and near each proposed lease area, potential impacts from commercial project development would be similar to those identified for Alternative B.

TABLE 2.6-2 (Cont.)

Resource	Alternative A: No Action	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 431,224 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]	Alternative C: Amend Land Use Plans to Identify 229,038 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]
Cultural Resources	NA	Commercial tar sands development could impact cultural resources in the Alternative B potential lease areas and at locations on nonfederal lands where project-related infrastructure (e.g., employer-provided housing) would be located. Approximately 221,000 acres of the land that would be available for leasing application have the potential to contain important cultural resources. Some of these resources could be affected by construction and operation of commercial projects within the potential lease areas. Potential impacts may include damage or destruction and increased potential for vandalism or theft due to increased human access.	Approximately 97,000 acres that would be available for lease application have the potential to contain important cultural resources. Potential impacts on these resources from commercial tar sands development within the Alternative C potential lease areas would be similar to those identified for Alternative B but could occur in fewer locations.

TABLE 2.6-2 (Cont.)

Resource	Alternative A: No Action	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 431,224 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]	Alternative C: Amend Land Use Plans to Identify 229,038 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]
Socioeconomics	NA	Socioeconomic impacts could occur within the study area from amending land use plans; specifically, changes in property values could occur. Construction and operation associated with individual tar sands technologies would have small to moderate impacts on employment, income, population, housing, public finances, and public service employment in the ROI. Small to moderate impacts on property values and recreation would also occur, and water diversions would also affect agriculture. Rapid increases in population in-migration in the ROI could impact quality of life, in particular requiring a transition from traditional rural, to more urban lifestyles, and potentially cause large social disruption impacts.	Socioeconomic impacts could occur within the study area from amending land use plans; specifically, changes in property values could occur. Potential project impacts would be similar to those identified for Alternative B.

TABLE 2.6-2 (Cont.)

Resource	Alternative A: No Action	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 431,224 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]	Alternative C: Amend Land Use Plans to Identify 229,038 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]
Environmental Justice	NA	Tar sands project construction and operation would disproportionately impact minority and low-income populations depending on their location. Changes in quality of life caused by rapid in-migration of population into rural communities would likely occur, thereby undermining local community social structures and requiring a transition to more urban life styles. Social disruption would also occur. The impacts of facility operations on air and water quality and on the demand for water for agriculture in the region could also cause environmental justice impacts. Land use and visual impacts would depend on the location of land parcels impacted by tar sands projects, their importance for subsistence, their cultural and religious significance, and possible alternate economic uses.	Potential project impacts would be similar to those identified for Alternative B.

TABLE 2.6-2 (Cont.)

Resource	Alternative A: No Action	Alternative B: the Proposed Plan Amendment. Amend Land Use Plans to Identify 431,224 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]	Alternative C: Amend Land Use Plans to Identify 229,038 Acres of Federal Land in Utah as Available for Application for Commercial Tar Sands Development[b]
Hazardous Materials and Waste Management	NA	Future commercial tar sands development within the Alternative B potential lease areas would use and generate similar types of hazardous materials and wastes. Spent tar sands may also be generated in large quantities if development by mining occurs; the shale would require management as a waste. The specific types and amounts and their handling and treatment would depend on the specific design of each commercial project.	For individual projects, the types and amounts of hazardous materials and wastes that could be used and generated during commercial tar sands development would be the same as those identified for Alternative B.
Health and Safety	NA	Commercial tar sands project development may result in worker injuries or fatalities from accidents, possible hearing loss from high noise levels, and inhalation of particulates and/or volatile compounds.	Potential health and safety impacts from project construction and operation would be similar to those identified for Alternative B and identical for projects with identical plans of development and located in common lease areas.

[a] NA = not applicable.

[b] Under both Alternatives B and C, the nature, magnitude, and extent of project-related impacts of commercial development on all resource areas would depend on the type, location, and design of the individual projects.

2.7 REFERENCES

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained. It is likely that at the time of publication of this PEIS, some of these Web pages may no longer be available or their URL addresses may have changed.

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