U.S. Department of the Interior
Bureau of Land Management
21605 North 7th Avenue
Phoenix, Arizona 85027

Environmental Assessment

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NUMBER

DOI-BLM-AZ-P010-2012-010--EA

PROJECT NAME

HASSAYAMPA FIELD OFFICE OIL AND GAS LEASING EA

LOCATION

Tracts of land located approximately 40 miles north and west of Flagstaff, northern Coconino County, Arizona, T. 27 N., R. 8 E., and T. 27 N., R. 9 E., Gila & Salt River Meridian (see Map 1).

INTRODUCTION

The Arizona State Office has received an Expression of Interest (EOI), from Monte Vista Exploration Company, Inc., Albuquerque, New Mexico, nominating federal lands located in Coconino County, Arizona, for consideration of competitive oil and gas lease sale.

It is the policy of the Bureau of Land Management (BLM) as derived from various laws, including the Mineral Leasing Act of 1920 (MLA), as amended [30 U.S.C. 181 *et seq.*] and the Federal Land Policy and Management Act of 1976 (FLPMA), as amended, to make mineral resources available for disposal and to manage for multiple resources which include the development of mineral resources to meet national, regional, and local needs.

The Federal Onshore Oil and Gas Leasing Reform Act of 1987 Sec. 5102(a)(b)(1)(A) directs the BLM to conduct quarterly oil and gas lease sales in each state whenever eligible lands are available for leasing. BLM State Offices conduct the lease sales. Surface management of non-BLM administered land overlying federal minerals is determined by the BLM in consultation with the appropriate surface management agency or the private surface owner

In the process of preparing a lease sale the Arizona State Office provides a draft parcel lists to the appropriate field offices for review. Field office staff then review legal descriptions of nominated parcels to determine: if they are in areas open to leasing; if new information has come to light which might change previous analyses conducted during the land use planning process; if appropriate consultations have been conducted; if there are special resource conditions of which potential bidders should be made aware; and which stipulations should be identified and included as part of a lease.

This Environmental Assessment (EA) documents the Hassayama Field Office (HFO) review of the four (4) parcels nominated for the February 2013 Competitive Oil and Gas Lease Sale that are under the administration of the HFO. It serves to verify conformance with the approved land use plan, provides the rationale for deferring or dropping parcels from a lease sale, as well as providing rationale for attaching lease stipulations to specific parcels.

The project area covers the area of the proposed lease parcels in eastern Coconino County in northeastern Arizona. The nominated parcels are State surface and federal minerals (93 percent) with a very small amount of private surface with federal minerals (7 percent). See Map 1.

State of Arizona-administered surface – Coconino County – 8,263 acres
Private-administered surface –Coconino County – 624 acres

PURPOSE AND NEED FOR THE ACTION

The purpose of offering parcels for competitive oil and gas leasing is to consider opportunities for private individuals or companies, to explore for and develop federal oil and gas resources on public lands through a competitive leasing process.

The need for the action is established by the BLM's responsibility under the MLA, as amended, to promote the development of oil and gas on the public domain. The MLA also established that deposits of oil and gas owned by the United States are subject to disposition in the form and manner provided by the MLA under the rules and regulations prescribed by the Secretary of the Interior, where consistent with the FLPMA, the National Environmental Policy Act (NEPA) of 1969, as amended (Public Law 91-90, 42 USC 4321 it seq.), and other applicable laws, regulations and policies.

The decision to be made is whether or not to lease the nominated parcels and, if so, what stipulations would be identified as required for specific parcels at the time of lease sale.

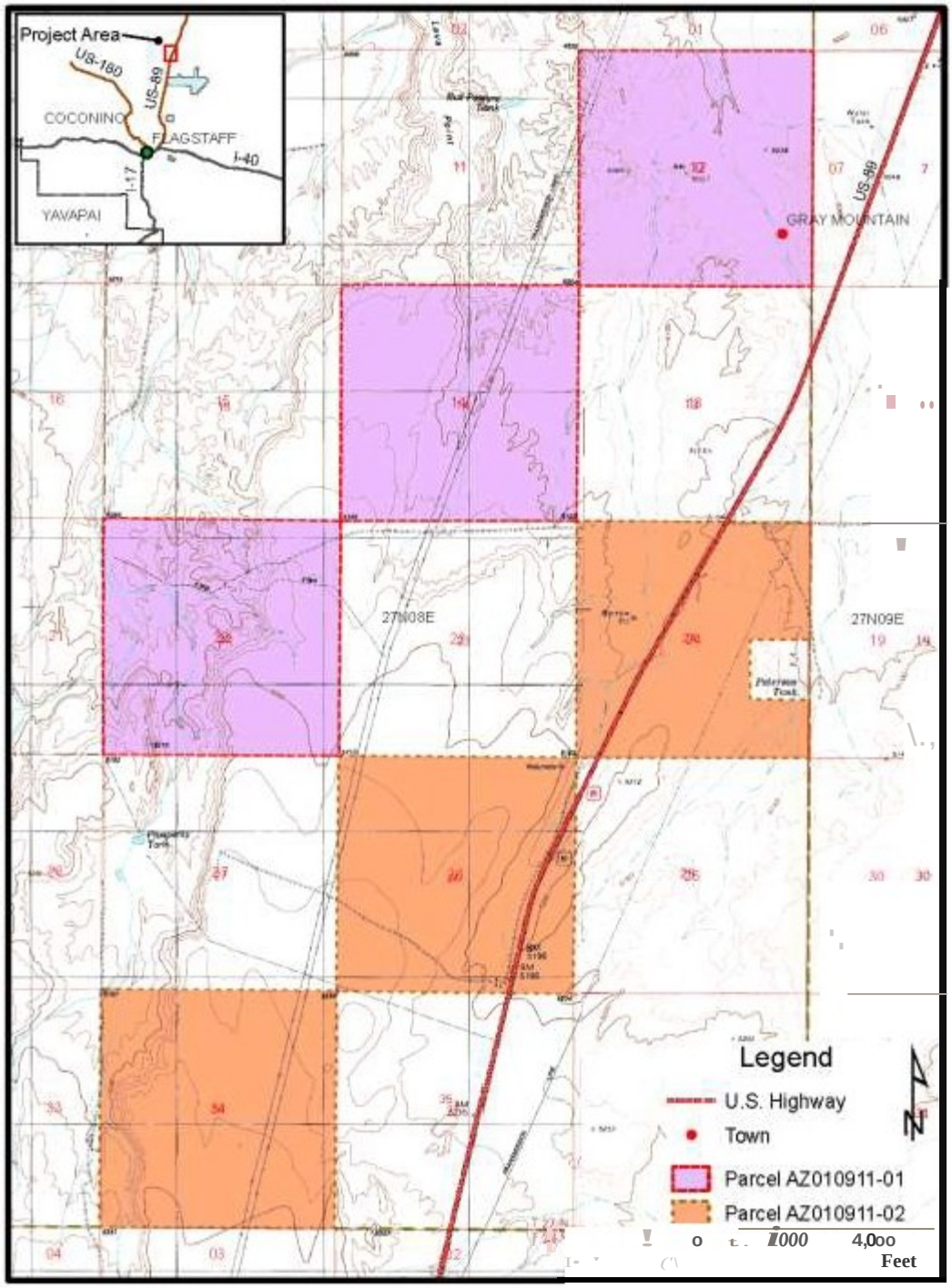
CONFORMANCE WITH LAND USE PLAN(s)

This EA is tiered to the decisions, information, and analysis contained in the Bradshaw-Harquahala Resource Management Plan of April 2010, which states that, unless otherwise restricted, all Federal mineral estates administered by BLM within the Planning Area are available for orderly and efficient development of mineral resources. Lease applications will be considered on a case-by-case basis, and will be issued with needed restrictions to protect resources. Special stipulations would be incorporated into any lease agreement after the results of site-specific environmental assessments become known.

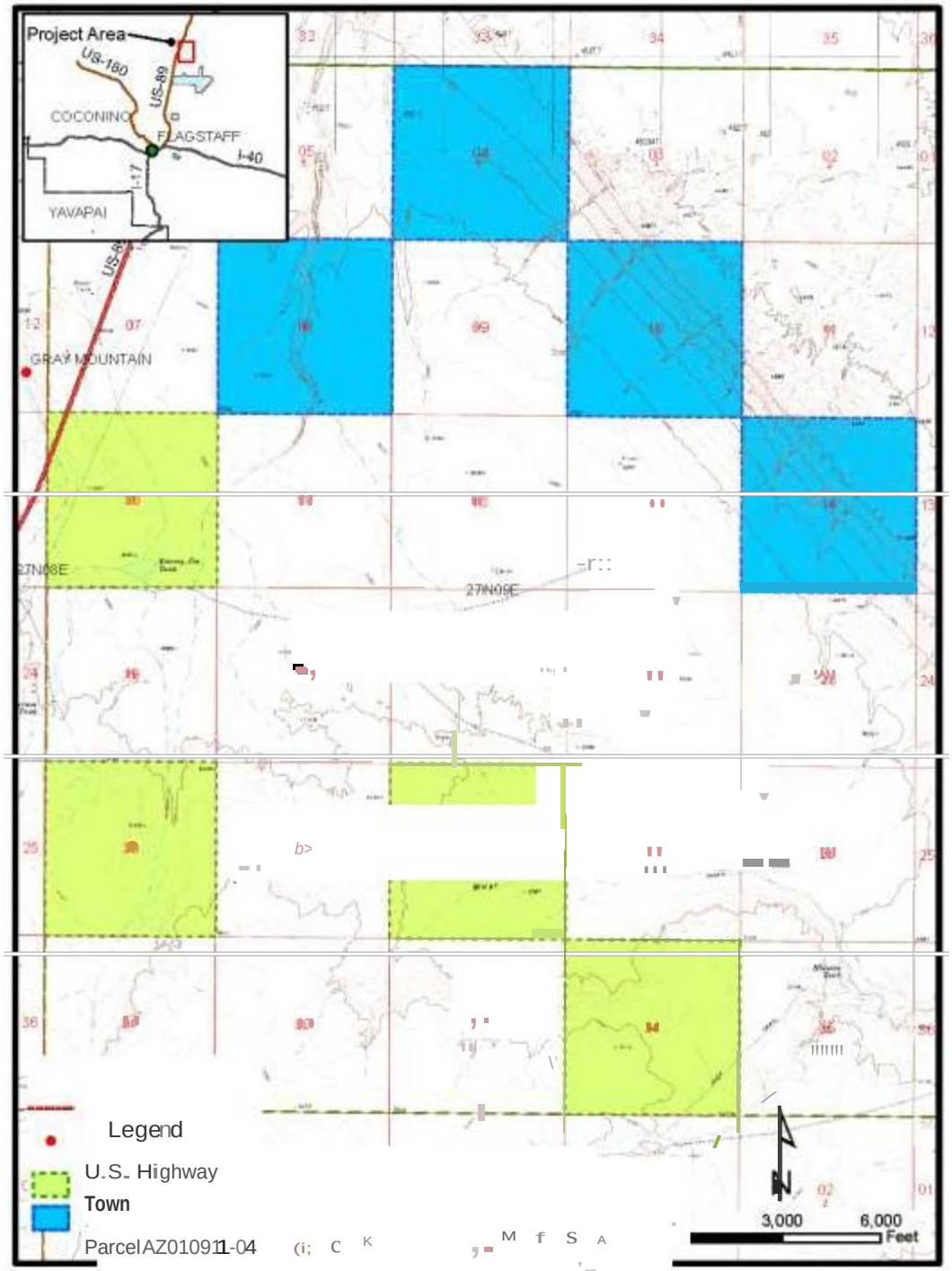
At the time of this review it is unknown whether a particular parcel will be sold and a lease issued. It is unknown when, where, or if future well sites, roads, and facilities might be proposed. Assessment of projected activities and impacts was based on potential well densities submitted by Monte Vista Exploration Company, Inc. (MVEC), the company that submitted the Expression of Interest (EOI.) A Reasonably Foreseeable Development (RFD) Scenario was submitted by MVEC in August of 2011 at the request of the BLM Arizona State Office. The information submitted in the RFD was reviewed by the HFO Geologist, and is considered reasonable and acceptable for the purpose of this analysis. Details of the RFD can be found on page 26. Detailed site-specific analysis of activities associated with any particular parcel would occur when a lease holder submits an application for permit to drill (APD).

The proposed project would not be in conflict with any local, county, or state laws or plans. The proposed action is in conformance with the applicable land use plans because it is specifically provided for in the following land use plan decisions: Bradshaw-Harquahala Record of Decision and Approved Resource Management Plan, April 2010, Mineral Resources, Leasable Minerals, which states, "Lease applications will be considered on a case-by-case basis; leases will be issued with needed restrictions to protect resources; stipulations to protect important surface values will be based on interdisciplinary review of individual proposals and environmental analysis"; lease terms refer to the need to be in compliance with 43 CFR 3100, which provides its own protections.

Elements not addressed were determined by the HFO as not potentially present or as potentially present but not subject to potentially significant adverse impacts from post-leasing oil and gas development.



Map 2 -Nominated lease Parcels AZ10911-01 & AZ10911-02



ParcelAZ010911-04

ParcelAZ010911-03

0 3.000 6.000
Foot

Map 3- Nominated lease Parcels AZ10911-03 & AZ10911-04

SCOPING & ISSUES

Internal consultation with resource specialists of the HFO was performed in order to identify important resource values of the identified parcels. Internal scoping for this EA included a site visit in February 2012 by BLM HFO and Arizona State Office resource specialists and a review of available resource information, an evaluation of the adequacy of lease stipulations available for attachment to the lease, and an assessment of the types of impacts typically associated with oil and gas development projects. During the internal scoping process, the resource specialists identified the following elements of the natural and human environment as present in the project vicinity and potentially affected by oil and gas exploration and development:

- Air Quality
- Climate
- Cultural Resources (Archaeology)
- Fossil Resources (Paleontology)
- Geology and Minerals
- Invasive Non-Native Plants
- Lands and Realty
- Native American Religious Concerns
- Soil Resources
- Socioeconomics
- Special Status Species
- Vegetation Resources
- Visual Resources
- Water Quality, Surface & Groundwater
- Wildlife Resources

These elements are addressed in the following subsections. If, during the review of an oil and gas development plan submitted by an operator subsequent to the lease sale, the HFO determines that these and any additional environmental elements are present and subject to potentially significant adverse impacts by a specific project, those elements would be analyzed in a project specific EA prepared in response to any proposal that includes a surface-disturbing activity. As appropriate, any potentially affected resources would be protected through the application of standard lease stipulations, standard or site-specific Conditions of Approval, and other management actions within BLM's regulatory authority. At a minimum, these include BLM's authority to require the following:

- Relocation of a proposed surface-disturbing activity by up to 200 meters to protect a sensitive resource.
- Submittal and implementation of an adequate reclamation plan and achievement of reclamation goals.
- Conduct operations in a manner that avoids undue impacts to other resources.

Based on the results of these efforts, the professional opinion of BLM biologists, using BLM inventory and monitoring data, is that no federally listed, threatened, endangered, or proposed species would be adversely affected by sale of the lease parcels. Compliance with Section 106 responsibilities of the National Historic Preservation Act (NHPA) were adhered to by cultural resource staff Class 1 review of the nominated parcels. External communication with tribal governments and other federal and state agencies was performed by certified mail, in order to solicit comments and/or concerns to be incorporated into this analysis. Notifications were sent to the National Park Service, the State of Arizona Land Board, the Navajo Nation, the Hopi, Hualapai, and Havasupai Tribes. Two responses were received by mail, one from the Navajo Nation, and one from the Hopi Tribe. The comments address consideration of Tribal Cultural Properties (TCPs) during the course of the cultural survey,

which will be initiated by the State of Arizona at the time that development activities are proposed on the parcels.

DESCRIPTION OF ALTERNATIVES, INCLUDING PROPOSED ACTION

NO ACTION ALTERNATIVE

The No Action alternative generally means that the proposed action would not take place. In the case of a lease sale, this would mean that all expressions of interest to lease (parcel nominations) would be deferred, denied, or rejected. Such a decision would preclude the development of the oil and gas resources potentially contained within that area of Federal mineral estate until such time as a lease sale is made.

The No Action Alternative would exclude offering four (4) lease parcels covering 8,887 acres in the Hassayampa Field Office (HFO) from the upcoming February lease sale. Surface management would remain the same, and the interest in oil and gas development of these parcels, as defined by the proponent, would terminate.

PROPOSED ACTION

The Bureau of Land Management (BLM), Arizona State Office (ASO), proposes to lease, through competitive lease sale, four (4) parcels of federal mineral estate for the purpose of oil and gas exploration and development. The parcels which include 8,887 acres administered by the Hassayampa Field Office (HFO) were nominated for leasing by Monte Vista Exploration Company, Inc. The parcels are located in eastern Coconino County, approximately 35 miles northeast of Flagstaff, AZ. Parcel number, size, and detailed locations are listed in Table 1. The location of each parcel is shown on Maps 2 and 3.

Table 1. List of Lands to be considered or November 2012 Oil and Gas Lease Sale

Parcel Number	*Township-Range*	*Sections*	*Acres*
AZ010911-01	T. 27 N., R. 8 E., G&SRM	Section 12; All	640
		Section 14: All	640
		Section 22: All	640
AZ010911-02		Section 24: N2, SW4, S2SE4, NW4SE4	600
		Section 26: All	640
		Section 34: All	640
AZ010911-03	T. 27 N., R. 9 E., G&SRM	Section 4: Lots 1,2,3,4, S2, S2N2 (All)	636.68
		Section 8: All	640
		Section 10: All	640
		Section 14: All	640

AZ09011-04		Section 18: Lots 1,2,3,4, E2, E2W2 (All)	624
		Section 28: All	640
		Section 30: Lots 1,2,3,4, E2, E2W2 (All)	626.16
		Section 34: All	640

Of the approximately 8,887 acres of federal mineral estate considered in this EA, all are spilt estate (private or state surface with federal mineral estate). The four proposed lease sale parcels would be subject to leasing stipulations as per the oil and gas leasing decisions in the Bradshaw-Harquahala Resource Management Plan, (MI-5, Page 34) which states that management actions regarding leasable minerals would be to develop and implement needed restrictions to protect important resources. Stipulations are based on interdisciplinary review of the individual proposals and environmental analysis.

Standard lease terms, conditions, and operating procedures, as well as additional stipulations and lease notices would apply to the proposed lease sale parcels. Standard operating procedures, as well as best management practices (BMPs) and conditions of approval include measures to protect the environment and resources including surface and groundwater, air quality, wildlife, visual resources, cultural resources, recreation, and others as identified in the Bradshaw-Harquahala RMP.

Oil and gas leases would be issued for a 10-year period and would continue for as long thereafter as oil or gas is produced in paying quantities. If a lessee fails to produce oil and gas, does not make annual rental payments, does not comply with the terms and conditions of the lease, or relinquishes the lease, ownership of the minerals leased would revert back to the federal government and the lease could be resold.

Drilling of wells on a lease would not be permitted until the lease owner or operator secures approval of a drilling permit and a surface use plan specified at 43 CFR 3160 and 3162. Specific drilling permits would be subject to additional environmental analysis.

LEASE STIPULATIONS

Leasing of Federal oil and gas mineral estate in Parcels AZ010911-01 through 04 would carry with it protective stipulations summarized in Table 2. The stipulations are specific to the Hassayampa Field Office, under the current use plan (BLM 2010).

Table 2. Lease Stipulations Applicable to all Parcels		
Number	*Where Applicable*	*Stipulation Tile and Synopsis*

HFO-1	All lands	**Cultural Resources Standard Stipulation**: Any cultural and/or paleontological resource (historic or prehistoric site or object) discovered by the holder, or any person working on his behalf, on public or Federal land shall be immediately reported to the Bureau of Land Management authorized officer. The holder shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the authorized officer to determine appropriate actions to prevent the loss of significant cultural or scientific values.
HFO-2	All nominated parcels	**Fickeisen Plains Cactus:** An Endangered Species Act candidate species that is "highly safeguarded" under the Arizona Native Plant Law. Fickeisen Plains Cactus is endemic to Kaibab limestone derived soils as found in Parcel AZ-010911—03. Populations of the species *Pediocactus peeblesianus var Fickeiseniae* shall be avoided.
HFO-3	All nominated parcels	**California Condor:** All federal agencies are required to use their authority to conserve the species. The California Condor is a wildlife species of concern under state law and protected from take.
IM No. 2010-117	All nominated parcels	**Cultural Resources and Tribal Consultation Lease Stipulation:** This lease may be found to contain historic properties and/or resources protected under the National Historic Preservation Act (NHPA), American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, Executive Order 13007, or other statutes and executive orders. The BLM will not approve any ground-disturbing activities that may affect any such properties or resources until it completes its obligations (e.g. State Historic Preservation Officer (SHPO) and tribal consultation) under applicable requirements of the NHPA and other authorities. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized, or mitigated.

Standard terms and conditions as well as new stipulations developed through the parcel review and analysis process would apply as additional lease stipulations (as required by 43 CFR 3130.3) to address site specific concerns or new information not identified in the land use planning process.

AFFECTED ENVIRONMENT

All nominated lands within the project area are split estate with State or private surface ownership. Tracts of public domain are present throughout the HFO, but not within the nominated lands as identified. One isolated federal surface parcel is found in Section 24, Township. 27 North, Range 9 East, but that parcel is not included within the nominated lands. Surrounding lands include the Navajo Nation, private and state lands. Section 22 of Parcel AZ010911-01, and Section 4 of Parcel AZ010911-03 are located immediately adjacent to Navajo Nation lands.

Topographically, the project area is located within a broad sweeping high desert plain approximately

Table 3. 2010 Summary of Pollutant Concentrations, Coconino County, Arizona				
Pollutant	***NAAQS Standard***	***Highest Recorded Concentration***	***# of NAAQS Exceedences***	***Stations Monitoring Pollutant***
Ozone	*0.08 ppm*	*0.07 ppm*	*0*	*1*
PM-25	*15 μ/m^3*	*5.1 μ/m^3*	*0*	*1*
PM-10	*50 μ/m^3*	*27 μ/m^3*	*0*	*2*
Source: EPA Air Quality Statistics Report: Coconino County, AZ				

seven (7) miles north of Wupatki National Monument. Part of the Colorado Plateau physiographic province, the topography of the project area has little relief, allowing unobstructed views eastward toward the Painted Desert and the Little Colorado River. Terrain in the project area includes relatively flat lying sedimentary deposits dissected by shallow ephemeral washes. Elevations range from 6,000 to 6,200 feet above sea level. Vegetation is sparse, defined as arid desert scrub. The project area is access by U.S. Highway 89, with parcels located southwest and southeast of Gray Mountain, Arizona.

Air Quality

The Environmental Protection Agency (EPA) has the primary responsibility for regulating air quality, including seven nationally regulated ambient air pollutants. Regulation of air quality is also delegated to some states. Air quality is determined by atmospheric pollutants and chemistry, dispersion meteorology and terrain, and also includes applications of noise, smoke management, and visibility.

National Ambient Air Quality Standards (NAAQS) are health based criteria for the maximum acceptable concentrations of air pollutants in areas of public use. Although specific air quality monitoring has not been conducted within the project area, regional air quality monitoring has been conducted in Flagstaff and elsewhere in Coconino County. Air pollutants measure in the region for which ambient air quality standards exist include carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter less than 10 microns (µ) in diameter (PM_{10}) and less that 2.5 µ in diameter ($PM_{2.5}$), and sulfur dioxide (SO_2).

Coconino County is described as an attainment area under NAAQS. An attainment area is an area where ambient air pollution quantities are below NAAQS standards. As shown in Table 3, regional background values are well below established standards, and all areas within the cumulative study area are designated as attainment for all criteria pollutants. Federal air quality regulations are enforced by the Arizona Department of Environmental Quality (ADEQ) through its delegated authority from the U.S. Environmental Protection Agency (EPA). As defined in accordance with Arizona Revised Statues (A.R.S.) §49-107, the ADEQ has delegated to the Coconino County Health Department the responsibility for determining potential impacts subject to air quality laws, regulations, standards, control measures, and management practices. ADEQ has the ultimate responsibility for reviewing and permitting any project's air quality impacts. Permitting of activities related to oil and gas exploration would be based on site-specific, detailed engineering values, which would be assessed prior to commencement of any development activities.

Climate

Climate is the composite of generally prevailing weather conditions of a particular region throughout the year, averaged over a series of years. Since the current land use plan was approved (BLM, 2010), ongoing scientific research has identified the potential impacts of "greenhouse gases" (GHGs) and their effects on

global atmospheric conditions. These GHGs include carbon dioxide, methane, nitrous oxide, water vapor, and several trace gases. Through complex interactions on a global scale, these GHG emissions are believed by many experts to cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated back into space.

A number of activities contribute to the phenomenon of climate change, including emissions of GHGs (especially carbon dioxide and methane) from fossil fuel development, large wildfires, activities using combustion engines, changes to the natural carbon cycle, and changes to radiative forces and reflectivity. There is uncertainty regarding how climate change may affect different regions. The assessment of GHG emissions and climate change remains in its formative phase. Therefore, it is not yet possible to know with certainty the net impact to climate from GHGs produced globally over the last century or from those produced today.

The lack of scientific tools designed to predict climate change on regional or local scales limits the ability to quantify potential future impacts of climate change on the specific parcels. A number of activities contribute to the phenomenon of climate change, including emissions of GHGs (especially carbon dioxide and methane) from fossil fuel development, large wildfires, activities using combustion engines, changes to the natural carbon cycle, and changes to radiative forces and reflectivity. While potential oil and gas leasing or development projects may contribute to GHGs to the atmosphere, these contributions would not have a significant effect on a phenomenon occurring at the global scale. Without additional meteorological monitoring and modeling data, it is difficult to determine the spatial and temporal variability and change in climatic conditions; but it is generally accepted that increasing concentrations of GHGs are likely to accelerate the rate of climate change.

Soil Resources

The proposed project area is covered by the *Soil Survey of Coconino County Area Arizona Central Part (*NRCS 2011, USDA 1983). According to this survey, there are predominately two soil types that make up the parcels found in Township 27 North, Range 8 East (see Map 1). Of the total 3,800 acres nominated within T. 27 N., R. 8 E., approximately 51.0% is found on the Tuweep very gravelly loam soil type. This deep, well-drained soil is found on plateaus and mesas from 4,800 to 5,800 feet. It forms in alluvium derived predominantly from basalt and pyroclastics. Permeability is moderately slow, with slow runoff potential and hazard of erosion slight. The hazard of soil blowing is also slight. This soil unit is used as rangeland and for wildlife habitat.

Other parcels found within T. 27 N., R. 8 E., approximately 41%, are found on the Epikom complex soil type. This unit is 50% Epikom fine sandy loam and 40% Epikom *gravelly* fine sandy loam. The remaining 10% includes small areas of Tours silty clay loam in recent alluvial swales, Ives sandy loam on alluvial fans, and rock outcrop of sandstone. The fine sandy loam is found in concave areas, with slopes ranging from 0 to 8 percent, averaging 2 to 5 percent. This soil type is shallow and well drained, forming in alluvial and eolian deposits derived predominantly from calcareous sandstone and shale. Typically, the surface layer is a 3-inch thick, reddish brown fine sandy loam, with reddish yellow gravelly loam subsoil to a depth of 15 inches. Fractured sandstone is at a depth of 15 inches, with depth to bedrock ranging from 10 to 20 inches.

The Epikom *gravelly* fine sandy loam is found on ridges, with slopes ranging from 8 to 15 percent. It is also shallow and well drained, forming in alluvial and eolian deposits derived predominately from calcareous sandstone and shale. Typically, the surface layer is reddish brown gravelly fine sandy loam to a depth of 3 inches. The subsoil, to a depth of 15 inches, is reddish yellow gravelly loam, underlain by fractured, thin-bedded, sandy shale. Depth to the sandy shale ranges from 10 to 20 inches. Permeability of the Epikom soils is moderate. Runoff is slow, and the hazard of water erosion is slight to moderate. The hazard of soil blowing is high. This unit is used as rangeland and for wildlife habitat.

The remaining soil types, in order of largest percentage, consist of Winona gravelly loam, Tours silty clay loam, Lomaki-Nalaki very cindery loams, Valle gravelly silt loam, Navajo clay, and in Section 22, approximately 5 acres of Cross-Apache complex.

Just over 22 percent of the soil type found within T.27 N., R. 9 E. is Winona gravelly loam. Of the total 5,086.86 acres that have been nominated in this area, 1,129.7 acres are found on this soil type. This very shallow, well-drained soil type is found on plateaus and mesas at elevations between 5,000 and 6,200 feet, at slopes ranging from 0 to 8 percent. Made up of alluvial and eolian deposits derived predominantly from limestone and calcareous sandstone, the surface layer is typically brown gravelly loam 2 inches thick. Underlying the surface layer, to a depth of 15 inches, is a light yellowish brown extremely cobbly loam. Limestone is found at a depth of 15 inches, but ranges from 6 to 20 inches. Permeability of this soil type is moderate, runoff is slow, and the hazard of water erosion is slight. Wind transport potential is slight. This unit is used as rangeland and for wildlife habitat.

Of almost equal proportion is the Epikom complex soil type. At close to 22% of the total acres nominated in T. 27 N., R. 9 E., 1,097.7 acres are found on this soil type (see description above). With 1,569 acres of this type found in T. 27 N., R. 8 E. as well, the Epikom complex is the most extensive soil type found within the project area, totaling approximately 2,700 acres, or 30% of the total nominated lands.

Of lesser proportion overall, but a significant portion of the soil type found in T. 27 N., R. 9 E., is the Winona-Rock outcrop complex. Almost 16% of the nominated lands in this area are found on this soil type on hillsides. At elevations ranging from 4,800 to 6,100 feet, this unit consists of a series of limestone ledges and intervening areas of Winona soils. Common short, intermittent, V-shaped drainage ways intersect the major drainage ways on the valley floor. The Winona soil is very shallow and is well drained. It has formed in alluvial and eolian deposits derived predominantly from limestone and calcareous sandstone. Typically, the surface layer is brown gravelly loam to a depth of 2 inches. The underlying sediments are yellowish brown and light yellowish brown extremely cobbly loam to a depth of 15 inches. Limestone is found underneath, ranging between 6 and 20 inches thick. Rock outcrops consist of exposed areas of limestone and calcareous sandstone. Permeability of the Winona soil is moderate, with high potential for water erosion, and slight potential for wind erosion. This unit is used mainly for wildlife habitat and livestock grazing.

Water Quality, Surface and Ground

Surface Water

The nominated lease parcels are found within the Little Colorado River Watershed. Streams and surface water runoff generally flow toward the Little Colorado River, the main surface drainage within the watershed. The headwaters of the Little Colorado originate in the White Mountains of Arizona and flow northwest to the Colorado River, leaving the basin at Cameron (ADWR, 2009). The river was formerly perennial throughout its length, but it now flows perennially only from its headwaters to Lyman Lake, north of Springerville (Tellman and others, 1997), below its confluence with Silver Creek, and below Blue Springs near its confluence with the Colorado River. Elsewhere it is intermittent due primarily to impoundments, diversions, and falling groundwater levels (Tellman and others, 1997). Ninety-six percent of the streams in the watershed are ephemeral or intermittent (Parra and others, 2006).

Average annual runoff varies from 5 inches per year, or 265 acre-feet per square mile at higher elevations along the Mogollon Rim, to 0.1 inches, or five acre-feet per square mile, near the Little Colorado River between Gray Mountain and Cameron (ALRIS, 2005 in ADWR, 2009). The closest stream flow gauge located within the project area is near Cameron, which has been in operation since 1947. Data collected at this station indicates 34% of average seasonal flow occurs in the winter, with a combined total of 53% occurring during the spring and summer months. A summary of USGS data collected at this station indicates the mean stream flow was 162,448 acre-feet over the 55 years that records have been collected. The maximum and minimum stream flows for this location for the same time period were 10,215 ac/ft. recorded in 2000, and 816,449 ac/ft. recorded in 1973, respectively. (USGS, 2008 & 2005 in ADWR, 2009).

Groundwater

The project area is dissected by two separate groundwater basins. The majority of nominated parcels found in T. 27 N., R. 9 E., are located within the Little Colorado River Plateau Basin, while those parcels located in T. 27 N., R. 8 E., are within the Coconino Plateau Basin.

The Little Colorado River Plateau basin is bordered on the north by the Arizona-Utah border, on the east by the Arizona-New Mexico state line, on the south by the Mogollon Rim, and the west by U.S. Highway 89, which has no hydrogeologic significance, but happens to coincide with the lithologic and tectonic changes in the aquifer system of the basin (ADWR, 2009). Elevations in the basin vary from 12,600 ft. above mean sea level (AMSL) at Humphrey's Peak, north of Flagstaff, to 4,200 ft. AMSL where the Little Colorado River flows out of the basin.

There are several local aquifers and three regional aquifers in the Little Colorado River Plateau basin. The project area is underlain by Mesozoic to Paleozoic sedimentary strata and volcanic rocks that form the regional aquifers. Sequences of sandstone and limestone are stacked on top of one another, separated by impermeable shales and siltstones. The three largest regional aquifers are the Dakota/Cow Springs (D), the Navajo/Lukachukai (N), and the Coconino-De Chelly (C) aquifers. The regional aquifers have a very large areal extent within the basin and, and except for the D- and N-aquifers, have very little vertical

Table 4. Water Bearing Formations of the Little Colorado River Plateau Basin			
Formation Name	***Formation Type***	***Period***	***Major Aquifer***
Quaternary Surficial deposits	Alluvium deposits	Quaternary & Tertiary	Water bearing alluvial
Bidahochi Fm	Sedimentary & volcanic rock	Tertiary	Bidahochi Aquifer
Mesa Verde Group	Interbedded sandstone & shaly siltstone	Cretaceous	Water-bearing zones
Dakota Sandstone	Irregularly bedded sandstone, some shale	Jurassic	Dakota/Cow Springs Aquifer (D-Aquifer)
Cow Springs Sandstone	Fine-grained well-sorted sandstone	Jurassic	Dakota/Cow Springs Aquifer (D0-Aquifer)
Navajo Sandstone	Cliff-forming friable, cross-bedded sandstone	Jurassic	Navajo/Lukachukai Aquifer (N-Aquifer)
Kayenta Fm.	Fine to coarse-grained sandstone, some shale & limestone	Jurassic	Navajo/Lukachukai Aquifer (N-Aquifer)
Lukachukai Mbr of Wingate Sandstone	Fine to very fine-grained quartz sandstone with large scale cross-beds	Jurassic/Triassic	Navajo Lukachukai Aquifer (N-Aquifer)
Coconino Sandstone	Cross-stratified, noncalcareous quartzarenite of eolian origin	Permian	Coconino-De Chelly Aquifer (C-Aquifer)
Source: Arizona Water Atlas, Volume 2, Eastern Planning Area, May 2009.			

connectivity between them. Table 4 lists the water bearing formations that make up the aquifers of the Little Colorado River Plateau Basin.

These formations gain thickness towards the center of the basin, resulting in confined, or artesian, conditions. The primary recharge areas are the eastern and southern highlands of the plateau. Local aquifers are important for domestic water supplies where the regional aquifers are too deep, or have unsuitable water quality. These aquifers include alluvial deposits which occur in washes and stream channels throughout the basin, occurring in sedimentary and volcanic rocks of the Bidahochi Formation, and various sandstones. Recharge to the alluvial aquifers is discharge from the D, N, and C-aquifers, stream flow infiltration, or direct rainfall (ADWR, 2009). The community of Cameron, located closest to the project area, is served primarily by alluvial wells completed in Little Colorado River alluvium (Bureau of Reclamation, 2006).

The Coconino Plateau marks the southern edge of the Colorado Plateau, stretching east toward the Colorado River surface water divide, and south to the Mogollon Rim, the southern boundary of the Coconino Plateau Basin. Most of the Plateau is above 5,000 feet in elevation and consists of low hills, mesas, broad valleys and lava flows in the southern portion (ADWR 2009). The Redwall-Muav (R-Aquifer) is the primary water bearing unit of the Coconino Plateau Basin. The Kaibab, Coconino and Supai Formations comprise the regional Coconino Aquifer (C-Aquifer). Of local importance, is the Moenkopi Formation, with volcanic rocks and unconsolidated sediments that overly both the C- and R-

aquifers. Perched zones in association with volcanic rocks occur primarily in the central and southern portions of the basin as well as in consolidated sedimentary rocks near the volcanic fields. These aquifers are thought to be undependable water supplies since they rely on intermittent recharge from runoff and precipitation. The exception is the San Francisco Peaks area, which contains an "Inner Basin Aquifer" within the glacial outwash and volcanic rocks that is used as a water supply by the City of Flagstaff (USBOR, 2006).

The R-aquifer, the deepest of the regional aquifers, underlies the entire Coconino Plateau Basin with depths of greater than 3,000 feet below land surface in most areas (Bills and others, 2007). Very few wells have been completed in the R-aquifer in the basin due to its depth. The C-aquifer consists of hydraulically connected sandstones, limestones, and shales. Although perched zones occur, it is largely

Table 5. Water Bearing Formations of the Coconino Plateau Basin

Formation Name	***Formation Type***	***Period***	***Major Aquifer***
Younger basalts	Lava and cinders	Quaternary	Perched water bearing zones
Kaibab Formation	Limestone, chert & sandstone	Early Permian	Solution channels and caves, regional C-aquifer
Toroweap Formation	Interbedded sandstone & shaly siltstone	Early Permian	Coconino Aquifer (C-aquifer)
Coconino Sandstone	Gray to yellow to white cross-stratified, noncalcareous quartzarenite of eolian origin	Permian	Coconino Aquifer (C-aquifer)
Schnebly Hill Formation	Sandstone, siltstone, mudstone & evaporates	Permian	Coconino Aquifer (C-aquifer)
Upper Supai Formation	Sandstone, siltstone, limestone, & dolomitic limestone	Lower Permian	Coconino Aquifer (C-aquifer)
Middle Supai Formation	Siltstone, sandstone, conglomerate, & minor dolomitic limestone	Lower Permian	Coconino Aquifer (C-aquifer)
Redwall Limestone	Cliff-forming limestone with Carboniferous fossils	Mississippian	Redwall Aquifer (R-aquifer)
Temple Butte (Martin) Formation	Dark-gray hard, compact fossiliferous limestone	Devonian	Redwall Aquifer (R-aquifer)

Source: Bills and Flynn, 2002, *in* Arizona Water Atlas, Volume 6, Western Plateau Planning Area, October 2009.

drained of water in all but the eastern portion of the basin, coincident with the northeast-southwest trending Mesa Butte Fault (Bills and others, 2007). The primary source of recharge for the C-aquifer is through infiltration of precipitation through volcanic rocks and the Kaibab Formation. Lateral movement of groundwater between the R- and C- aquifers occurs through fracture zones and solution cavities (USBOR, 2006). Regional flow is generally northward toward the Grand Canyon where springs discharge along the Little Colorado and Colorado Rivers and Havasu Creek (ADWR, 2009).

Widely spaced faults and folds also affect groundwater movement in the region. Table 5 lists the water bearing formations of the Coconino Plateau Basin.

Local flow characteristics are poorly understood, mainly due to the complex geologic structure of this area and the depth of these aquifers, as well as limited drilling and testing data. Water levels in the basin are typically quite deep, and well yields are relatively low, depending upon the occurrence of fractures, faults, and solution cavities. Water quality of the upper and middle parts of the C-aquifer are generally good, but can be poor locally from leakage from overlying units and other factors. Generally, water quality of the C-aquifer degrades with increasing depths (ADWR, 2009).

Vegetation Resources

Vegetation of the project area is characteristic of the semi-arid grasslands and shrub lands of the Colorado Plateau region. Below 6,000 feet in elevation, the two most dominant grasslands are the Great Basin grasslands and Plains grasslands. Plains grasslands are commonly dominated by Blue Grama or other gramas that extend into the area from southern Colorado. Great Basin grasslands are dominated by Galleta Grass and Indian Rice Grass and reach down to the Colorado Plateau from the northwest (Grahame, et al., 2002). A large transitional area between the two types occurs in north-central Arizona and extreme southern Utah. Most of the cold-tolerant, cool-season bunch grasses that are native to these grasslands are most productive during spring and early summer, and once existed in a mosaic of deep-rooted shrubs. Cattle grazing that was introduced near the end of the last century, has extensively altered these ecosystems through overgrazing. Coupled with fire suppression, shrub species are favored over grasses, allowing Eurasion annual grass species such as cheat grass to aggressively colonize vast areas (Grahame, et. al, 2002). Big sagebrush, a hardy, cold-tolerant shrub has expanded throughout the Colorado Plateau, and has dominated the scrublands.

Vegetation Communities

The potential plant communities of approximately 93% of the lands nominated in T. 27 N., R. 8 E., are mainly galleta *(Pleuraphis rigida)*, black grama *(Bouteloua eriopoda)*, blue grama *(Bouteloua* gracilis), alkali sacaton *(Sporobolus airoides)*, and fourwing saltbush *(Atriplex canescens)*. The production of forage is limited by shallow depth to bedrock and very low available water capacity. Occurring on steeper slopes is New Mexico feathergrass *(Stipa neomexicana)*, black grama, and sideoats grama *(Bouteloua curtipendula)*. Approximately 44% of these plant communities are also found within those lands nominated in T. 27 N., R. 9 E. An additional 16% of these lands include the grasses and shrubs already mentioned, but in areas where limestone outcrops are found, include the plant communities of needle-and-thread *(Hesperostipa comate)*, and Bigelow sagebrush *(Artemisia bigelovii)*. Forage in these areas is limited by depth to bedrock, slope, very low available water capacity, and high content of lime.

Invasive, Non-Native Species

Widespread livestock grazing has significantly altered the biota of the Colorado Plateau (Grahame, et al., 2002). Livestock grazing on the Colorado Plateau has always been a marginal prospect due to the climate irregularities of this semi-arid region. Native bunchgrasses, which are most productive during the spring and early summer, are not generally tolerant of grazing. Wildfires, that were once common in these grasslands, are less frequent, favoring shrub species and accelerating soil erosion.

Both grazing and fire suppression have altered native plant conditions, allowing the colonizing of annual grasses like cheat grass *(Bromus tectorum)* at the expense of native perennial grasses. Once cheat grass becomes the dominant grass type, secondary invasive species such as knapweed *(Centaurea diffusa, Acroptilon repens)*, leafy spurge *(Euphorbia esula)*, Camelthorn *(Alhagi pseudalhagi)*, and Dalmation toadflax *(Linaria dalmatica)* may be introduced, spread primarily by livestock grazing and wind.

Special Status Species

Federally Listed, Proposed, or Candidate Plant Species

According to the latest species list from the United States Fish and Wildlife Service (USFWS), the only federally listed, sensitive plant species which may occur within or be impacted by actions occurring within the BLM Phoenix District (PDO), the district which administers the area where the nominated parcels are found, is Tumamoc Globeberry *(Tumamoca macdougalii)*. Although few populations have been identified, known occurrences are found within the Sonoran Desert plains. In addition, currently the Fickeisen Plains Cactus *(Pediocactus peeblesianus)* is the only candidate species which may occur within the identified project area. This cactus is a narrow endemic restricted to Kaibab Limestone derived soils in alkaline desert scrub and desert grassland habitat of northern Arizona (Coconino and Mohave counties). Most populations occur on canyon margins or well-drained hills, including flatter ridge-tops and benches with slight to moderate slopes and have also been observed in grasslands at the foot of cliffs. Populations are known to occur between 4,000 and 5,600 ft. in elevation (Roth, 2008).

Wildlife Resources

This project area is within the 10J (experimental-nonessential population) area for California condor (*Gymnogyps californianus*), though the current distribution of condors in Arizona is centered around the Vermillion Cliffs area. As a 10J population, the California condor does not have full protection under the Endangered Species Act (ESA), but all federal agencies are required to use their authorities to conserve the species. The California condor is a state wildlife species of concern and is protected from take under state law. Bald eagles *(Haliaeetus leucocephalus)* and golden eagles *(Aquila chrysaetos)* are known to occur in this area. These two eagle species are protected under the Bald and Golden Eagle Protection Act. This act prohibits "take" of these birds – which includes direct mortality on individuals and actions that cause a nest failure. All migratory birds are protected under the Migratory Bird Treaty Act where take, including destruction of eggs and active nests, is prohibited.

Visual Resources

All lands identified in the project area are split estate parcels. Surface ownership of all of the nominated parcels is the State of Arizona, with the exception of Section 18, T. 27 N., R. 9 E., G&SR., which is under private ownership. Federal lease terms regarding visual concerns are not applicable. Visual Resource Management (VRM) objectives do not apply to non-BLM lands. Visual values can only be protected at the landowner's discretion. Topographically, the project area is located within a broad sweeping high desert plain. Results of a site visit performed on February 13, 2012 indicate local topography as predominantly flat terrain with little visual variety, frequently dissected by small ephemeral washes. The lack of relief allows unobstructed views eastward towards the Painted Desert and the Little Colorado River. Existing vegetation is predominately native bunch grasses and desert sage. Surrounding development is virtually non-existent, with the exception of U.S. Highway 89,

which dissects the parcels, and the unincorporated community of Gray Mountain. (See Figures 1 through 4).

Figure 1. View of Parcel 01 looking east from west edge of Section 14, T. 27 N., R. 9 E.

Figure 2. View of Parcel 02, looking northwest from center of Section 14, T. 27 N., R. 8 E.

Figure 3. View of Parcel 03, looking east from west edge of Section 4, T. 27 N., R. 9 E.

Figure 4. View of Parcel 04, looking southwest from northeast corner of Section 26, T. 27 N., R. 9 E.

Geology and Minerals

The nominated parcels identified in this EA are located along the southern boundary of the Colorado Plateau physiographic province. The Colorado Plateau is a high standing crustal block of relatively undeformed rocks characterized by scarped plateaus dissected by deep canyons and dry washes. Quaternary and Tertiary aged lava flows are found along the margins of the Colorado Plateau, with cinder cones and craters found throughout the landscape. The southern boundary is marked by the Mogollon Rim, an erosional cuesta that separates the Colorado Plateau from the extensively faulted Basin and Range Province (Foos, 1999). Major structures of the plateau include broad flexures, monoclines, vertical faults, and intrusive and extrusive igneous and tectonic features. Folds of the Colorado Plateau occur in broad open folds and flexures of sedimentary strata. Large, wide areas of nearly flat-lying sedimentary strata are separated by abrupt bends of layered strata along monoclonal (one-sided) folds. Some classic examples of these structures include the Waterpocket Fold found within Capitol Reef National Park, and Comb Ridge, exposed along US Highway 163 just north of Kayenta, Arizona, extending north into southeastern Utah. Bounded by the Black Point Monocline to the north and east, and the Coconino Point Monocline to the east, the parcels are located on surface expressions of Paleozoic sedimentary strata, draped with Quaternary lava extrusions. Table 6 lists the formations that crop out along or near the project area.

Table 6. Surficial Geologic Formations found within the Study Area

Map Symbol	***Formation Name***	***Age***	***Characteristics***	***Location***
Qmlp	Basalt flow of Lava Point	Pleistocene	Lava flows, cinder cones	South and west of the parcels?
Qs	Stream channel deposits	Holocene	Gravel terraces in drainage areas	Ephemeral streams, drainages and dry washes
Qb	Basalt flows	Pleistocene	Lava flows, cinder cones and craters	Mesas and buttes
Qae	Mixed alluvium & eolian deposits	Holocene & Pleistocene	Sand dunes ,alluvial fan and valley fill deposits	Plateaus and mesas
Qd	Sand dune deposits	Holocene	Dune sand and sand sheet deposits	Plateaus and basins
Jk	Kayenta Formation	Lower Jurassic	Fine to coarse grained sandstone with sandy shale, fossiliferous limestone and conglomerate	Underlies cliff forming Wingate Sandstone
Trcp	Petrified Forest Mbr of Chinle Fm	Upper Triassic	Variegated friable shales & marls (lower), thin multicolored sandstones & shales & volcanic ash (upper), petrified wood common	Weathers as steep slopes
Trcs	Shinarump Mbr of Chinle Fm	Upper Triassic	Conglomerate with petrified wood	Cliffs and mesas

Trm	Moenkopi Formation	Lower to middle Triassic	Argillaceous shale with layers of sandstone, limestone, and gypsum	Ledges, low ridges, buttresses, isolated knolls or buttes
Pkh	Harrisburg Mbr ofKaibab Formation	Lower Permian	Upper member of Kaibab limestone, thin-bedded gray limestone with fragments of chert and shale and gypsum	Slopes and ledges
Source: Billingsley, et al. 2007, and Chenowith, 1993.				

The Cambrian-age Tapeats Sandstone is the likely target of any oil and gas development within the parcels. Unconformably underlain by Precambrian strata, and overlain by the Bright Angel Shale of middle Cambrian age, the Tapeats consists of gray to red-brown, medium to coarse grained feldspathic, glauconitic, pebbly sandstone and some thin red and green shales (GNU records). Although interpreted by McKee, 1945, as a shallow marine deposit, Wiley and others, 1998, feel initial deposition began on a fluvial braid plain, as opposed to an offshore marine environment. Hereford (1977) and Middleton and Hereford (1981) also interpreted the Tapeats to consist of basal fluvial facies overlain by a variety of nearshore marine facies in north-central Arizona.

Reservoir intervals of the Late Proterozoic Chuar Group (Figure 5) are the potential source rock that has been recognized by Summons and others (1988), and Reynolds and others, (1988). Type I and II kerogen from the Walcott Member of the Group has been identified from dark mudstones containing as much as 5% Total Organic Content (TOC) (Reynolds and others, 1988). Palacas and Reynolds (1989, Abstract) characterized the Walcott Member as having good to excellent petroleum source rock potential.

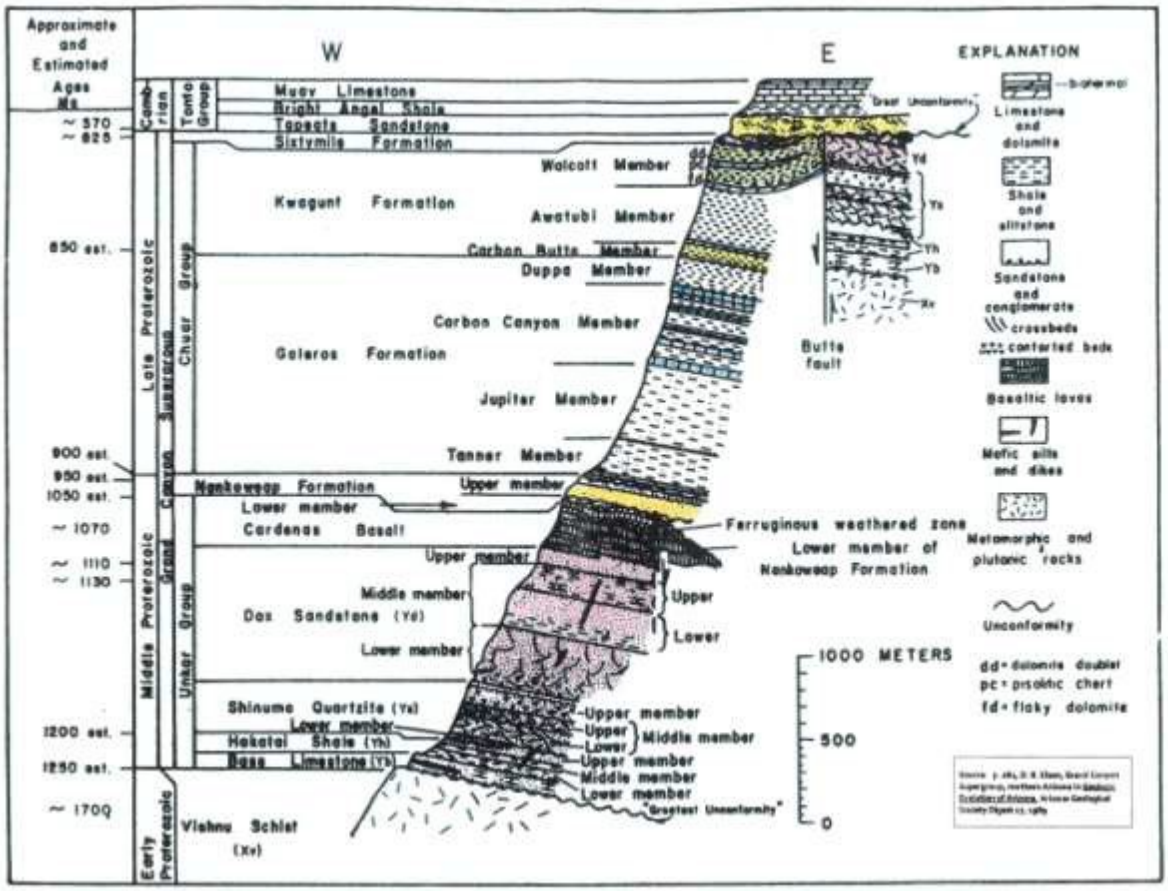


Figure 5. Stratigraphic section showing source and reservoir rock of the nominated parcels

Current production of oil and gas is from four fields, located in northern Apache County, Arizona. The Dry Mesa, East Boundary Butte, Black Rock, and Dineh-Bi-Keyah are the only currently producing fields, but historically, thirteen fields or producing areas have produced oil from Devonian, Mississippian, Pennsylvanian, and Tertiary aged reservoir rocks (Nations and others, in Jenney and Reynolds, 1989). Production zones are primarily Paleozoic sediments of Pennsylvanian age, with the most production coming out of the Paradox Formation.

Although not found within the nominated parcels, additional mineral resources are found within the Cameron uranium mining district, located along the southwestern boundary of the Navajo Nation Reservation within the Little Colorado River Valley. The district was active from 1951 to 1963 when 100 separate properties produced 289,247.96 tons of ore containing 1,211,812.48 pounds of U_3O_8 (uraninite) with an average grade of 0.21 percent (Chenoweth, 1993). The main mining area was in the form of a curved belt approximately 2 miles wide and stretching 6 miles north of Cameron along U.S. Highway 89, and within an 18 mile stretch southeast of Cameron along the Little Colorado River. The principal host rocks for the uranium deposits in the Cameron area are fluvial sandstones in the lower part of the Petrified Forest Member of the Chinle Formation (see Table 6). Other deposits were also mined from the upper part of the underlying Shinarump Member, the Kayenta Formation and the Moenkopi Formation. These shallow, oxidized, near-surface deposits were quickly depleted, with the

last shipment of ore from the district occurring in January, 1962.

Cultural Resources (Archaeology)

A literature search (Level I or Class I) of records at the Hassayampa Field Office was conducted for each of the four lease parcels to determine whether known cultural resources are present within or adjacent to the subject lands. Additional cultural resource information was reviewed for the general area in the June 2008 Agua Fria National Monument and Bradshaw-Harquahala Proposed Resource Management Plan and Final Environmental Impact Statement. In addition, requests were made to tribal historic preservation offices for the Navajo Nation, and the Hopi, Havasupai, and Hualapai Tribes in Arizona for additional cultural information or areas of concern.

The records review found four previously recorded sites, with five previous surveys recorded within the project area. In 1987 approximately 109 acres were surveyed with one site documented [AZ 1:7.5(ASM)]. An additional 90 acres were surveyed in 1984, with no sites identified. Surveys were again conducted in 1998 and 2001, with results from those surveys undocumented.

As a result of the mentioned surveys, four sites were documented, with one site determined eligible for inclusion on the National Register of Historic Properties (NRHP). Of the remaining three sites, one was considered ineligible, one was not evaluated, and the final site required testing.

Fossil Resources (Paleontology)

The predominant geologic formations present at or near the surface within the boundaries of the lease parcels are Paleozoic sediments overlain by Quaternary aged deposits of alluvium and eolian deposits (Qae), and lava flows (Qmlp and Qb). See Table 6 in the section on Geology and Minerals for a more detailed description of these strata and their characteristics. Occurring in varying thicknesses, these types of sediments are considered Class 2 under the Potential Fossil Yield Classification (PFYC) system. Class 2 units are defined as having a *low* probability of fossil occurrence. Recent eolian deposits and units that are generally younger than 10,000 years before present are not considered likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils. Units that are igneous in nature, such as the basalt flows previously identified, are considered Class 1 units, having a *very low* probability to contain recognizable fossil remains.

The lower Triassic Holbrook and Moqui, Shnabkaib, and Wupatki Members of the Moenkopi Formations crop out in portions of Section 14, T. 27 N., R. 9 E. Surface expression of the two lower members, the Shnabkaib and Wupatki, are mapped in sections 12, 22, and 24, as well as sections 18, 28, 30, and 34, and northeastern sections of sections 4, 10, and 14 of T. 27 N., R. 8 E. The lower Permian Harrisburg Member of the Kaibab Formation is the most prevalent surface formation mapped in sections 4, 8, 10, 14 and 16,T. 27 N., R. 8 E.

Although not present in surface expression, underlying the Harrisburg Member of the Kaibab Formation is the Fossil Mountain Member, a fossiliferous, sandy, cherty limestone. Permian aged invertebrate brachiopods, bryozoans, clams, snails, corals, sponges, algal stromatolites, cephalopods, trilobites, and conodonts have been identified in localities in Utah. Fossils that have been identified to occur within the Triassic Moenkopi Formation are plants, snails, clams, ammonoids, crinoids, echinoids, ostracods, fish, reptile tracks and arthropods, also in Utah (Gillette, et. al. 1997). Although not yet classified under the PFYC classification system, no documented occurrences of fossils have been noted within these two formations on the lands identified within the project area. Units having no

known or unknown potential of fossil occurrence are considered PFYC Class 3 units (Foss, 2012) indicating little information about the unit is known, or is poorly studied.

Although both the Kaibab and Moenkopi Formations are mapped as underlying sediments, no fossil discovery sites have been locally identified within the study area.

Lands and Realty

The lands proposed for competitive leasing of the federal mineral estate are split estate mineral parcels containing 8,887.04 acres of federal mineral estate under the jurisdiction of BLM. The State of Arizona administers all surface encumbrances on the parcels with the exception of a portion of Parcel AZ010911-04, defined as Section 18, T. 27 N., R. 9 E. Total acreage under private surface ownership is 624 acres; 8,263.04 acres is under state surface ownership. All lands are located northeast of Flagstaff, Arizona via U.S. Highway 89.
Parcel AZ010911-01 is comprised of 1,920 acres of split estate lands. Located west and southwest of Gray Mountain, Arizona, access can be obtained via U.S. Highway 89, to a transmission line access road running parallel to the highway. Accessible from Gray Mountain proper, the transmission line access road runs the length of Parcel 01, allowing complete access to all of the lands contained in the parcel. The transmission line is located on both state and private surface lands, and access across those jurisdictions will be necessary.

Parcel AZ010911-02 is comprised of 1,880 acres of split estate lands. Located south and southwest of Gray Mountain, Arizona, access to these lands can also be obtained via US Highway 89. Sections 22 and 26 of Parcel 02 are dissected by the highway, thus access is roadside. Section 34 of Parcel 02 can be accessed by the same transmission line identified above, with authorized access through private surface.

Parcel AZ010911-03 is comprised of 2,556.88 acres of split estate lands. Access to Parcel 03 will have to be developed through private surface, as no roads were identified during the on-site visit. There is currently no legal access through the private land.

Parcel AZ010911-04 is comprised of 2,530.16 acres of split estate lands, with 624 of those acres under private ownership. Access can be obtained via U.S. Highway 89. Section 30 is accessed through an improved gravel haul road that terminates at an active basalt quarry. Sections 28 and 34 can be accessed via dirt roads maintained by the surface owner in support of cattle operations. Section 18 of Parcel 04, with private surface ownership, has no current legal access.

Socioeconomics

The nominated parcels are located within Coconino County, Arizona. The population of Coconino County grew by approximately 20% from 1990 to 2000, with an increase from 96,591 to 116,320 residents (USDA, 2005). Population growth in Coconino County is expected to increase 30% over the next 20 years from over 140,000 in 2010 to 190,000 by 2030 (USDA, 2005).

In 2000, the last year for which Coconino County has reported data, industries with the highest percentage of total employment were services (33.24%), government (22.38%), retail trade (21.72%), and state and local government (17.25%). Employment in manufacturing, transportation and public utilities, and construction combined for 5.41% of total employment.

Median family income in Coconino County has risen by 13.56%, from $30,648 in 1990 to $34,805 in 2000. Annual per capita income grew by 22.91% during the same period, from $10,580 to $13,004. Median Home values increased 72.52% from $82,600 in 1990 to $142,500 in 2000, with Flagstaff seeing the biggest increase of all the communities within Coconino County, at 78.29%. Homes in Flagstaff that sold for $90,300 in 1990, increased to values exceeding $142,500 (USDA, 2005).

Activities on lands in the vicinity of the project area are primarily livestock grazing, recreational uses such as hunting, fishing and tourism within the forest boundaries, and tribal lands.

Coconino County is the largest county in Arizona and the second largest in the United States, but it remains one of the most sparsely populated. Native American reservations (Navajo, Hopi, Kaibab-Paiute, Havasupai, and Hualapai) cover 38.1% of the land area (USDA, 2005). Federal and state agencies manage a combined 49% of the county's lands – the Forest Service (28.3%), the BLM (5%), the State Trust lands (9.4%), and the Park Service (6.8%). Only 13% of the land in Coconino County is under private ownership (Coconino County 2003).

The Federal government makes "Payments in Lieu of Taxes" (PILT) to County governments to help offset property tax revenue lost from nontaxable Federal lands within County boundaries (BLM, 2004). Payments are based on Federal acreage in the County for all land management agencies, including BLM, USFS, USFWS, and the National Park Service (NPS). The amount may also be adjusted based on population and as appropriated by Congress. By formula, payments are decreased as other Federal funds such as mineral royalty payments increase. PILT received by Coconino County was $820,879 in 2000; $1,329,731 in 2002; and $896,233 in 2004.

Federal mineral royalties are levied on oil and gas production from Federal mineral leases. Oil and gas lessees pay royalties equal to 12.5% of the wellhead value of oil and gas produced from public land. Half the royalty receipts received from production are distributed to the State and county governments, which are then allocated to fund County services, schools, and local communities.

Assumptions and Reasonably Foreseeable Development Scenario Summary

The following assumptions are from the Reasonably Foreseeable Development (RFD) scenario developed by Monte Vista Exploration Company, Inc. for this EA. The RFD forecasts the following level of development in the HFO planning area.

> The target formation is the Tapeats Sandstone of Cambrian age. This formation and other targets would be analyzed at the APD stage.
> Total depth of wells to be 4,000 – 6,000 ft. below ground surface (bgs). Deeper depths would be analyzed at the APD stage.
> Area of disturbance for each well ranging from 2 – 4 acres, or more if multi-well pads become feasible.
> Surface and/or subsurface well spacing ranging from 40 to 160 acres (potential for 220 plus wells)
> Production drainage approximating 2 – 6 square miles
> Any access roads will be designed at a width of 12 ft. to 16 ft., 0 – 2 miles in length with the possibility of greater lengths.
> Completion method: set casing, cement and perforate casing, formation stimulation.

Production method: flow or pump to surface tankage or flow to gas market pipeline.
Productive life: 4 – 10 years, but could exceed 30 years with new technologies

The source of hydrocarbons is Precambrian Chuar Group, with production from both stratigraphic and structural plays within the Gray Mountain Anticline. The amount of well activity would be determined by economic production of initial wells. Conventional activity would center on wildcat exploration and potential reserve growth if the area proves productive for oil and gas resources.

ENVIRONMENTAL IMPACTS

Assumptions for Analysis

The act of leasing parcels would, by itself, have no impact on any resources in the HFO. All impacts would be linked to as yet undetermined future levels of lease development.

If lease parcels were developed, short-term impacts would be stabilized or mitigated within five years and long-term impacts are those that would substantially remain for more than five years. Potential impacts and mitigation measures are described below.

Cumulative impacts include the combined effect of past projects, specific planned projects and other reasonably foreseeable future actions. All actions, not just oil and gas development may occur in the area, including non-federal actions.

Effects of the No Action Alternative

Under the No Action Alternative, the four lease parcels totaling 8,887 acres nominated for leasing would not be leased. There would be no subsequent impacts from oil and/or gas construction, drilling, and production activities. The No Action Alternative would result in a decision to preclude the development of the potential oil and gas resources contained within the federal mineral estate as defined in the Expression of Interest submitted by the proponent. Surface management of the private and State of Arizona lands as identified, would remain the same.

It is an assumption that the No Action Alternative may result in a slight reduction in domestic production of oil and gas. This would likely result in reduced Federal and state royalty income, and the potential for Federal lands to be drained by wells on adjacent private or state lands. If BLM were to forego leasing and potential development of those resources, it is assumed the public demand for those resources would not change. The undeveloped resource would be replaced by other sources, which may include foreign imports, or other domestic production elsewhere.

Effects of the Action Alternative

Air Quality

Leasing the subject parcels would have no direct impacts to air quality. Any potential effects to air quality from the sale of the lease parcels would occur at such time that the leases were developed. Potential impacts of development of the parcels would result in localized short-term increases in pollutant emissions from vehicles and drilling equipment and fugitive dust emissions from the use of vehicles on unpaved access roads. In the event any such development should occur, specific performance standards regarding air quality impacts would be defined to meet or exceed current local and national regulations.

In order to reasonably quantify emissions associated with well exploration and production activities,

more information is needed. Such information includes a combination of activity data such as the types of equipment needed to successfully complete a well, the technologies which may be employed by a given company for drilling a new well, area of disturbance for each type of activity, (e.g. roads, pads, compressor station, etc.), the depth of each well, and the number of days to complete each activity associated with the development. The characteristics of the geologic formations from which production occurs will also vary from site to site. Therefore, it is not currently feasible to directly quantify emissions. Alternatively, it can be inferred that exploration and production would contribute to incremental increases in overall air quality emissions associated with oil and gas exploration and production into the atmosphere.

Potential Mitigation

BLM encourages industry to incorporate and implement BMPs, which are designed to reduce impacts to air quality by reducing emissions, surface disturbances, and dust from field production and operations. Such actions might include flaring hydrocarbon gases that cannot be economically recovered at higher temperatures in order to reduce incomplete combustion; spraying dirt roads with water in order to reduce fugitive dust emissions, and collocating production facilities in order to reduce new surface disturbances.

Climate

The assessment of Greenhouse Gas (GHG) emissions, their relationship to global climatic patterns, and the resulting impacts is an ongoing scientific process. It is currently not feasible to know with certainty the net impacts from the proposed action on climate. While BLM actions may contribute to the climate change phenomenon, the specific effects of those actions on global climate change are speculative given the current state of the science. The BLM does not have the ability to associate an action's contribution to climate change with impacts in any particular area, since the science to be able to do so is not yet available. The inconsistency in results of scientific models used to predict climate change at the global scale coupled with the lack of scientific models designed to predict climate change on regional or local scales, limits the ability to quantify potential future impacts of decisions made at this level and determining the significance of any discrete amount of GHG emissions is beyond the limits of existing science. If and when additional information on the impacts of climate change becomes known, such information would be incorporated into the BLMs planning and NEPA documents as appropriate.

Leasing the subject tracts would have no direct impacts on climate as a result of GHG emissions. There is an assumption, however, that leasing parcels would lead to some type of development that would have indirect effects on global climate through GHG emissions. However, those effects on global climate change cannot be determined.

Current oil and gas production in Arizona is limited to four fields located in northern Apache County (see section under *Geology and Minerals).* Oil and gas production statistics for the United States as a whole, and the contribution from Arizona's portion of the industry is shown in Table 7.

Table 7. 2011 Oil and Gas Production

Location	*Oil (thousand bls)*	*% U.S. Total*	*Gas (Mcf)*	*% U.S. Total*
United States	*2,078,479*	*100*	*23,576,117*	*100*
Arizona	37	*0.0018*	*168*	*0.0007*

Source: Arizona Oil and Gas Conservation Commission; U.S. Energy Information Administration

In order to estimate the contribution of oil and gas development to greenhouse gases in Arizona, the assumption is that the percentage of U.S. total production of oil and gas is comparable to the percentage of total emissions as a result of oil and gas production for the United States. Albeit, rather simplistic in

the approach, this assumption states that similar emissions occur in all areas that may have very different characteristics and operational procedures, but which could be reflected in output of total emissions. While not precise, this assumption is adequate for the purpose of comparison of sources of GHG emissions in a broad sense.

Table 8. 2010 Oil and Gas Production Potential Emissions *(latest data available)*

Location	**Oil (in Tg[1] CO_2^e)**		**Gas (in Tg CO_2^e)**		**Total Oil & Gas Production (in Tg CO_2^e)**	**% Total U.S. GHG Emissions (in Tg CO_2^e)[2]**
	CO_2	***CH_4***	***CO_2***	***CH_4***		
United States	0.3	31.0	32.3	215.4	279	.04
Arizona (to date)	0.0002	0.0217	0.0226	0.151	0.1953	.00003

Source: EPA, U.S. Greenhouse Gas Inventory Report

1. Tg = teragrams or million metric tons of CO_2 equivalent (CO_2^e)
2. In 2010, total GHG emissions for the U.S. for all sources totaled 6,821.8 Tg CO_2^e (EPA)

The table above shows the estimated GHG emissions for oil and gas production for the U.S., and Arizona. Only production phase emissions are considered here since processing and refining emissions would take place after these resources leave the jurisdiction of the BLM. Further, fossil fuel combustion and electricity generation for use at well sites and facilities are also not included for the purpose of this analysis, which is for operations.

To estimate the potential emissions from the proposed lease sale, the total emissions per well is interpreted. Based on total Arizona oil and gas production for 2011 (see Table 7) the potential GHG emissions that potentially could be produced, given the potential number of wells that could be developed on the nominated parcels is shown below.

Table 9. Potential GHG Emissions Resulting from Proposed Lease Sale Referenced to Oil and Gas Production Data from 2010

Total U.S. GHG Emissions from all sources	6,821,800,000 metric tons	100%
Total U.S. GHG Emissions from Oil & Gas Production	279,000,000 metric tons	0.0409%
Total Arizona GHG Emissions from Oil & Gas Production	195,300 metric tons	0.00003%

Total Arizona GHG Emissions per well	10,279[1] metric tons	0.000002%
Total Potential GHG Emissions from Oil & Gas Production at Full Development)	2,281,938[2] metric tons 570,934[3] metric tons	0.0003% 0.0001%
Source: EPA, U.S. Greenhouse Gas Inventory Report 1. Based on total number of producing wells in Arizona in 2010, (19, AZOGC) 2. Based on total acreage proposed for lease sale (8,887) and 40-acre spacing. Potential number of wells at full build out is ~222. 3. Based on total acreage proposed for lease sale (8,887) and 160-acre spacing. Potential number of wells at full build out is ~55.		

GHG emissions from consumptive uses of oil and gas are not direct effects under NEPA because they do not occur at the same time and place as the action. They are also not indirect effects because oil and gas leasing and production would not be a proximate cause of greenhouse gas emissions resulting from consumption.

Potential Mitigation

The EPAs inventory data describes "Natural Gas Systems" and "Petroleum Systems" as the two major categories of total U.S. sources of GHG gas emissions regarding oil and gas development (EPA, 2012). The identified emission gasses are carbon dioxide (CO_2) and methane (CH_4). The EPA data shows that CO_2 emissions from these two systems has remained relatively flat since 2005, while CH_4 emissions show a decline since 2005 for Natural Gas Systems. Petroleum system emissions for methane have increased slightly from 2005 levels from 29.2 Tg CO_2^e to 31.0 Tg CO_2^e in 2010. The success of reducing CH_4 emissions can be attributed in part to the promotion of EPA's Natural Gas Star Program, a voluntary partnership that encourages natural gas companies to adopt best management practices to reduce methane emissions. As such, BLM will work with potential developers to facilitate the use of these emission reducing practices.

Cultural Resources

There will be no immediate consequences to cultural resources as a result of the leasing of any of the parcels. This EA deals only with lease sale actions. Any subsequent oil and gas development will be subject to a separate NEPA analysis, as well as compliance with Section 106 of the National Historic Preservation Act (NHPA). Native American consultation was conducted by certified mail regarding this lease sale. Although BLM did not receive any specific comments as a result of the initial consultation, BLM does acknowledge the potential exists for the Native American community to identify heritage related issues in the future if specific actions are proposed.

Potential Mitigation

Depending upon the nature of the lease developments proposed, and the cultural resources potentially affected, compliance with the NHPA Section 106 and Executive Order 13007 could require cultural resource inventories. Costs for Native American Consultation and mitigation measures to avoid adverse effects will be borne by the lessee. BLM may also require modifications to, or disapprove of, proposed activities that are likely to affect Traditional Cultural Places or sacred sites for which no mitigation measures are possible.

Paleontological Resources

If the parcels were to be developed, surface disturbing activities have the potential to adversely affect important fossils that may be present in the underlying sediments. The greatest potential for impacts would be associated development activity such as construction of facilities and pipelines. In general, unconsolidated sediments, such as alluvium and colluvium, are less likely to contain well-preserved fossils than intact bedrock. Based on a preliminary site survey and review of existing information, fossil resources are not expected to be impacted, should development occur.

Potential Mitigation

BLM may require inventory for paleontological resources and well as modifications to proposed activities that are likely to affect paleontological resources.

Water Resources, Surface and Ground

While the act of leasing Federal minerals would produce no direct impacts to water resources, subsequent development of the nominated parcels would result in impacts to surface water associated with traffic, waste management, and the use, storage and transportation of fluids, i.e., chemicals, and produced water. Contamination of soils could cause long-term reduction in site productivity resulting in increased erosion and potential sediment and contaminant delivery to nearby dry washes during runoff. Although surface waters would be most susceptible to sedimentation over the short-term, erosion control measures for surface disturbances would be implemented for any surface disturbing activities through Best Management Practices and other preventative measures.

Potential impacts to groundwater resources if the nominated parcels were to be developed may include contamination of the groundwater with produced water, drilling mud, and petroleum constituents. Geologic and engineering reviews are conducted to ensure that the cementing and casing programs are adequate to protect all groundwater resources.

Potential Mitigation

Preventative measures to control stream sedimentation and erosion control would include limiting cut slope steepness, limiting road grade to 10%, crowning of road surfaces, installing culverts and drainage systems, and applying gravel to new or upgraded roads within the project area, as well as designing mitigative measures to reduce risk to surface waters associated with the accidental release of fluids.

Specific mitigation measures would be addressed during the APD process which would incorporate Best Management Practices. Each APD would also be subject to specific conditions of approval prior to any proposed surface disturbing activities, should development take place.

Identification of potential fresh water bearing zones, aquifers, gas producing zones, and under- and over-pressured formations are incorporated into drilling scenarios. Estimates of what depth these zones would be encountered are used to determine drilling fluids, fluid densities, surface casing depths, and production planning. Casing and cementing programs are designed to protect and isolate all usable water zones, potentially productive zones, lost circulation zones, and abnormally high-pressure zones. No significant adverse impact to groundwater aquifers is anticipated if the nominated lease parcels were to be developed.

Soil Resources

Leasing Federal minerals would produce no direct impacts to soils, but subsequent development of the parcels would involve possible surface disturbance for access roads, well pads, and pipelines. This development could result in possible short-term vegetation loss and soil compaction and displacement. The largest proportions of soils have low to moderate slopes that reduce the potential for sediment transport through erosion. However, construction activities could increase local soil loss and loss of

preferred forage production. Potential for such soil loss and transport would increase as a function of slope, feature (pad, road, or pipeline route) to be constructed, and proximity to drainages.

The potential also exists for accidental spills or leaks of petroleum products and hazardous materials during construction. These events would cause soil contamination and an associated decrease in soil fertility and revegetation potential. Following interim reclamation, it would be the responsibility of the operator to continue revegetation/reclamation efforts until vegetative communities on disturbed surfaces are composed of seeded or other desirable vegetation, as determined by the BLM. Appropriate revegetation is important to prevent or minimize soil erosion and infestation of weeds.

Potential Mitigation

Should the parcels be developed, impacts to soil resources could be adequately mitigated through standard conditions of approval related to topsoil handling and reclamation. Best management practices would be incorporated into the standard lease terms and conditions of all the parcels, in order to lessen potential hazards to soil resources.

Vegetation

If the nominated parcels were leased and developed, vegetation would likely be impacted by subsequent oil and gas exploration and development activities. The extent of disturbance would be dependent upon the approved amount of development by the BLM. Construction of well pads, pipelines, and access roads would result in both direct and indirect effects on vegetation. Direct effects would include short and long-term loss of vegetation and long-term modification of community structure and composition. Indirect effects could include increased potential for noxious weed invasion, increased soil erosion and sedimentation, and reduced wildlife habitat quantity or quality.

Potential Mitigation

With implementation of standard Conditions of Approval (COAs) applied to all authorizations for proposed surface-disturbing activities associated with the leased parcels, desirable forbs and grasses could be established within desired timeframes. Establishment of self-sustaining native plant communities that meet desired reclamation standards for cover and species composition would be implemented as part of approved reclamation activities. COAs attached to authorizations would include seedbed preparation, installation of approved native seed mixes, use of mulch, site protection from grazing, weed control, and monitoring of reclamation success. Impacts would be addressed when site specific development proposals are received.

Invasive, Non-Native Species

Surface disturbing activities provide a niche for the invasion and establishment of invasive non-native species, particularly when these species are already present within the area. If one or more of the nominated parcels were to be developed, there would be potential for weed invasion.

Potential Mitigation

Mitigation measures designed to minimize the spread of these species would be attached as a condition of approval to permitted activities. A weed control COA would be applied to the authorization for any surface disturbance activities associated with any development of the nominated parcels.

Special Status Species

In the event the nominated parcels were to be developed, a plant survey would be conducted prior to any surface disturbing activities. Plants should be avoided if practicable or salvaged and re-planted under permit from the Arizona Department of Agriculture. The BLM will not approve any ground

disturbing activity that may affect any such species or critical habitat until it completes its obligations under applicable requirements of the Endangered Species Act as amended, 16 U.S.D. §1531 etseq., including completion of any required procedure for conference or consultation.

Potential Mitigation

Lease stipulations would be attached to authorizations that may require modification or disapproval of proposed activities that is likely to result in jeopardy to the continued existence of a proposed, listed, or candidate species, or result in the destruction or adverse modification of a designated or proposed critical habitat.

Wildlife

In the event the nominated parcels were to be developed, a survey to identify potential nesting sites for bald and golden eagles in and near the project area would be conducted. Bald eagles nest near water in large trees or cliffs, while in Arizona, golden eagles nest in steep cliff habitat. Nest location data for golden eagles is sparse in this area. Potential impacts to individuals and nesting success within ten miles of an active nest would be addressed. California condors nest on cliff ledges, caves, and large trees. Active nest location data is collected by the Arizona Game and Fish Department (AGFD). The majority of locations have been identified within the Vermillion Cliffs area. The leading human causes of direct mortality to eagles and condors are vehicle collisions, electrocution from power lines, and lead poisoning. The nesting season for migratory birds in that area can be found in the Arizona Breeding Bird Atlas.

Potential Mitigation

In Arizona, wildlife is property of the state and managed by the Arizona Game and Fish Commission. Contact with the AGFD to develop strategies to minimize impacts to wildlife would be undertaken prior to any surface disturbance of the proposed lease parcels. BLM will require oil and gas lessees to operate in a manner that will minimize adverse impacts to wildlife. Site-specific COAs and BMPs may be developed at the APD stage in order to further mitigate direct and indirect effects of potential lease development.

Visual Resource Management

Implementation of oil and gas development within the nominated parcels would create contrasts by removing existing vegetation and exposing bare ground. Clearing for pads, roads, and pipelines create unnatural color, line and texture changes. Tanks and poles add vertical trends to generally flat landscapes. The more prominent these visual contrasts, the more a project will be visible and distract from the natural view. In the long term, interim reclamation of development activities would reduce visual contrasts after several growing seasons. Visual impacts associated with production activities and traffic related to oil and gas development would continue for the producing life of the wells. To avoid the degradation of visual esthetics associated with development in an undeveloped area, all project's surface disturbance should be hidden, masked, and reclaimed as best as possible with BMPs and COAs.

Potential Mitigation

Since all of the nominated parcels are held under non-federal surface ownership, Federal lease terms regarding visual concerns are not applicable. Visual Resource Management (VRM) objectives do not apply to non-BLM lands. Visual values can only be protected at the landowner's discretion, but to the extent possible, BLM will work with the surface landowners in order to meet these objectives.

Mineral Resources

At this stage of the leasing process, the act of leasing parcels would not result in any activity that might affect various resources. Even if parcels are leased, it remains unknown whether development would

actually occur, and if so, where specific facilities would be placed. This would not be determined until the BLM receives an application for permit to drill (APD) in which more detailed information about proposed activities and facilities would be clarified for particular lease parcels.

Upon receipt of an APD, the BLM would initiate a more site-specific NEPA analysis to more fully analyze and disclose site-specific effects of specifically identified activities. In all potential exploration and development scenarios, the BLM would require the use of best management practices documented in "Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development" (USDI and USDA 2007), also known as the "Gold Book." The BLM could also identify APD Conditions of Approval, based on site-specific analysis, that could include moving the well location, restrict timing of the project, or require other reasonable measures to minimize adverse impacts (43 CFR 3101.1-2 Surface use rights; Lease Form 310011, Section 6) to protect sensitive resources, and to ensure compliance with laws, regulations, and land use plans.

Development of the parcels would result in oil and associated natural gas being produced from the potential reservoir rock as defined in the Reasonable Foreseeable Development (RFD) scenario. Due to the lack of well information available within the proposed parcel boundaries, the amount of potential oil and gas resources found within the parcels cannot be accurately estimated. According to IHS Energy, four wildcat wells have been drilled within the project area by different operators beginning in 1949. Although the most recent wildcat well was completed in August 2005, none of them have resulted in production.

Uranium potential in the area is unknown. Past exploration did not test the identified uranium bearing host rocks of the Cameron Mineral District at depth, but the possibility exists that such targets could generate future prospecting interest Potential lower grade ores that were once overlooked could become productive with more advanced technologies and emerging markets.

Potential Mitigation

Mitigation for impacts to mineral resources will be determined when specific sites for development are determined. This may include relocating and co-locating facilities in order to minimize disturbance to other resources. Site-specific COAs and BMPs may be developed at the APD stage in order to further mitigate direct and indirect effects of potential lease development.

Lands and Realty

Leasing of split estate lands can cause conflicts when surface owners are not aware of federal ownership of the mineral estate or are not aware of the implications of the federal ownership. All surface landowners have been notified that the federal mineral estate underneath their surface is proposed for oil and gas competitive leasing. Access to leased parcels is the responsibility of the lessee and not the BLM, but BLM retains "surface entry rights" for exploration and development. Leasing can cause indirect impacts to adjacent lands due to the need for road access.

Potential Mitigation

While the act of leasing the parcels would produce no impacts, subsequent development of the lease would lead to surface disturbance from construction of well pads and access roads. The scope and extent of the impacts would be analyzed in accordance with NEPA, at the time such development would be proposed.

Socioeconomics

The leasing process provides a direct socioeconomic benefit from the collection of bids, bonus bids, and

rental fees. Income from the sale would go to the federal and Arizona treasuries. At this stage of the leasing process, the act of leasing would not result in any activity that might affect various resources. Even if the parcels are leased, it remains unknown whether development would actually occur.

Oil and gas development of the parcels would have beneficial impacts on the local economies of this part of Coconino County through the creation of job opportunities in the oil and gas industry and in the supporting trades and services. In addition, local governments would experience an increase in funds from tax and royalty revenues.

Oil and gas development could also result in negative social impacts, including (1) decrease in the solitary character of the area, (2) reduced scenic quality, (3) increased dust levels, and (4) an increase in traffic. However, most of these impacts would be limited to the relatively short duration of drilling and completion activities.

Potential Mitigation

The overall economic effects of well development on the leases would be examined closely once the exact locations were known. The extent of these impacts would be analyzed during additional NEPA analysis at the time development is proposed.

Native American Religious Concerns

BLM sent letters containing a description of the oil and gas lease sale and maps showing parcel locations to the tribal historic preservation officers (THPO) of the Navajo Nation and the Hopi Tribe in February 2012. These federally recognized tribes are known to have ancestral ties to the lease parcel areas. In this letter, the BLM requested information regarding sites of traditional cultural or religious value which may lie within the boundaries of the listed lease sale parcels. Although the Hopi Tribe did not respond to the letter, the Navajo Nation did respond, expressing areas of concern related to Traditional Cultural Resources (TCPs). A TCP is defined as a place that is eligible for inclusion in the National Register of Historic Places because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community.

Potential Mitigation

Based on IM 2010-117, the 2010 Oil and Gas Leasing Reform, State and field offices will meet the National Historic Preservation Act (NHPA), and General Procedural Guidance for Native American Consultation requirements for lease issuance, and will attach, at a minimum, the standard NHPA lease stipulations to any lease that is offered (see the section on Lease Stipulations). In addition, BLM will coordinate with the surface land owner, the State of Arizona, requiring that all applicable statues and executive orders are met.

CUMULATIVE IMPACTS

The HFO received 4 parcel nominations (8,887 acres) for consideration in the February 2013 Oil and Gas Lease Sale. Assumptions of total surface disturbance can be based on estimating the maximum potential that could be developed within the nominated lease parcels. The surface disturbance assumptions shown in the following table estimates impacts associated with oil and gas exploration and development activities that could occur on each lease if it were fully developed on 40-acre spacing. Surface disturbance estimations are based on averages sampled from such activities found in surrounding states.

Estimations for surface disturbance:

Drill Pads - ~ 2 acres disturbance per well pad (300’ x 300’)

Access Roads – 0.4 acres disturbance per access road (14' wide x ¼ mile travel distance)

Table 7 - Maximum Estimated Surface Disturbance (*40-acre spacing****)***			
Parcel #	*Acreage*	*Potential Wells*	*Potential Acres Disturbed*
AZ010911-01	1,920	48	97
AZ010911-02	1,880	47	96
AZ010911-03	2,556.88	64	130
AZ010911-04	2,530.16	63	127

Surface and/or subsurface well spacing was identified as 40 – 160 acres in the Reasonably Forseeable Development (RFD) submitted for this EA. If the well spacing increased to 160 acres, then the potential acres disturbed would decrease as a result, since the number of potential wells would decrease. Well spacing would be defined once development plans were finalized.

Whether or not future interest in oil and gas development will increase in this area is difficult to predict. All drilling activity in this region to date can be defined as exploratory in nature.

Air Quality

Development of oil and gas activity will result in a cumulative increase in surface and subsurface disturbances as well as increase emissions during drilling and completion activities. The type of impacts will be the same as described under environmental impacts associated with the proposed action.

Climate

The EPA's inventory of US Greenhouse Gas Emissions and Sinks found that in 2010, total U.S. GHG emissions were almost 7 billion (6,821.8 million) metric tons and that total U.S. GHG emissions have increased by 10.5% from 1990 to 2010. The increase from 2009 to 2010 was primarily due to an increase in economic output resulting in an increase in energy consumption across all sectors, and much warmer summer conditions resulting in an increase in electricity demand for air conditioning that was generated primarily by coal and natural gas. Since 1990, U.S. emissions have increased at an average annual rate of 0.5 percent (EPA, 2012).

The incremental contribution to global GHG gases cannot be translated into effects on climate change globally or in the area of this site-specific action. As oil and gas production technology continues to improve, and because of the potential development of future regulations or legislation, one assumption is that reductions in the rate or total quantity of GHG emissions associated with oil and gas production are likely.

When compared to the total GHG emission estimates from the total number of oil and gas wells nationally, the potential number of wells that could be developed on the nominated parcels represents an incremental contribution to the total regional and global GHG emission levels. When compared to the number of oil and gas wells in Arizona, the incremental contribution to global emissions would be even smaller.

Increased GHG emissions are tied to both population and economic growth, which Arizona has seen increase over the last 20 years. During the 1990s, Arizona's population grew by 39%, compared with 13% nationally. During that same time frame, Arizona electricity demand grew at a rate of 4.0% per year, while electricity emissions grew 3.3% annually. This decline in emissions per kWh is attributed to rapid growth of new natural gas generation (CCAG, 2006).

The state of Arizona completed a GHG inventory in 2006, which presented estimates of historical and

projected GHG emissions and sinks for the period of 1990 to 2020. According to that study, electricity use and transportation are the state's principal GHG emissions sources. Together, these two sectors account for nearly 80% of Arizona's gross GHG emissions (CCAG, 2006). The remaining emissions are sourced from consumption of natural gas, oil products, and coal, for use in the residential, commercial, and industrial sectors (~11%), agricultural activities (~5%), and industrial processes (~4%). The purpose of the inventory is to assist the State with an understanding of current and possible future GHG emissions, thereby aiding in the design of possible mitigation strategies.

Cultural Resources

Federal laws and regulations protect cultural resources on public lands, including archaeological sites and historic properties. Development activities must comply with these protective regulations, and BLM requires the completion of cultural resource inventories prior to surface disturbing activities.

Because Class III cultural resource inventories must be completed, the potential for increased impacts on cultural artifacts will be minimized. By avoiding known cultural and historical sites during the layout of development projects, the potential for incremental increases in cumulative impacts will be avoided.

Completion of cultural resource inventories would have a beneficial, cumulative impact on the level of cultural information about the proposed lease area. Newly built roads could open previously inaccessible areas to illegal collection or vandalism of cultural resources, however, implementation of resource protection and mitigation would enhance protection of such resources upon discovery.

PERSONS AND AGENCIES CONSULTED

Joe Dixon – Arizona State Land Department
Bill Cardasco – Babbitt Ranches, LLC
Ben Donagon – Consulting Geologist
Steven L. Rauzi – Oil and Gas Program Administrator, State of Arizona
Mike Johnson – Deputy Preservation Officer, BLM Arizona
Phil Gensler – BLM Regional Paleontologist, NM, AZ, CA
Diane Chung – Superintendent, Wupatki National Monument
Scott Foss – BLM Regional Paleontologist, UT
Mr. Alan Downer – Navajo Nation Historic Preservation Department
Mr. Ben Shelley – President, Navajo Nation
Mr. Leigh Kuwanwisimwa – Cultural Preservation Office, Hopi Tribe
Mr. LeRoy Shingoitewa – Chairman, Hopi Tribe

INTERDISCIPLINARY TEAM INPUT & REVIEW

Table 8 lists the members of the Interdisciplinary Team who participated in the impact analysis of leasing and development of these parcels – which included review of available resource information, evaluation of lease stipulations in relation to the types of impacts likely to result from subsequent oil and gas exploration and development.

Table 8. The BLM Interdisciplinary		
Name	*Title*	*Areas of Participation*

Fred Conrath	Geologist, ASO	Review, Project Coordinator
Rem Hawes	Hassayampa Field Manager	Review
Leah Baker	Phoenix District Planning and Environmental Coordinator	NEPA Review
Karen Conrath	LSFO, Geologist	Project Lead, Minerals
Chris McLaughlin	HFO, Archaeologist	Cultural Resources, Native American Religious Concerns
Cody Carter	HFO, Wildlife Biologist	Wildlife, Special Status Species

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