FINDING OF NO SIGNIFICANT IMPACT

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Environmental Assessment
Expressions of Interest 247 and 270
DOI-BLM-ES-030-2012-0013-EA

The proposed action is for the BLM to offer the federally owned oil and gas resources in Michigan Meridian, Mitchell, Hawes, Millen, and Mikado Townships, Alcona County, Michigan (T. 25 N., R. 8 E., Sec. 4 NE¼NW¼; Sec. 21 SW¼, Sec. 26 Pt. NW¼NW¼ (34.7 acres); T. 26 N., R. 7 E., Sec. 4 N 933.4' of the E 933.4' of the SE¼NE¼ (20 acres); T. 27 N., R. 6 E., Sec. 23 W½NW¼; T. 27 N., R. 7 E., Sec. 27 N½SE¼; T. 27 N., R. 8 E., Sec. 13 NW¼NE¼; T. 28 N., R. 5 E., Sec. 22 NE¼NE¼, Sec. 26 S½NE¼, NW¼SE¼), totaling 696 acres, on the next available Eastern States competitive oil and gas lease sale.

There are no surface disturbing activities proposed at the leasing stage. However, it is reasonable to expect the development of one well in the future. When an Application for Permit to Drill (APD) is proposed for these lands, a site specific NEPA document will analyze the effects of the development.

Based on the analysis of potential environmental impacts contained in the Environmental Assessment (DOI-BLM-ES-030-2012-0013-EA), and considering the significance criteria in 40 CFR 1508.27, I have determined that the proposed action will not have significant impacts on the human environment. Therefore, preparation of an environmental impact statement is not required prior to approving and implementing the proposed action.

Authorized Officer:

Tony J Herrell — 9-13-13

Tony Herrell, Associate State Director — Date
Eastern States Office

Northeastern States Field Office
626 East Wisconsin Ave. Suite 200
Milwaukee, Wisconsin 53202-4617
414-297-4400
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DECISION RECORD

Environmental Assessment
DOI-BLM-ES-0030-2012-0013-EA
Expressions of Interest 247 and 270

It is my decision to allow the Proposed Action to be implemented as described in the EA of Expressions of Interest (EOI) 247 and 270, Michigan Meridian, Mitchell, Hawes, Millen, and Mikado Townships, Alcona County, Michigan (T. 25 N., R. 8 E., Sec. 4 NE¼NW¼; Sec. 21 SW¼, Sec. 26 Pt. NW¼NW¼ (34.7 acres); T. 26 N., R. 7 E., Sec. 4 N 933.4' of the E 933.4' of the SE¼NE¼ (20 acres); T. 27 N., R. 6 E., Sec. 23 W½NW¼; T. 27 N., R. 7 E., Sec. 27 N½SE¼; T. 27 N., R. 8 E., Sec. 13 NW¼NE¼; T. 28 N., R. 5 E., Sec. 22 NE¼NE¼, Sec. 26 S½NE¼, NW¼SE¼), totaling 696 acres. The EA and FONSI analyzed the selected alternative and found no significant impacts. Implementation of this decision will grant exclusive rights to the lessee to develop federally owned oil and gas resources, but does not authorize any drilling and associated activities or obligate the company to drill any wells on the lease.

Authorities: The authority for this decision is contained in the Mineral Leasing Act of 1920, as amended; the Mineral Leasing Act for Acquired Lands of 1947, as amended; the Federal Land Policy and Management Act (FLPMA) of 1976; and the Energy Policy Act of 2005.

Compliance and Monitoring: This decision does not authorize any ground-disturbing activities. A BLM-approved Application for Permit to Drill (APD), Surface Plan for Operations (SUPO), and a site-specific environmental assessment are required to authorize ground-disturbing actions.

Terms / Conditions / Stipulations: Any purchaser of a Federal oil and gas lease is required to comply with all applicable Federal, State, and local laws and regulations including obtaining all necessary permits required prior to the commencement of project activities.

PLAN CONFORMANCE AND CONSISTENCY:

The selected alternative is in conformance with the *Michigan Resource Management Plan* (Record of Decision signed on June 5, 1985).

Alternatives Considered: The EA considered two alternatives: the no action alternative and the proposed action, which is the alternative recommended.

Rationale for Decision: The proposed action alternative was selected because the policy of the BLM is to promote oil and gas development if it meets the guidelines and regulations set forth by the National Environmental Policy Act of 1969 and other subsequent laws and policies

passed by the U.S. Congress and to make Federal minerals available for economically feasible development in an environmentally sound manner.

Protest/Appeal Language: In accordance with 43 CFR 4.411 and 4.413, any person whose interest is adversely affected by a final decision of the authorized officer may appeal the decision to the Interior Board of Land Appeals. The appeal must be filed within 30 days after the date the proposed decision becomes final or 30 days after receipt of the final decision. In accordance with 43 CFR 4.411 and 4.412, the appeal shall state clearly and concisely the reason(s) why the appellant thinks the final decision of the authorized officer is wrong.

Pursuant to 43 CFR 4.21(b) and 4.413(a), an appellant also may petition for a stay of the final decision pending appeal by filing a petition for stay along with the appeal within 30 days after the date the proposed decision becomes final or 30 days after receipt of the final decision.

The appeal and any petition for stay must be filed at the office of the authorized officer: Authorized Officer, BLM Eastern States Office, 7450 Boston Blvd., Springfield, VA 22153. **At this time, the BLM will not accept protests or appeals sent by electronic mail.** Within 15 days of filing the appeal and any petition for stay, the appellant also must serve a copy of the appeal, and any petition for stay, on any person named in the decision and listed at the end of the decision, and on the: Regional Solicitor, Northeast Region, U.S. Department of the Interior, One Gateway Center, Suite 612, Newton, MA 02458.

Pursuant to 43 CFR 4.21(b)(1), a petition for stay, if filed, must show sufficient justification based on the following standards:

(1) The relative harm to the parties if the stay is granted or denied;
(2) The likelihood of the appellant's success on the merits;
(3) The likelihood of immediate and irreparable harm if the stay is not granted; and,
(4) Whether the public interest favors granting the stay.

43 CFR 4.21(b)(2) provides that the appellant requesting a stay bears the burden of proof to demonstrate that a stay should be granted.

Authorized Officer:

Tony J. Herrell

Tony Herrell, Associate State Director
BLM Eastern States Office

9-13-13
Date

United States Department of the Interior
Bureau of Land Management
Northeastern States Field Station
LLES003410

Environmental Assessment

NEPA #: DOI-BLM-ES-030-2013-0025-EA

Expressions of Interest 247 and 270

Date: June 2013

Type of Action: Oil and Gas

Serial Number: MIES-052158 (EOI 247 only)

Location: Michigan Meridian, Mitchell, Hawes, Millen, and Mikado Townships, Alcona County, MI
T. 25 N., R. 8 E.,
Sec. 4 NE¼NW¼ (38.47 acres),
Sec. 21 SW¼,
Sec. 26 Pt. NW¼NW¼ (34.7 acres);
T. 26 N., R. 7 E.,
Sec. 4 N 933.4' of the E 933.4' of the SE¼NE¼ (20 acres);
T. 27 N., R. 6 E.,
Sec. 23 W½NW¼;
T. 27 N., R. 7 E.,
Sec. 27 N½SE¼;
T. 27 N., R. 8 E.,
Sec. 13 NW¼NE¼;
T. 28 N., R. 5 E.,
Sec. 22 NE¼NE¼,
Sec. 26 S½NE¼, NW¼SE¼.

Project Acreage: 696 acres

Proponent Address: Proprietary

Bureau of Land Management
Northeastern States Field Office
626 E. Wisconsin Ave., Suite 200
Milwaukee, WI 53202
414-297-4400 (phone)
414-297-4409 (fax)

BLM

Northeastern States Field Office

MISSION STATEMENT

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

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CHAPTER 1 – PURPOSE OF AND NEED FOR ACTION

Purpose of the Proposed Action

The purpose is to consider opportunities for private individuals or companies to explore and develop Federal oil and gas resources through a competitive leasing process. A Federal oil and gas lease is a legal contract that grants exclusive rights to the lessee to develop Federally-owned oil and gas resources but does not authorize surface-disturbing activities or obligate the company to drill a well on the lease.

Need for the Proposed Action

The parcels considered for lease in this analysis were nominated by Expressions of Interest (EOIs) from private industry. The oil and gas leasing program managed by the Bureau of Land Management (BLM) encourages private exploration and development of domestic oil and gas reserves and the reduction of U.S. dependence on foreign sources of energy and is essential to meeting the nation's future needs for energy. The BLM's oil and gas leasing programs are codified under the authority of the Mineral Leasing Act of 1920, as amended, the Mineral Leasing Act for Acquired Lands of 1947, as amended, the Federal Land Policy and Management Act (FLPMA) of 1976, and the Energy Policy Act of 2005.

On April 13, 2004 and October 8, 2004, the BLM Eastern States Office (ESO) received requests to lease Federal minerals under the lands described on the title page. These nominated lands are privately-owned.

Management Objectives of the Action

Since the BLM does not manage the surface, the BLM's sole management objective is to make Federal minerals available for economically feasible development in an environmentally sound manner.

Conformance with BLM Land Use Plan(s)

The proposed action and the no-action alternative described in Chapter 2 of this Environmental Assessment (EA) are in conformance with the existing *Michigan Resource Management Plan (RMP)*, available at the NSFO. This plan provides the basis for considering the proposed action and alternatives (43 CFR 1610.8). The *Michigan RMP* was developed with public participation and governmental coordination, and this EA provides the site-specific environmental analysis required by the *Michigan RMP* (Page 4, Section B.2.c.).

Relationship to Statutes, Regulations and Other Plans

This EA was prepared in accordance with the NEPA of 1969 and in compliance with all applicable laws and regulations, including Council on Environmental Quality (CEQ) regulations (40 C.F.R., Parts 1500-1508), U.S. Department of the Interior (DOI) requirements (Department Manual 516, Environmental Quality), the National Historic Preservation Act, the American Indian Religious Freedom Act, the Native American Graves Protection and Repatriation Act, Executive Order 13007 (Indian Sacred Sites), guidelines listed in BLM's NEPA Handbook, H-1790-1 , and/or other Federal statutes and executive orders. Any purchaser of a Federal oil and gas lease is required to comply with all applicable Federal,

State, and local laws and regulations including obtaining all necessary permits required prior to the commencement of project activities.

Decision to Be Made

The decision to be made is whether to offer the Federal oil and gas mineral estate for competitive leasing. The BLM's policy is to promote oil and gas development if it meets the guidelines and regulations set forth by the National Environmental Policy Act of 1969 and other subsequent laws and policies passed by the U.S. Congress.

Scoping and Issues

Rationale for conducting external scoping

The BLM elected to conduct external scoping for various reasons:

- The areas proposed for leasing are widely scattered across an entire county;
- The areas proposed for leasing are close to both state and Federal public lands, and the agency managers of those lands have a great deal of information about the uses of and conditions on those public lands.

The BLM and the Forest Service signed a memorandum of understanding in 2006 that establishes cooperative scoping of oil and gas leasing requests on private surface within the administrative boundaries of the Huron-Manistee National Forests (Bureau of Land Management and U.S. Forest Service, 2006). According to this MOU, the BLM and the Forest Service will jointly analyze proposed leasing on split-estate lands within the administrative boundaries of national forests and ensure consistency in stipulations between private and Federal surface. The objective is to maintain consistency in the way leasing stipulations are applied on leases on both private and National Forest lands.

Process for conducting external scoping

In compliance with the MOU described above, the Forest Service has produced a list of standard notices and stipulations pertaining to the Huron-Manistee National Forests (HMNF) and maps showing no-surface-occupancy areas within the HMNF. The BLM sent letters to the private owners of the lands overlying the requested minerals, informing them of the lease requests and inviting them to notify the BLM with information about their lands.

Issues identified through internal and external scoping

The proposed lease areas do not intersect any of the restricted areas identified by the Forest Service. Following are the issues that were identified through internal and external scoping:

1. The EOIs contain navigable waterways. In the National Forest, development must be kept at least 300 feet from navigable waterways.
2. The EOIs contain abundant wetlands.

CHAPTER 2 – ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Introduction

The NSFO has received Expressions of Interest (EOIs) to lease 696 acres of federal mineral estate for oil and gas development in Mitchell, Hawes, Millen, and Mikado Townships, Alcona County, Michigan (Figure 1, Appendix A). Issuance of a competitive lease or leases would give the lessee exclusive rights to explore and develop Federal oil and gas minerals but would not authorize surface-disturbing activities or obligate the company to drill a well on the lease. A lease may be used to consolidate acreage to meet well spacing requirements, and a lease may be acquired for speculative value. The BLM will require applicants to adhere to lease stipulations, which have been formulated while conducting this EA and are made part of the proposed action.

Location

The sites are located on private lands in the northeastern portion of Michigan's Lower Peninsula. A legal description of the requested parcel is found on the **title page**.

Proposed Action

The proposed action is to lease the nominated parcels. If approved, a lease or leases would be offered for competitive sale with stipulations and notices generated through this process and other consultations.

Connected Action – Drilling and Production

Site-Specific Applications for Permit to Drill (APDs)

The proposed nominations, if approved, would be offered for competitive sale with stipulations and notices generated through this process and other consultations. Once a lease is awarded, the successful bidder is required to submit an Application for Permit to Drill (APD) to the BLM before any ground disturbance is authorized. In an APD, an applicant identifies a proposed drill site and provides the BLM with specific details on how and when the applicant proposes to drill the well within the constraints of the lease document. Upon receipt of an APD, the BLM conducts an onsite inspection with the applicant and, if possible, the private landowner or the surface-managing agency. NEPA and Endangered Species Act requirements must also be met at the APD stage and, in cases with potential to affect Federally-listed or State-listed species, a site-specific biological assessment is written, including the results of any required biological surveys. This is submitted to the U.S. Fish and Wildlife Service (USFWS) and the MDNR for consultation. The lessee would be required, as a condition of approval, to comply with the recommendations of these consultations.

This EA will analyze impacts to natural resources from two scenarios based on the Reasonably Foreseeable Development Scenario (RFDS) in Appendix B. The low-development scenario, which is more likely to occur, includes two wells and a total construction impact of three acres. The high-development scenario, which is not likely to occur, includes 12 wells and a total construction impact of 18 acres. *These scenarios are provided strictly for the purpose of analysis and do not represent the BLM's decision or prediction as to a number of wells that may be permitted under the proposed lease.*

Hydrocarbon Drilling Methods

Oil and gas (hydrocarbon) wells are built in two phases – drilling the borehole and completing the well. Wells may be drilled vertically if the end of the well, or *bottom hole location*, is directly below the well pad, or directionally, if the well pad is not directly above the bottom hole location. For example, Federal minerals under a state park, where drilling is not permitted, can be accessed by directional drilling from a surface location outside of the park. The same method may be used to drill horizontally, with a wellbore extending up to several thousand feet through the hydrocarbon-producing rock formation. Horizontal drilling is unlikely in this case and will not be analyzed in this EA.

Vertical Drilling

Preparation for the drilling process includes construction of a road, drilling pad, and reserve pit. Constructed access roads normally have a running surface width of 25-30 feet, the length depending upon the well's location in relation to existing roads or highways. Land is cleared and graded for pad construction. If the well is productive, additional land may be affected by pipeline construction. According to the RFDS in Appendix B, **the total disturbed area for drilling a productive vertical well would be 1.5 acres.**

Drilling operations continue around the clock, and wells may be drilled in as little as two days. During well pad construction, topsoil is stockpiled for use during restoration activities. Further details on production can be found in the RFDS.

Well Completion

Wells in the area proposed for leasing are typically completed using hydraulic fracturing, in which water and chemicals are injected at high pressure into the producing formation in order to open fissures to allow the hydrocarbons to flow out. This process in a vertical well typically consumes on the order of 500,000 gallons of water.

Production, Abandonment, and Site Reclamation

Formation water production, along with the oil and/or gas, is expected during a well's productive life, and separation, dehydration and other production processing may be necessary. This processing may require construction of temporary facilities, both on- and off-site.

A notice in the proposed lease would encourage the use of non-invasive plant species during all restoration and stabilization activities. Final seed mixtures and plantings are determined by recommendations from the BLM with approval of the landowner.

No-Action Alternative

Under the No-Action Alternative, the request to offer the proposed tract for oil and gas lease would be denied.

CHAPTER 3 – DESCRIPTION OF THE AFFECTED ENVIRONMENT

Introduction

The Decision Area includes a one-mile buffer around the EOI, the distance within which directional drilling is likely to be viable, producing a total area of 24,770 acres (Figures 1a-1d and 2, Appendix A). The Decision Area is divided into six separate areas.

The Decision Area is within the Northern Lakes and Forests Level-III ecoregion. It is within the Northwestern Lake Huron Basin. The Decision Area is within the administrative boundaries of the Huron-Manistee National Forest, though the areas proposed for lease are privately owned. Most of the Decision Area is directly accessible via improved roads or forestry roads.

Table 1. Technical Review.

Program	Reviewer	Signature	Date
Air Quality	Derek Strohl Natural Resources Specialist		6/20/13
Climate Change	Derek Strohl Natural Resources Specialist		6/20/13
Cultural/Paleontology	Jarrod Kellogg Cultural Resources Specialist		6/21/13
Environmental Justice	Kurt Wadzinski Planning & Environmental Coordinator	Kurt J. Wadzinski	6/20/2013
Farmlands	Derek Strohl Natural Resources Specialist		6/20/13
Fish and Wildlife	Derek Strohl Natural Resources Specialist		6/20/13
Floodplains	Derek Strohl Natural Resources Specialist		6/20/13
Geology/Mineral Resources/Energy Production	~~Dave Lachance~~ Jeff Nolder Geologist	JN	6/20/13
Hazardous Wastes	Derek Strohl Natural Resources Specialist		6/20/13
Invasive Species/Noxious Weeds	Derek Strohl Natural Resources Specialist		6/20/13
Native American Religious Concerns	Jarrod Kellogg Cultural Resources Specialist		6/21/13
Recreation	Derek Strohl Natural Resources Specialist		6/20/13
Socioeconomics	Kurt Wadzinski Planning & Environmental Coordinator	Kurt J. Wadzinski	6/20/2013
Soils	Derek Strohl Natural Resources Specialist		6/20/13
Sensitive Species	Derek Strohl Natural Resources Specialist		6/20/13
Vegetation	Derek Strohl Natural Resources Specialist		6/20/13

Table 1. Technical Review.

Program	Reviewer	Signature	Date
Visual Resources	Derek Strohl Natural Resources Specialist		6/20/13
Water Resources/Quality (Drinking, Surface & Ground)	Derek Strohl Natural Resources Specialist		6/20/13
Wetlands/Riparian Zones	Derek Strohl Natural Resources Specialist		6/20/13
Wild & Scenic Rivers	Derek Strohl Natural Resources Specialist		6/20/13
Wilderness	Derek Strohl Natural Resources Specialist		6/20/13

Air Quality

Alcona County meets the National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2), particulate matter ($PM_{2.5}$ and PM_{10}), and lead (Pb). These are the primary pollutants that the U.S. Environmental Protection Agency (EPA) tracks nationwide.

Climate Change

The primary indicators of interest regarding climate change are emissions of greenhouse gases (GHG), primarily water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and a few other gases of lesser importance. These gases tend to trap heat from the sun in the Earth's atmosphere, leading to global warming. The various GHGs trap different amounts of heat and persist in the atmosphere for different amounts of time. Therefore, the various GHGs have different levels of potency in causing global warming per unit volume in the atmosphere. These potencies are normalized with respect to that of CO_2 and expressed in terms of *carbon dioxide equivalent*, or CO_2e. For example, one metric ton of methane, which is 21 times as potent as carbon dioxide, represents 21 metric tons of CO_2e. Carbon dioxide and CH_4 are the most abundant GHGs in terms of CO_2e.

Because these gases circulate freely throughout Earth's atmosphere, the appropriate Analysis Area for this resource is the entire globe. The largest component of global anthropogenic greenhouse gas emissions is carbon dioxide. Global anthropogenic carbon emissions reached about 7,000,000,000 metric tons per year in 2000 and about 9,000,000,000 metric tons per year in 2008 (Boden, et al, 2010). Oil and gas production is a major contributor of greenhouse gases. In 2006, natural gas production accounted for eight percent of global methane emissions, and oil production accounted for 0.5% of global methane emissions (URS Corporation, 2010).

Cultural/Paleontology

Paleo-Indians first inhabited Alcona County and other portions of the Lower Peninsula beginning 10,000 years ago. Increased settlement began after 300 Common Era (CE) as the Hopewell Culture began to spread into Michigan from the South with its agriculture and mound construction. However, while the Hopewell influence reached north to modern Traverse County, it was not as predominate as in southern Michigan (Fitting, 1978).

By the time of initial European exploration of the area, the Pottawatomi, a people with a distinct Algonquin dialect, occupied the northern half of the Lower Peninsula. In the 1600's French explorers explored the area, creating missions and fur trading settlements, although European influence in general was low with few permanent settlements (Alcona County, 2011). However, these new incursions coincided with Iroquoian expansion, forcing the Pottawatomi to move south and west across Lake Michigan. The Ottawa from the north, and later the Ojibwa from the south and east, then moved into the region and began trading furs with the French in the northern part of the Lower Peninsula by the 1670s. By the mid-1700s, the northern Lower Peninsula was firmly in the French orbit (Stone & Chaput, 1978).

The end of the Revolutionary War brought significant changes to the Native inhabitants of modern day Michigan. Although the British were officially expelled from the area, several frontier posts remained, which coupled with American influence brought a peak to fur trading in the region. However, unlike the British who gave the Native Americans a more favorable status, the United States viewed the Native Americans of Michigan as a conquered people. This situation was exacerbated by the conclusion of the War of 1812, which all but eliminated British influence and allowed the United States to more freely deal with Native Americans as seen fit. A series of treaties between 1814 and 1825, including the Saginaw Treaty of 1819, resulted in the ceding of most of Michigan to the United States, including modern day Alcona County (Stone & Chaput, 1978).

The survey of what was initially named Newagon County was completed in 1840, allowing for orderly settlement. Alcona County was organized in 1869 from portions of neighboring counties. During this time, commercial fishing was the primary industry of the county followed by lumber, which peaked around 1910. Lumber companies built the first railroads during the late 1800s to move lumber and logs to ports along the Great Lakes for shipping. Agriculture supplanted lumber as the primary industry before declining during the mid-1900s (Alcona County, 2011).

Alcona County has 21 properties listed in the National Register of Historic Properties, most of which are structures, with two farms and one cemetery. None are known to exist within the APE.

The BLM would consider potential cultural resources and paleontological resources, and any affect to historic properties, with each APD that is submitted under any lease(s) that would be approved pursuant to this EOI. This may include, but may not be limited to, archaeological surveys, archeological site and survey record searches, consultation with the Michigan State Historic Preservation Office, and appropriate Native American Tribes.

Paleontology

Michigan's Lower Peninsula is comprised primarily of sedimentary rock deposited from a shallow sea during the Paleozoic Era. Fossils of brachiopods, trilobites, crinoids, and corals are found throughout Michigan from this period. Whale fossils have also been discovered. Pleistocene fossils, from the period after the last glacial retreat, are also found throughout Michigan, most notably in the form of mastodons.

No known paleontological localities are located in or immediately adjacent to the current proposed EOI. If the lease is approved, a paleontological records search will be required, as well as a report detailing the likelihood of finding fossils. No further analysis is currently warranted.

Environmental Justice

Executive Order 12898 (1994) formally requires Federal agencies to incorporate environmental justice as part of their missions. Specifically, it directs agencies to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority or low-income populations.

The Decision Area is located in a rural area. According to the RFDS, potential drilling within the project area is not anticipated to involve more than one well. The proposed action will not create disproportionately high and adverse human health or environmental effects on minority populations and low-income populations, including tribal populations. No further analysis is warranted for Environmental Justice factors on this project.

Farmlands

The Decision Area contains 1,200 acres of land classified as *prime farmland*, 460 acres classified as *farmland of local importance* and 2,220 acres classified as *prime farmland if drained*. These are most abundant in the eastern and southern portions of the Decision Area.

Fish and Wildlife

The Decision Area consists mostly of forests, wetlands, and cleared fields (See **Floodplains, Wetlands, and Riparian Zones** and **Vegetation** sections below). The Decision Area harbors populations of diverse types of wildlife, including deer, grouse, rabbit, turkey, beaver, nesting birds, reptiles and amphibians, fish, and insects.

Floodplains, Wetlands, and Riparian Zones

The Decision Area contains 5,370 acres of wetlands. Three-quarters of these wetlands are forested wetlands, and the remainder is composed of shrubby wetlands, marshes, and open water. The wetlands are distributed across all segments of the Decision Area.

Geology/Mineral Resources/Energy Production

In the Decision Area, up to 800 feet of glacial material is underlain by about three kilometers of sedimentary rock and crystalline basement rocks of the Granite-Rhyolite Province. The region is situated within the northern Michigan Basin, a roughly circular sedimentary basin that encompasses the Lower Peninsula, the eastern portion of the Upper Peninsula, and parts of adjacent states. Structure is dominated by a gentle southwesterly dip toward the basin center. No obvious structural features occur in the area.

Production from the Prairie du Chien group in Alcona County was first established in 1990, and the pool was depleted within a few years. Antrim Shale development in the area began in 1993 and continues to be the only productive formation in the county, producing in wells north and east of the requested

federal tracts. The production that is predicted in the RFDS (Appendix B) is expected to be concentrated in just two of the separate portions of the Decision Area, as shown in Figure 2 (Appendix A).

Hazardous Wastes

The Michigan Department of Environmental Quality's *Environmental Mapper* (Michigan Department of Environmental Quality, 2012) shows one open underground storage tank and one closed underground storage tank in the Decision Area, both within the small community of Barton City.

Invasive Species/Noxious Weeds

Many invasive species are present in and around the Decision Area and throughout Michigan and the Midwest. The Natural Resources and Environmental Protection Act 451 of 1994, Sections 324.41301-324.41325, regulates activities that may spread invasive species in Michigan. The Emerald ash borer (*Agrilus planipennis*) is widespread throughout Lower Michigan, and it is spread by people moving infested wood and wood products. All of Lower Michigan is under a quarantine that restricts the movement of wood and wood products to locations outside the quarantined area.

Many noxious weeds are spread by land-disturbing activities and by vehicle traffic. These species tend to be more abundant in areas with high road density. Roadsides throughout the Decision Area are likely locations for invasive species, since cars often spread seeds and other plant parts. The most likely locations for most of these species are in and around areas disturbed by road construction and land clearing.

Native American Religious Concerns

The BLM sent letters on June 7, 2013, to twelve Indian tribes that have a known connection to the Decision Area, asking whether they can identify any concerns that would need special consideration with respect to the proposed action. To date, the BLM has not received any responses from the contacted Tribes. The BLM's responsibility is limited to the area of surface disturbance if, or when, a proposal for development is submitted. The BLM would consider potential Native American religious concerns with each APD that is submitted under any lease(s) that would be approved pursuant to this EOI. No further analysis is warranted.

Recreation

The Decision Area contains 2,240 acres of land in the Huron-Manistee National Forest and 4,970 acres of state-owned land that is open to recreational use, including the 59-acre Jewell Lake Recreation Area (Figure 3, Appendix A). This campground is open from May 20 to September 10 and offers access to Jewell Lake. One and two-tenths miles of the H108-02 (DNR-966) snowmobile trail and 0.6 mile of the Jewell Lake Nature Trail (hiking) pass through the Decision Area. The Decision Area contains 20 miles of trout streams, 118 acres of Jewell Lake, an entire 62-acre, unnamed lake, and another entire 21-acre lake called Millikin Lake. These other lakes do not appear to have public boat access, but they are adjacent to public lands.

Socioeconomics

Alcona County is located in the northeastern portion of Lower Michigan, borders Lake Huron on the east and borders the following counties: Alpena (north), Iosco (south), and Oscoda (west). Alcona County is 674.59 square miles, with a population density of approximately 16 persons per square mile, considerably lower than that for the state as a whole (174). Its estimated population in 2012 was 10,635 a 2.8% decrease from the 2010 census (U.S. Census Bureau, 2013). The county seat is located in Harrisville, on the eastern shore of the county. The project area encompasses 696 acres of scattered parcels located within Mitchell, Hawes, Millen, and Mikado Townships, and a one-mile buffer around the parcels, totaling approximately 24,770 acres.

The distribution of population in Alcona County is 96.8% White, 1.2% Hispanic or Latino, 0.8% Two or More Races, 0.7% American Indian or Alaska Native, 0.2% Black, and 0.2% Asian. 85.6% of Alcona County residents are 18 years of age or older, with 32.4% aged 65 years or older; the State of Michigan has a population 18 years of age and older of 76.8%, with 14.1% aged 65 or older (U.S. Census Bureau, 2013).

In 2011, there were 11,040 housing units in the county with a homeownership rate from 2007-2011 of 90.2%, which is about 17% higher than the state as a whole. The median value of these owner-occupied homes was $114,700 for the period 2007-2011, much lower than that of the state ($137,300) (U.S. Census Bureau, 2013). However, in 2011, 52.6% of housing units were categorized as "for seasonal, recreational, or occasional use," a vastly higher amount than for the United States as a nation (3.7%) (U.S. Department of Commerce, 2012b).

For the period 2007-2011, median household income was $35,490 for Alcona County, about $13,000 lower than for the state. Approximately 15% of persons lived below the poverty level, about equivalent to the 15.7% statewide that live below the poverty level. In 2011, over 56% of Alcona County households received some form of Social Security payment, 40% of households received retirement income, and 12.8% of households received benefits from the Supplemental Nutrition Assistance Program (SNAP). The figures for Social Security payments and retirement income are significantly above the national averages for these respective categories; SNAP payments are slightly above the national average (U.S. Department of Commerce, 2012c). 85.9% of the county population 25 years of age and over graduated from high school, 2.5% lower than the state total. About 13% of county residents 25 years of age and older have a bachelor's degree compared to 25.3% for Michigan as a whole. About 2.1% of residents speak a foreign language in the home; in total, about 9% of Michigan residents speak a foreign language in the home (U.S. Census Bureau, 2013).

The seasonally adjusted unemployment rate for Alcona County was 17.3% in February 2013, a 2.6% increase from the 14.7% rate in February 2012 and much higher than Michigan's seasonally adjusted unemployment rate of 8.8% for February 2013. However, it is evident that employment in Alcona County increases during the tourist season in summer-early fall, as the rate fluctuated between 12% in April 2012 and 9.9% in September 2012. This pattern also held during the previous three years (U.S. Department of Labor, 2013).

Between 2001 and 2011, all industry sectors lost employment (defined as wage and salary jobs and proprietors) in Alcona County. The non-services-related industries lost the least amount of employment (-41); services-related industries lost 54 total jobs for the period. Non-services-related industries that gained employment were led by mining (+130) and farm (+3); construction (-76) and manufacturing (-60) lost the most employment from 2001-2011. Services-related industries that gained employment were led by health care and social assistance (+64) and real estate and rental and leasing (+37); retail trade (-96) and accommodation and food services (-66) led those industry sectors that lost employment from 2001-2011. Employment in the government sector also lost 68 total jobs during the period (U.S. Department of Commerce, 2012a).

In Alcona County, the mining industry increased employment by 1300% during the period 2001-2011, adding 130 wage and salary jobs and proprietors during that time, representing 4% of all employment in Alcona County in 2011 (U.S. Department of Commerce, 2012a). The average annual wage for the mining industry in Alcona County is unknown, but nationwide the average mining industry wage in 2011 was $97,237 (U.S. Department of Labor, 2012).

Demographically, Alcona County is less affluent, has much fewer college-educated residents, is more homogenous and much older than the average county in the state of Michigan.

Soils

The Decision Area contains almost 4,000 acres of soils having slopes of 12 percent or greater, concentrated mostly in the 27 North townships. Since most of these soil types are sandy, they are likely to be highly erosion-prone if cleared or used for unpaved roads.

Sensitive Species

Four species are listed on the USFWS list of endangered species known to occur in Alcona County, Michigan (U.S. Fish and Wildlife Service, 2012). One of them, Pitcher's thistle (*Cirsium pitcheri*), dwells on dunes and is clearly not present in the Decision Area. The remaining three may be present in the Decision Area:

- Kirtland's warbler (*Dendroica kirtlandii*), an endangered bird species that nests in young stands of Jack pine (*Pinus banksiana*)
- Eastern massasauga (*Sistrurus catenatus*), a candidate snake species that uses various open and shrubby wetland habitats and nearby uplands
- Hine's emerald dragonfly (*Somatochlora hineana*), an endangered insect species that uses wet meadows and streams that are connected to groundwater from dolomitic bedrock

There are also 31 additional State-listed species that have been reported in Alcona County and that may be present in the EOI (Michigan Department of Natural Resources, 2013). Several of these species dwell primarily in wetland habitats, and a few of them dwell on dunes, which are not present in the Decision Area.

Vegetation

The National Forest lands within the Decision Area include 500 acres of bigtooth aspen, 300 acres of quaking aspen, 200 acres of red pine, 600 acres of forested wetland vegetation types, and lesser amounts of upland hardwoods and conifers. Aerial photos show the northern and western portions of the Decision Area to be almost entirely forested, while the vegetation becomes more open and agricultural to the south and east.

Visual Resources

Most of the Decision Area is undeveloped forest that is broadly accessible by improved roads. Lands within the Decision Area include large patches of cultivated vegetation, such as pine plantations, regenerating aspens, croplands, and old fields. A small urban area makes up the unincorporated community of Barton City.

Water Resources and Water Quality

Wetlands are described in the **Floodplains, Wetlands, and Riparian Zones** section above. Lakes in the Decision Area are described in the **Recreation** section. The Decision Area contains 45 water wells, ranging in depth from 29 feet to 255 feet.

Wild and Scenic Rivers and Wilderness

The Decision Area includes three miles of the Manistee River, a designated National Scenic River (Figure 3, Appendix A).

CHAPTER 4 – ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES

Introduction

This chapter assesses potential consequences associated with direct, indirect, and cumulative effects of the Proposed Action. As detailed in the Chapter 2, this analysis will consider a low-development scenario of two wells, which is more likely to occur, and a less likely high-impact scenario of twelve wells. The low-impact scenario would result in the clearing of three acres, and the high-impact scenario would result in the clearing of 18 acres. The No-Action Alternative, which would be to withhold the Federal minerals from leasing, would have no impacts on resources.

General Direct Impacts on All Resources:
The action of leasing the nominated parcels would, in and of itself, have no direct impact on resources. Any potential effects on resources from the sale of leases would occur during lease exploration and development activities. At the time of this review, it is unknown whether a particular lease parcel would be sold and a lease issued.

General Indirect Impacts on All Resources:
Oil and gas exploration and development activities such as construction, drilling, production, infrastructure installation, vehicle traffic and reclamation are indirect impacts of leasing and production

of federal minerals on the nominated parcels in the Proposed Action. It is unknown when, where, how, or if future surface disturbing activities associated with oil and gas exploration and development such as well sites, roads, facilities, and associated infrastructure would be proposed. It is also not known how many wells, if any, would be drilled and/or completed, the types of technologies and equipment that would be used, and the types of infrastructure needed, for production of oil and gas. Thus, the types, magnitude and duration of potential impacts cannot be precisely quantified at this time, and would vary according to many factors. The potential impacts from exploration and development activities would be analyzed after receipt of an APD or sundry notice.

General Cumulative Impacts on All Resources:
Cumulative impacts are those impacts resulting from the incremental impact of an action when added to other past, present, and reasonably foreseeable actions regardless of what agency or person undertakes such other actions (40 CFR 1508.7). The ability to assess the potential cumulative impacts at the leasing stage for this project is limited for many resources due to the lack of site specific information for potential future activities. Upon receipt of an APD for any of the lease parcels addressed in this document, more site-specific planning would be conducted in which the ability to assess contributions to cumulative impacts in a more detailed manner would be greater due to the availability of more refined site-specific information about proposed activities.

Air Quality

Air quality modeling is directed under an MOU between the Departments of the Interior and Agriculture and the U.S. Environmental Protection Agency. This MOU directs that air quality modeling will be conducted for actions that meet certain geographic or emissions-related criteria:

- Creation of a substantial increase in emissions,
- Material contribution to potential adverse cumulative air quality impacts,
- Class I or sensitive Class II Areas,
- Non-attainment or maintenance area,
- Area expected to exceed National Ambient Air Quality Standards (NAAQS) or Prevention of Significant Deterioration (PSD) increment.

The proposed action is not expected to produce amounts of any of these pollutants in excess of *de minimis* amounts, which are defined by the U.S. Environmental Protection Agency (2011a) as maximum amounts that will not threaten a state's efforts to attain or maintain conformity with the National Ambient Air Quality Standards (NAAQS). Trucks using temporary roads are expected to create dust, depending on the volume of traffic, rainy or dry weather conditions, and the operators' efforts to suppress dust by wetting the roads. If an operator hauls water to a drill pad instead of obtaining the water from a dedicated well, then there will be an increase in truck traffic roughly in proportion to the volume of water used.

Climate Change

Many aspects of oil and gas production emit greenhouse gases (GHG). The primary aspects include the following:

- Fossil fuel combustion for construction and operation of oil and gas facilities – vehicles driving to and from production sites, engines that drive drill rigs, etc. These produce CO_2 in quantities that vary depending on the age, types, and conditions of the equipment as well as the targeted formation, locations of wells with respect to processing facilities and pipelines, and other site-specific factors.
- Fugitive methane – methane that escapes from wells (both gas and oil), oil storage, and various types of processing equipment. This is a major source of global methane emissions. These emissions have been estimated for various aspects of the energy sector, and starting in 2011, producers are required under 40 CFR 98, to estimate and report their methane emissions to the EPA (U.S. Environmental Protection Agency, 2013).
- Combustion of produced oil and gas – it is expected that drilling will produce marketable quantities of oil and/or gas. Most of these products will be used for energy, and the combustion of the oil and/or gas would release CO_2 into the atmosphere. Fossil fuel combustion is the largest source of global CO_2.

In recent years, many states and other organizations have initiated GHG inventories, tallying GHG emissions by economic sector. Links to statewide GHG emissions inventories are available (U.S. Environmental Protection Agency, 2012) as well as guidelines for estimating project-specific GHG emissions (U.S. Environmental Protection Agency, 2013). A GHG emissions estimate will be conducted at the APD phase.

Many oil and gas operators are already participating in Natural Gas STAR, a voluntary EPA program that identifies sources of fugitive methane and seeks to minimize fugitive methane through careful tuning of existing equipment and technology upgrades. The BLM would encourage operators to participate in this voluntary program.

Fish and Wildlife

The proposed action could potentially result in the clearing of between three and 18 acres of land, which may include either forested or open habitat. Impacted areas would be reclaimed at the end of their use as well pads or construction areas. The area impacted by clearing a forest is typically larger than just the area cleared. Clearing a corridor for a road or pipeline separates a block of forest into smaller blocks, a process called *fragmentation*. A fragmented forest contains far less useful habitat than an equally-sized block of continuous forest. This is due in part to the fact that many species will not cross the open corridors, where they are more susceptible to predation than in the forest. A closely related concept to fragmentation is *edge effects*, which refers to the differences in climate, predation exposure, and other factors that exist up to 100 meters into a forest from the edge. Edge effects increase the area impacted beyond just the area directly disturbed.

Floodplains, Wetlands, and Riparian Zones

As stated in a lease notice (Appendix C), operators proposing to drill will be required to verify the absence of wetlands or to take steps to avoid impacting them, in compliance with Executive Order 11990, the Clean Water Act, and state law. This will restrict direct filling of wetlands without necessarily preventing access to minerals under the wetlands, as wells could potentially be directionally drilled from

upland locations. The BLM will closely analyze areas proposed for drilling in APDs, since regional wetland inventories often do not capture small wetlands.

Geology/Mineral Resources/Energy Production

Since the Antrim formation is considered a mature play, with its boundaries and resources well inventoried, it is unlikely that the proposed action will result in the discovery of important new hydrocarbon resources. The proposed action will continue the ongoing depletion of the play.

Hazardous Wastes

Drilling introduces various chemicals into the environment that become waste products after use. These include drilling and completion fluids, which may contain heavy metals, hydrochloric acid, hydrocarbons, and brine. These materials are typically stored temporarily on-site. Michigan regulations require that field fluid wastes be injected into underground formations that are isolated from freshwater by impervious strata. These wastes are exempt from the Federal definition of hazardous waste and are referred to as *special wastes* by the EPA. Under certain circumstances, wastes may be disposed of in the annular spaces between strings of casing. Also, brines that are rich in calcium and that contain minimal concentrations of hydrogen sulfide and a few aromatic hydrocarbons may be used for ice and dust control and road stabilization (Michigan Department of Environmental Quality, 2013b). Environmental impacts to the Decision Area may occur under several circumstances. Chemicals may be spilled or leaked from a temporary storage facility or container used for transportation. Chemicals may contaminate groundwater resources in the event of improper design, construction, or use of an injection well intended for disposal of wastes. Surface introduction of restricted amounts of hydrogen sulfide and hydrocarbons may occur in the event that the State of Michigan permits the surface spreading of brines, as provided for in the State of Michigan's regulations.

Invasive Species/Noxious Weeds

Construction of roads, well pads, pipelines, and other structures associated with oil and gas development can be expected to spread invasive species and/or noxious weeds in two general ways. First, increased vehicle traffic may carry seeds, plant parts, or other live organisms that may become established within the Decision Area. This could introduce new species from outside the Decision Area or from one part of the Decision Area to another. The risk of such propagation may be estimated in terms of the area disturbed, the volume of vehicle traffic, and the presence of invasive species in locations along the routes that traffic uses on the way to and within the Decision Area. While the last two variables would be unreasonable to attempt to quantify without site-specific analysis, we may consider various scenarios of infestation. Areas that are disturbed by pads or other development would be susceptible to direct infestation by non-native, invasive plant species that thrive in disturbed conditions. However, many of these species are able to propagate into undisturbed areas, and large areas of otherwise intact habitat could be infested by plant parts that are introduced into the Decision Area on equipment and vehicles. Therefore, it is possible that far more than the directly-disturbed area of land could be infested in non-native, invasive plant species as a result of the disturbance.

The second way that oil and gas development may result in the propagation of invasive species is by creating open corridors and forest edges that are highly susceptible to edge-loving species. Where the

forest canopy is broken, invasive species that thrive in sunny conditions may thrive. This will likely not be a major factor in this situation, since the high proportion of cleared, agricultural land in the Decision Area makes it unlikely that an operator would choose to drill in a forest. The BLM would incorporate appropriate BMPs (Wisconsin Council on Forestry, 2012) as conditions of approval into permits to drill in order to prevent the introduction or spread of invasive species into affected areas.

Recreation

Well construction, operation, and, eventually, abandonment will create noise and change views in ways that will make the area less attractive to people who desire solitude and natural surroundings. Also, the noise from construction will drive away game animals.

Noise that is generated by construction or operation is naturally damped as it travels through an environment, and the nature of the environment through which it travels, such as open air, buildings, or woods, determines the rate at which noise is damped. Finally, the time during which the woods are disturbed with noise affects the value of the impact, since hunters and wildlife are present and/or active at some times of the year more than at others.

Construction equipment generates between 70 and 115 decibels (dB) (Bureau of Land Management, 1998), and a forest may damp noise by five to 20 dB per 100 feet. Hunters or game animals are unlikely to tolerate noise above 40 dB. Using these figures, the affected radius with respect to hunting around construction operation would range from 150 feet to 1500 feet (0.28 mile). The damping effect of the woods would be at its highest during summer, when leaves aid in damping the sound, or in winter under thick snow cover. The areas to be affected by these minimum and maximum radii are, respectively, 1.6 acres and 160 acres per point source of the described construction noises.

These noises are expected to continue non-stop for 30 days for each well that is constructed. The time of year of construction has a critical effect on the value of the disruption. For example, noise created at the height of a hunting season would impact the hunting in the affected area. It may also force animals to move to other, nearby areas, making them easier for hunters to target and improving hunting success. If the noise were created outside of a hunting season, the animals may reacclimate to the site and behave naturally by the time hunting begins, and hunters may not even be aware of the disturbance if they do not see the well(s).

Mitigation of Effects

As the BLM receives and processes APDs, the BLM, in consultation with MDNR, operators, and other parties, will seek to minimize auditory or visual impacts on recreational resources through simple, reasonable measures, such as restricting construction to certain times of year or requiring the preservation of plants that provide visual screening.

Socioeconomics

Local economic effects of leasing federal minerals for oil and gas exploration, development, and production are influenced by the number of acres leased and estimated levels of production.

The acres leased, number of wells drilled, and level of production all influence local employment, income, and public revenues (indicators of economic impacts).

Federal oil and gas leases generate a one-time lease bonus bid as well as annual rents. The minimum competitive lease bid is $2.00 per acre. If parcels do not receive the minimum bid, they may be leased later as noncompetitive leases that don't generate bonus bids.

Lease rental is $1.50 per acre per year for the first five years and $2.00 per acre per year thereafter. Typically, oil and gas leases expire after 10 years unless held by production. During the lease period annual lease rents continue until one or more wells are drilled that result in production and associated royalties.

For the state of Michigan in 2010, average wellhead prices were $74.91 per barrel (bbl.) for crude oil and $3.79 per thousand cubic feet (MCF) for natural gas. Statewide average output per producing well was 1.652 bbls. of crude oil and 12,891 MCF for natural gas from 3,885 producing crude oil wells and 10,253 producing natural gas wells, respectively. In 2010, the state of Michigan ranked 17th in crude oil production and 16th in natural gas production in the United States. In 2010, Alcona County ranked as the eighth-highest oil and gas producing county in Michigan, accounting for approximately three percent of all Michigan oil and gas production (Independent Petroleum Association of America, 2012).

Federal revenues from oil and gas production disbursed to the state of Michigan between 2007 and 2012 averaged $645,363 per year (U.S. Department of Interior, 2013a). From this amount, revenues are disbursed to each local county of production. These revenues help fund traditional county functions such as enforcing laws, administering justice, collecting and disbursing tax funds, providing for orderly elections, maintaining roads and highways, providing fire protection, and/or keeping records. Other county functions that may be funded include administering primary and secondary education and operating clinics/hospitals, county libraries, county airports, local landfills, and county health systems.

In 2012, Alcona County received $100,185 for payments in lieu of taxes (PILT) (U.S. Department of Interior, 2013b) and an additional $109,392 in Forest Service (25% fund) payments, which must be used to fund roads and schools (U.S. Department of Agriculture, 2013)on federal lands. Payments in lieu of taxes compensate county governments for non-taxable federal lands within their borders. Some of the revenue generated by oil and gas production on the federal mineral estate in Alcona County would be added to these totals. Additionally, a severance tax is levied by the state of Michigan on each barrel of crude oil or each thousand cubic feet of natural gas produced. In 2010, Michigan received over $57 million in severance taxes from all oil and gas produced in the state (Independent Petroleum Association of America, 2012) and some of this money was disbursed to each county.

The proposed action and the associated RFDS indicate that a total of twelve wells could potentially be drilled on these parcels, but most likely no more than two would ever be drilled. If the lease is sold and it leads to actual well drilling and economic production, it would likely bring modest revenues in the form of royalty payments, severance taxes, and rent monies to the state and county. Economic production would provide wages and salaries to employees, maintenance staff, and contractors employed in drilling wells, and sales to area hotels, restaurants, and other businesses that serve drillers for the duration of drilling and similar construction-related benefits later as wells are abandoned and sites restored.

Exploration, drilling and production could create an inconvenience to people living adjacent to leases due to increased traffic and traffic delays, and light, noise and visual impacts. This could be especially noticeable in rural areas where oil and gas development has not occurred previously. The amount of inconvenience could depend on the activity affected, traffic patterns within the area, noise and light levels, length of time and season these activities occur, etc. In addition, competition for housing could occur in some communities. Considering the scale of oil and gas leasing and production in Alcona County, cumulatively, the proposed action should have a minimal effect upon the lives of local residents.

Soils

Because permitted well pads could be scattered at various locations throughout the Decision Area, it is impossible to determine how much disturbance would take place on steep slopes and potentially highly erodible soils. If an operator were to apply for a permit to drill on a soil unit with a severe erosion hazard, the BLM would incorporate soil-conserving BMPs as conditions of approval into the drilling permit. The Michigan DNR and DEQ have compiled a guide to using BMPs to prevent erosion (Michigan Department of Natural Resources and Michigan Department of Environmental Quality, 2009). The Michigan water quality BMPs address several activities that are common in oil and gas drilling, such as building temporary roads and clearing land. The BLM would require the use of appropriate BMPs, through consultation with the MDNR, as conditions of approval for APDs.

Sensitive Species

Since stipulations will prohibit surface occupancy in wetlands, habitat-related impacts to species that dwell in wetlands are not expected to result from the proposed action. Lessees would be required to conduct surveys of areas that may contain endangered species, paying special attention to open wetlands and adjacent habitats, and to adhere to the recommendations provided by the Fish and Wildlife Service for avoiding and minimizing impacts to species.

Kirtland's warbler populations in Michigan have responded positively to habitat conservation efforts on public lands, and it is expected that the species will be delisted in the future due to these efforts. If a lessee proposes to impact young stands of Jack pine, the BLM will consult with the U.S. Fish and Wildlife Service before permitting the action, but it is expected that impacting small stands on private lands would not adversely impact the species.

Vegetation and Visual Resources

Impacts for vegetation and visual resources are combined because the primary visual quality of the Decision Area is defined by the vegetation or the industrial activities that replace the vegetation. A well in an agricultural area would be visible from throughout the field, resulting in an industrial element being present in an otherwise agricultural setting. If a well were to be constructed in a forested area, it would be visible from only a short distance due to the forest cover. If we assume that the two-acre well pad construction site is roughly square-shaped and that the well pad will be visible from up to 100 feet into the forest, then the well pad would convert two acres of forest to an industrial appearance. If a well were productive, the well pad would then be reduced in size, and the area no longer in use would be restored with native vegetation or other vegetation appropriate for screening and other site-specific needs.

Cumulative Impacts to Vegetation and Visual Resources

Most of the forested stands in the Decision Area are prescribed to be harvested within the foreseeable future. Well construction in a forest would have a greater impact than the impact of selective or clear-cut logging, described as follows:

- Complete vegetation removal – while prescribed forestry practices leave selected trees as well as shrubs and herbaceous vegetation, well pad construction would result in total clearing.
- Retention of cleared areas – while clearcut areas would be allowed, under normal forestry use, to regenerate or would be actively planted, well pads would be maintained in a cleared state for the duration of construction or for the well's life.

Water Resources and Water Quality

Construction of well pads produces water quality impacts similar to those from other types of construction, such as increased total suspended solids downstream of the sites. Lakes, streams, and wetlands will be protected from direct impacts by lease stipulations, and the same Best Management Practices that are applied to protect potentially highly erodible soils will be used to protect surface waters from runoff.

Some of the water that is used in hydrofracture remains in the producing formation, and some of that water, known as *produced water* or *frack water*, returns to the surface and must be treated for reuse or injected into deep disposal wells.

Both hydrofracture and deep-well disposal take place in formations thousands of feet below the lowest potable water, making contamination of potable water supplies unlikely (Abdalla, 2012). Fluids have been found not to migrate such long distances through single fractures, but it is feasible that multiple fractures may permit migration over longer distances (Mooney, 2011). Likewise, natural fissures in the bedrock may allow fluids to travel toward potable water supplies. Fractures may also connect to existing wells, allowing contaminants to travel through the wells' annular spaces to fresh water aquifers. These spaces are sealed with cement, and failure of these cement seals is considered to be an important vulnerability in well construction and permitting.

There is anecdotal evidence of fracking chemicals contaminating drinking water wells (Lustgarten, 2011), and there are studies demonstrating that horizontal drilling in shale gas formations does not contaminate them (Boyer, 2012). The U.S. EPA is planning to conduct a study of the issue (USEPA, 2011), and the BLM will continue to consider ongoing scientific evidence as it becomes available throughout the APD process.

As described in Chapter 2, drilling and completion phases consume quantities of water that are regulated by the State of Michigan. Anyone wishing to withdraw water at a rate of more than 70 gallons per minute must use the online *Michigan's Water Withdrawal Assessment Tool* (Institute of Water Research, 2013) and obtain a registration for the withdrawal. Depending on the need and local availability of groundwater, water would likely be obtained from a well or be delivered from a remote source by a pipeline or trucks. The volume of water required would depend on the completion methods used and depth of the oil/gas well, and the impacts of using a certain volume of water would depend upon the aquifer characteristics and the aquifer's proximity to surface water resources.

PERSONS, GROUPS, AND AGENCIES CONSULTED

Consultation and Coordination

List of Persons, Agencies and Organizations Consulted

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
U.S. Department of Agriculture, Forest Service, Huron-Manistee National Forests	Lease stipulations and restricted areas in Huron-Manistee National Forests	See **Appendix C - Stipulations**.
Brian D. Conway, State Historic Preservation Officer	Antiquities Act, Section 106 of the National Historic Preservation Act, 36 CFR 800 (as amended)	No response to date.
Kurt Perron, Chairman Bay Mills Indian Community 12140 West Lakeshore Drive Brimley, MI 49715	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response to date.
Alan Shively, Chairman Lac Vieux Desert Band of Lake Superior Chippewa Indians P.O. Box 249 Watersmeet, MI 49969	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response to date.
Aaron Payment, Chairman Sault Ste. Marie Tribe of Chippewa Indians 523 Ashmun St. Sault Ste. Marie, MI 49783	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders	No response to date.

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
Dexter McNamara, Chairman Little Traverse Bay Bands of Odawa Indians 7500 Odawa Circle Harbor Springs, MI 49740	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response to date.
Alvin Pedwaydon, Chairman Grand Traverse Band of Ottawa & Chippewa Indians 2605 N. West Bay Shore Dr. Peshawbestown MI 49682-9275	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response to date.
Kenneth Meshigaud, Chairman Hannahville Indian Community N14911 Hannahville B-1 Rd. Wilson MI 49896	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders	No response to date.
Homer Mandoka, Tribal Council Chairperson Nottawaseppi Huron Band of Potawatomi 2221 1-½ Mile Road Fulton, MI 49052	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response to date.

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
D.K. Sprague, Chairman Match-E-Be-Nash-She-Wish Band of Pottawatomi Indians PO Box 218 Dorr, MI 49323	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response to date.
Matthew Wesaw, Mekko Pokagon Band of Potawatomi Indians 58620 Sink Road, Box 180 Dowagiac, MI 49047	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response to date.
Warren Swartz, Jr., President Keweenaw Bay Indian Community 16429 Beartown Rd. Baraga, MI 49908	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	BLM received letter from Tribe dated June 18, 2013 stating no properties of interest regarding religious or cultural sites, but Tribe wishes to be notified if artifacts or human remains are discovered.
Dennis Kequom, Chief Saginaw Chippewa Indian Tribe 7070 East Broadway Road Mt. Pleasant, MI 48858	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response to date.

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
Larry Romanelli, Tribal Ogema Little River Band of Ottawa Indians 375 River Street Manistee, MI 49660	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other by pads or other development statutes and executive orders.	No response to date.

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Preparer	6/20/2013 Date
Planning & Environmental Coordinator	6/20/2013 Date
Assistant Field Manager, Natural Resources	21 JUN 2013 Date

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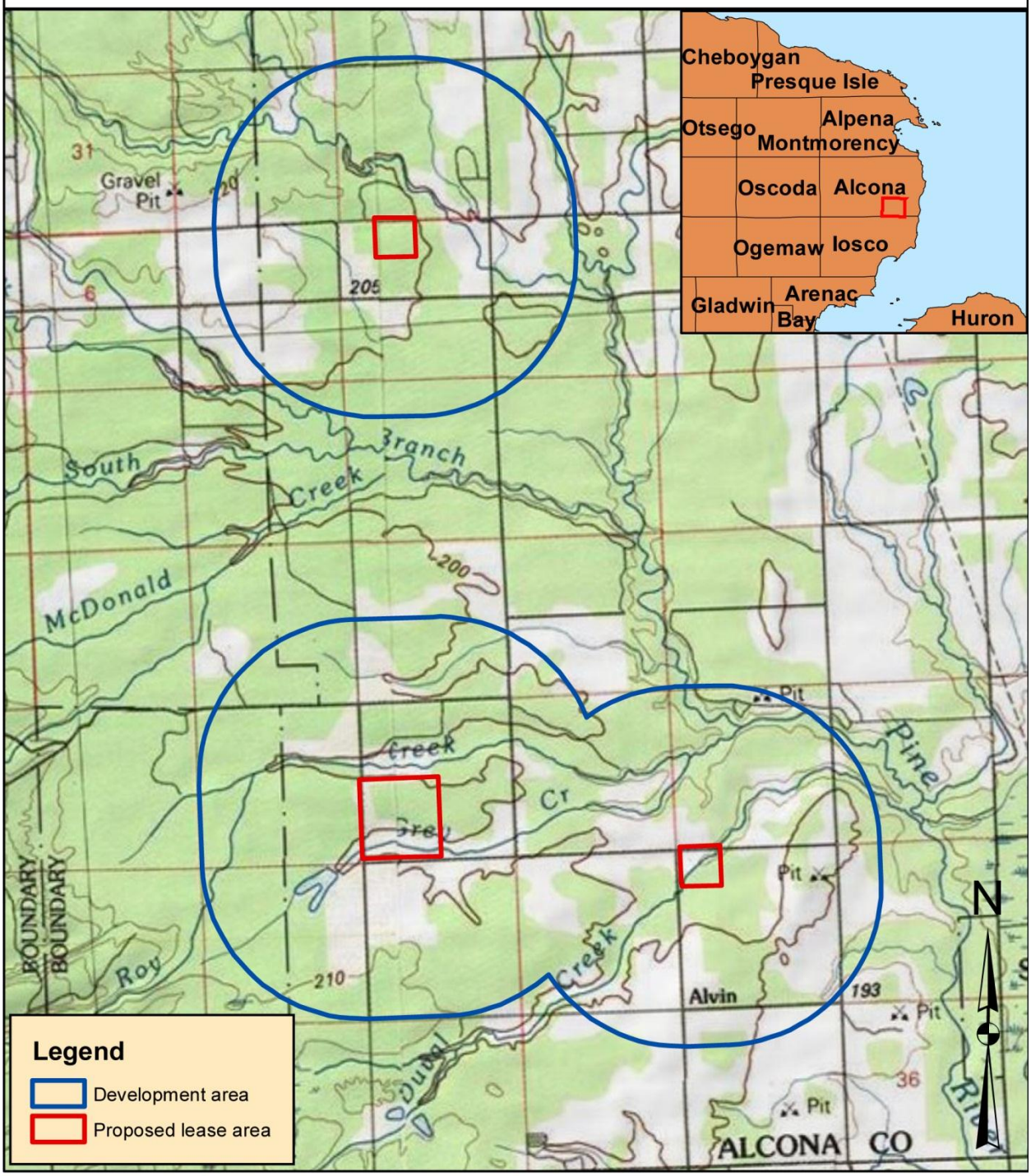
APPENDIX A – Figures

Figure 1a. Locations of EOIs 247/270 in T25N, R8E.



0 0.75 1.5 3 Miles

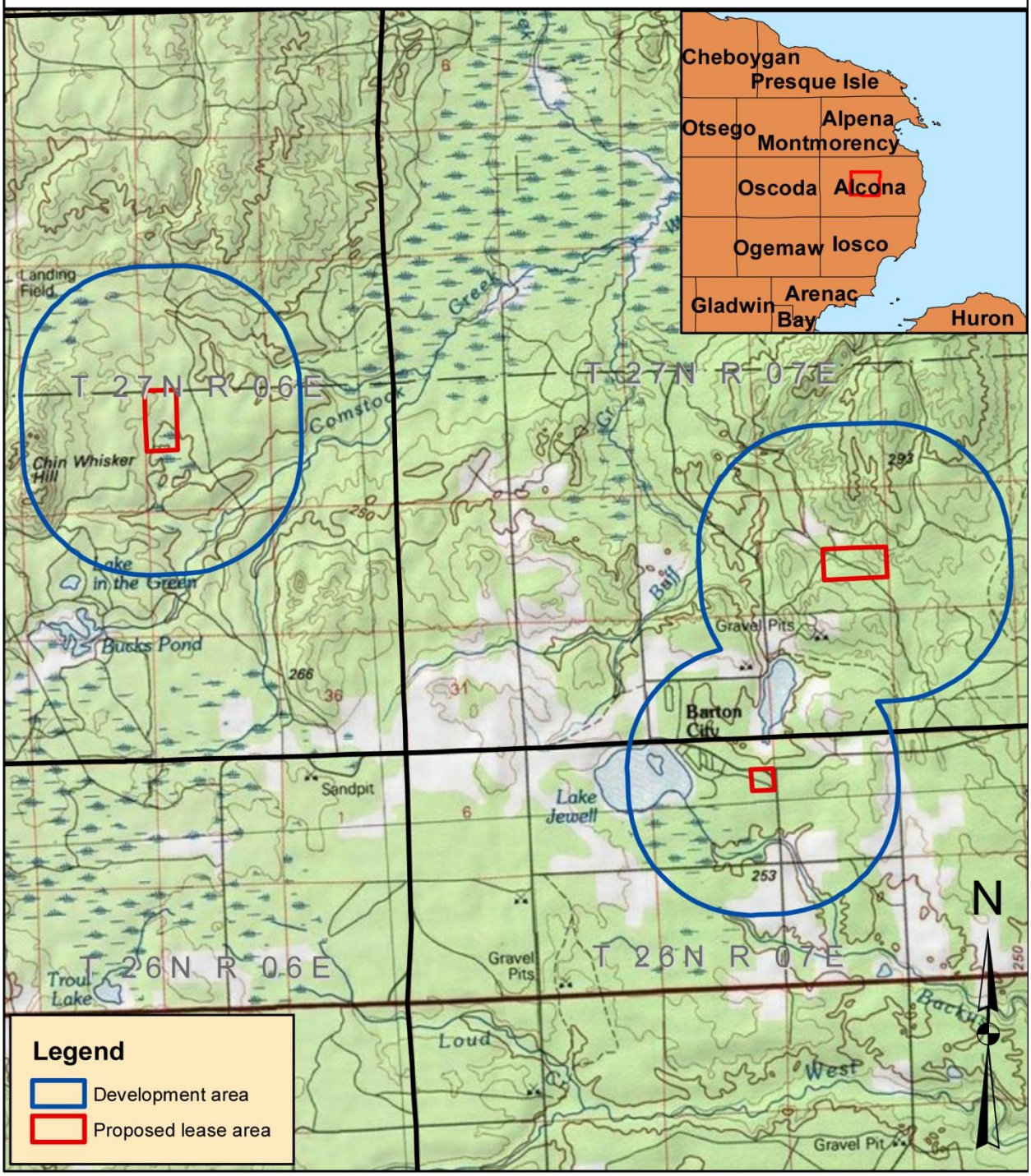
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure 1b. Location of EOIs 247/270 in T27N, R8E.

0 0.5 1 2 Miles

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

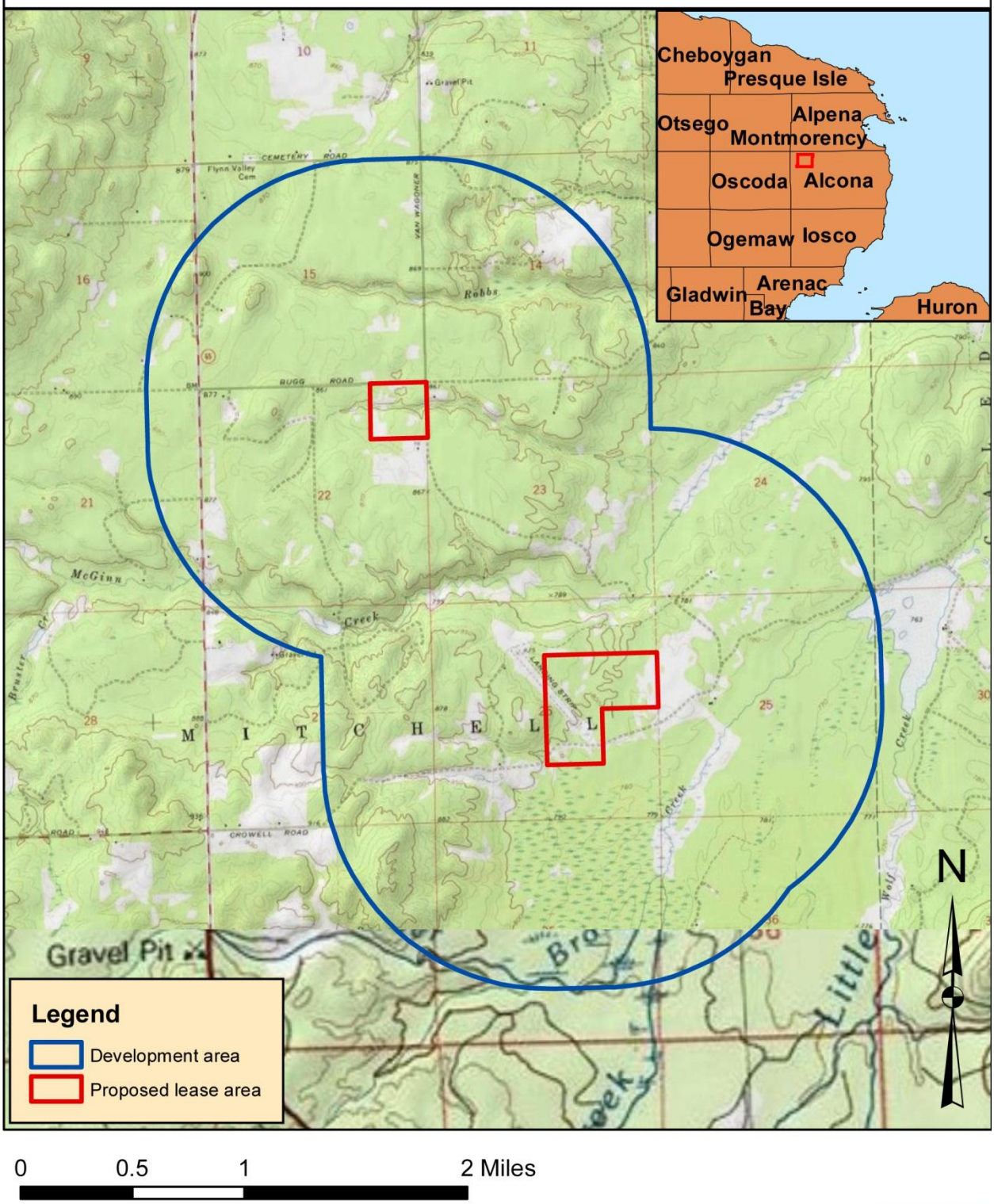
Figure 1c. Location of EOIs 247/270 in T26N, R7E, T27, R7E, and T27N, R6E.



0 1 2 4 Miles

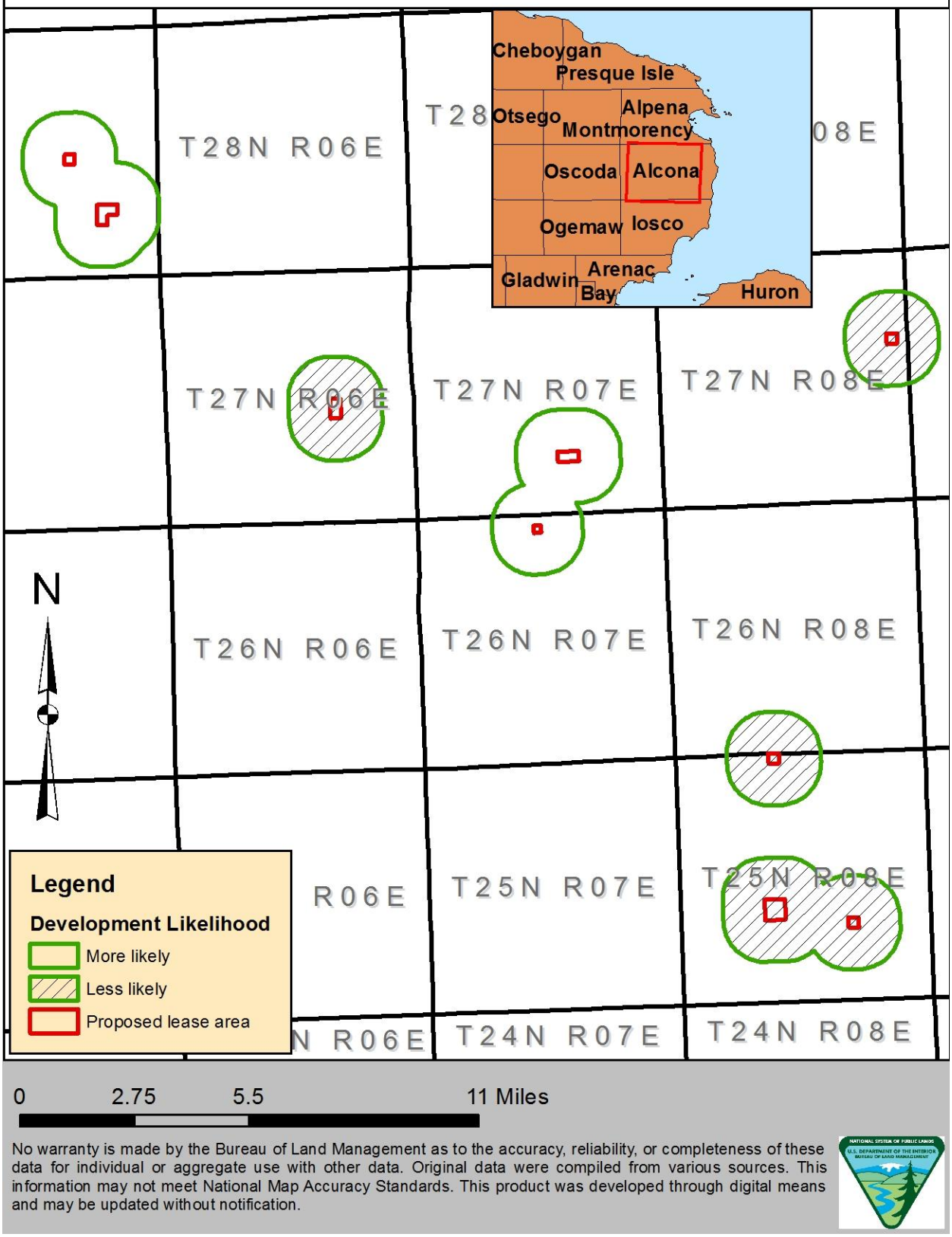
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure 1d. Locations of EOIs 247/270 in T28N, R5E.



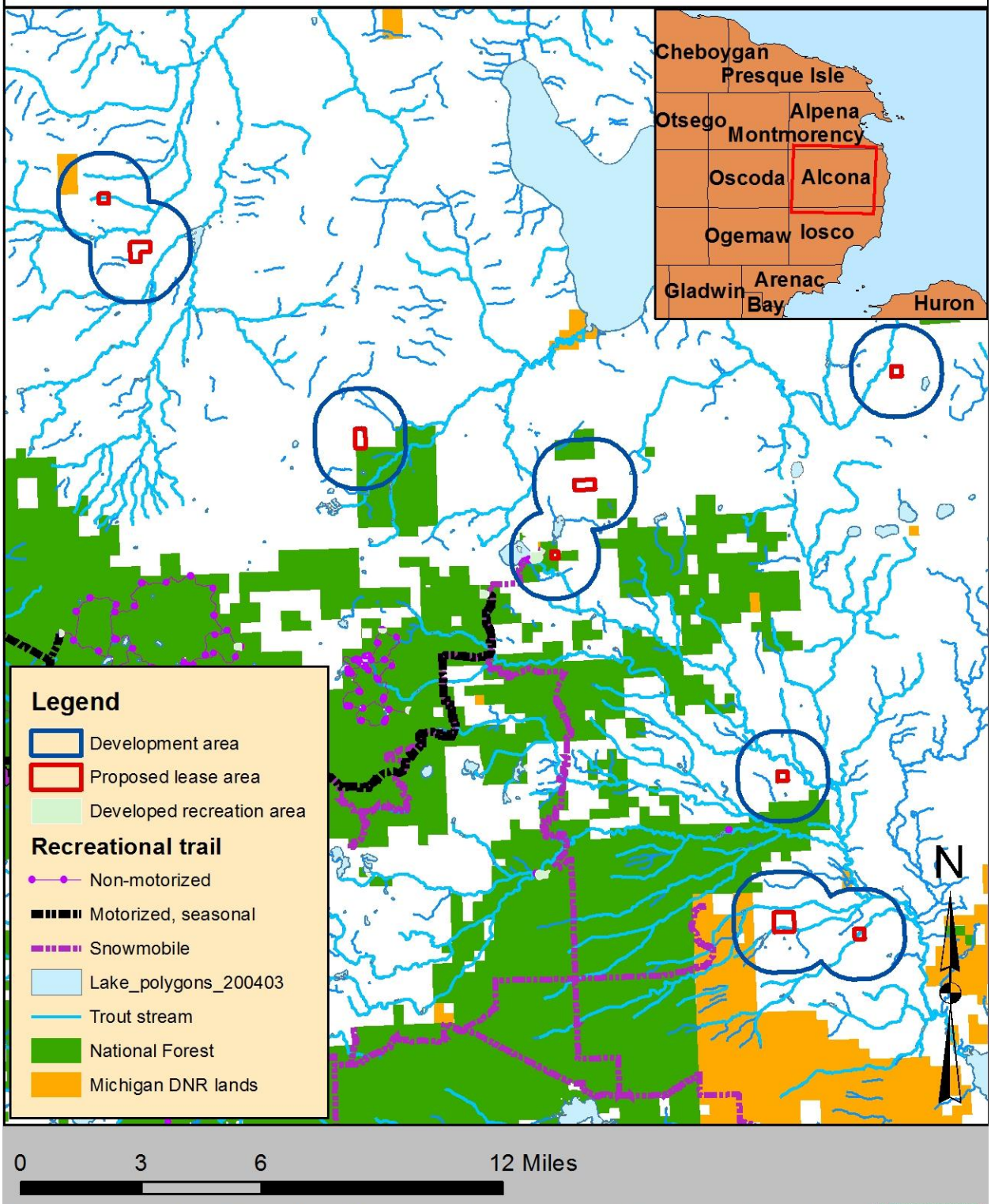
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure 2. Locations of requested lease areas and relative development likelihood.



No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Figure 3. Public lands and other recreational resources.



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APPENDIX B – Reasonably Foreseeable Development Scenario

I. Summary

The Reasonably Foreseeable Development Scenario (RFDS) for the approximately 24,770 acre analysis area indicates that, if a lease issues, twelve additional wells could be drilled on or adjacent to the federal leasehold, thus approximately 18 additional acres would be disturbed as a result of this action. It is unlikely that this number of wells will result from this action, however, over the ten-year period of a lease. The economics of natural gas production projected during that time, coupled with low resource potential for most of the leasable acreage, indicate that no more than two wells are likely to be proposed, resulting in a total disturbed area of 3 acres. During production, this would be reduced to about 2 acres.

If production results, the federal mineral estate would be included in production spacing units approved by the State of Michigan after the type of well and its production, if any, is determined. The size of the unit for a vertical Antrim well would be 80 acres. Some of the requested federal mineral properties could support an Antrim well; others would require adjacent state or private acreage to be included in the spacing unit.

Should horizontal Antrim development be proposed, the unit acreage would be increased as approved by the state. No horizontal development has occurred near any of the proposed lease tracts. Permits have been issued in the past have expired without development.

Long-term disturbance of about one acre per well would occur if production is established. The initial production period of 10-20 years could be increased if the well is reworked or recompleted, but this would not be done unless the anticipated increased production is significant. Approval of vacuum extraction to increase ultimate recovery is under review by the state at this time.

The Devonian-age Antrim Shale has produced natural gas in the area since the early 1990s along the Antrim trend just north of the tracts. Several successful deeper tests occurred about seven miles north and northwest of the northernmost requested tract, but attempts to expand production from these reservoirs have been unsuccessful. No deep exploration has occurred in the vicinity of the leases.

II. Introduction

A “Reasonably Foreseeable Development Scenario” (RFDS) is a projection of oil and gas exploration, development, production, and reclamation activity. The RFDS projects oil and gas activity in a defined area for a specified period of time, based on the best available information and data. This RFDS was prepared in response to Expressions of Interest (EOI) 247 and 270,

submitted by private entities in an area which has produced gas from the shallow Antrim Shale since 1993. The RFDS provides a baseline for conducting the required National Environmental Policy Act (NEPA) analysis before leasing can take place. This analysis will address potential interference with other surface uses and potential conflicts with surface resources.

With the exception of the parcel located at T. 27 N., R. 6 E., Sec. 23, W2NW (private surface and 31/32nd federal minerals), the lands nominated under EOI-247/270 are private surface overlying 100% federal minerals, much of which lies within purchase boundaries of the Huron National Forest. Any proposed oil and gas operations on the leased area would require compliance with federal and state laws, regulations, and policies, as well as coordination with surface owners. Those lands within purchase boundaries would also be subject to Forest Service standard and special stipulations. Should a well be drilled directionally from a location off the lease, evidence of landowner permission for surface use would be required.

Information and data used in this RFDS can be seen at the website created by the Michigan Department of Environmental Quality, Office of Geological Survey at http://ww2.deq.state.mi.us/GeoWebFace/#.

Proposed Action: The Bureau of Land Management (BLM), the agency responsible for Federal mineral leasing, is proposing to offer a Federal oil and gas lease to satisfy Federal policy regarding requests from private individuals or companies to explore for and establish production from unleased Federal minerals.

The lease sale would be conducted by competitive bidding with the amount of bonus bid per acre offered by the prospective lessee determining the owner of the lease. The term of a Federal lease is ten years; if after that time the lessee has not established production, the lease expires. If a lease operator establishes production, the lease remains in effect until the lease no longer produces in paying quantities. The lease operator must make annual rental payments of $1.50 per acre for the first five years of the lease term and $2.00 per acre thereafter. Royalty on the value of the production is 12.5%. Before any surface-disturbing activities related to oil and gas development may begin, the lessee or lease operator must establish or furnish proof of a performance bond to ensure compliance with all lease terms, including proper plugging, abandonment, and reclamation. Permit applications must also be submitted to the BLM and the Michigan Department of Environmental Quality for review and approval of proposed operations.

Any well drilled and completed as a result of lease issuance would be drilled from private surface into federal minerals; however, Federal law requires analysis under NEPA.

III. Description of Geology

Location and General Geology: The tracts are scattered throughout Alcona County, a largely rural county in northeastern Michigan. The area's economy is based on agriculture, timber and recreation. Drainage of the tracts is provided by several tributaries of the Au Sable and Thunder Bay watersheds.

The bedrock surface of the Coldwater Shale is covered by up to 800 feet of glacial material, which at the land surface consists of coarse till and ice-contact outwash sand and gravel. Elevations on the tracts range from about 750 to more than 840 feet.

The region is situated within the northern Michigan Basin, a roughly circular sedimentary basin that encompasses the Lower Peninsula, the eastern portion of the Upper Peninsula, and parts of adjacent states. The sediments may reach 5 kilometers deep near Saginaw, roughly the center of the basin, but are estimated here to be less than three kilometers thick. Beneath the sedimentary section are crystalline basement rocks of the Granite-Rhyolite Province. The basin in this area is filled with Paleozoic sediments ranging in age from Cambrian to Devonian; bedrock is everywhere covered by the thick Quaternary glacial section.

Structure is dominated by a gentle southwesterly dip toward the basin center. No obvious structural features occur in the area.

Economic Geology: Production in Alcona County was first established in 1990 with the drilling of a deep well which produced from the Prairie du Chien group. The well tested at 1.4 MMcf/d (million cubic feet of gas per day) with 34 barrels (bbl) condensate. A directional offset extended the field and the pool was depleted by early 1993. Other small (one- or two-well) deep gas/condensate fields producing from the Prairie du Chien, Burnt Bluff and A1 Carbonate were also discovered in Alpena County south and west of Fletcher Pond and were rapidly depleted.

In 1993, Antrim Shale development began in the area and continues to produce along the Antrim subcrop trend, which passes north and east of the requested federal tracts. At this time the Antrim Shale is the only producing formation in Alcona County. Antrim production is based on the subcrop of the Antrim Shale, where fracture density in the shale has been enhanced both by glacial scour and temperature fluctuations prior to glaciation. The more deeply buried by other formations, the less likely the Antrim is to produce. Fractures create porosity and permeability needed for production, and over time the organic content of the shale matrix creates more gas than is contained in the fractures. Because the Antrim Shale is thermally immature, it appears that the gas is produced by bacterial breakdown of the organics in the matrix rather than depth and pressure. The Antrim Shale is not uniformly productive; gas is concentrated in two highly organic sections of the lower Antrim, the upper Lachine member and the lower Norwood member, which are separated by the Paxton member.

The Antrim Shale produces from many shallow, low-volume gas wells, with gathering lines from each well leading to a large central processing facility (CPF). A CPF typically contains a separator, brine storage tanks, shop and compressor station. A brine disposal well may also be present on the site. A CPF may handle the production from many wells, allowing individual well pads to be small, typically 0.5 acres or less after initial reclamation.

Individual wells may be drilled in as little as two days, depending on the formation's depth (typically between 600 and 1500 feet) and the type of glacial overburden encountered. The wells are inexpensive (typically less than $500,000, including the cost of the CPF) and uncomplicated, and are usually completed by hydraulic fracture and acidization. Gathering lines are buried in access roads to established rights-of-way to the CPF. The wells tend to produce large quantities of formation water with the gas until the formation is dewatered. A typical well tests at 25-200 Mcf/d and will produce for from 10-20 years. Production tends to increase as the well dewaters. Wells testing at less than 25 Mcf may be included in a well "cluster" if other wells produce at sufficiently high rates to support operations. Some operators have proposed installation of large vacuum pumps at CPFs to allow more gas to be produced prior to depletion; this proposal is being studied by the state's Public Utility Commission.

IV. Past and Present Oil and Gas Exploration Activity

Geophysical Exploration:
Exact locations of survey grids around the properties are not known. It is likely that all roads in the area have been geophysical survey routes at times. No survey routes are known to have accessed the federal mineral tracts. Geophysical surveys are likely to have been the basis for the drilling of the deep wells to the north of the tracts, and may be useful in detecting faults or other structures in the shale zone and to delineate its subcrop.

Exploratory drilling:
The Antrim Shale play is considered to be a mature play, with its productive limits fairly well established. Exploratory efforts depend largely on the current and projected price of natural gas, and rather than attempt exploration of new areas, many operators develop wells in areas under their control which are known to be productive.

Exploration in the Antrim Shale is conducted on the fringes of the trend. If an initial well proves productive, step-out wells are drilled, a well cluster is developed and a CPF established. If an exploratory well is insufficiently productive to justify further development, it will be abandoned temporarily as the company attempts to evaluate surrounding acreage or sell the well. Many exploratory wells are plugged and abandoned without establishing production, although they

are listed as gas wells by the state. Because permitting for an Antrim cluster is usually done before an exploratory well is drilled, permits are allowed to expire if the initial well is unsuccessful.
Many exploratory Antrim wells drilled in the vicinity of the federal properties have been dry or produced such low volumes of gas that they were abandoned. At this time, no Antrim well development clusters are present within one-half mile of any federal tract.

V. Past and Present Oil and Gas Development Activity

The Antrim Shale has been known to hold producible gas since the 1940s. In areas where the fracture density is sufficient, small gas fields had been developed successfully without the need for hydraulic fracture completions. The fields produced relatively small volumes of gas suitable for local use. When natural gas prices rose in the 1980s, however, large-scale production became commercially attractive, and Antrim production spread rapidly from Antrim County east along the trend. Gas price fluctuations since that time have impacted the pace and location of development.

A typical vertical Antrim well in this area requires a well pad of less than one acre and a 16-foot wide access road of about 1200' or less, for a total surface disturbance of less than 1.5 acres. The pad would be slightly larger for a horizontal well to accommodate the equipment and supplies necessary for drilling and completion. Surface disturbance associated with a CPF is more variable, depending on the type and size of processing equipment present; a typical CPF would be about 4 acres. The state does not permit in-ground sumps for drilling fluids in this area, so steel storage tanks must be used during the drilling and testing of wells.

Operators may drill a vertical hole and then drill one or more horizontal holes from the same well pad, using the upper portion of the existing well as a guide. A hole is ground into the casing to allow the well to be kicked off into the productive shales. If tests are positive, the well is completed by hydraulic fracturing and acidizing the producing intervals. The gathering line to the CPF is installed and the gas and produced water is pumped to the CPF for processing.

VI. Oil and Gas Occurrence Potential

Natural gas is known to occur in the Antrim Shale in the area near its subcrop limits. Those federal tracts in the north and east are most likely to be explored, including those parcels located in T. 28 N. R. 5 E., T. 27 N., R. 7 and 8 E. The distance of the remaining parcels from the Antrim subcrop, and the general lack of interest and/or success in those areas, make them unlikely exploration targets.

VII. Oil and Gas Development Potential

Oil and gas have been developed in the area since 1990. Infrastructure for Antrim development is available, although additional CPFs may be required for some locations if production is established. Both vertical and horizontal drilling techniques have been used in the development of the Antrim in this area. Due to low natural gas prices, it is unlikely that new development clusters will be established; any production resulting from new wells will likely be processed through existing CPFs to keep operating costs low.

VIII. RFD Baseline Scenario Assumptions and Discussion

The unleased Federal minerals are not within ½ mile of current production units. The minimum production unit size for the Antrim wells in this field is 80 acres, but this acreage may be expanded by decision of the State of Michigan Oil and Gas Board if horizontal development is proposed. At least twelve wells would be required for complete development of the federal properties, but drilling of more than two or three new wells as a result of leasing is unlikely. Any wells drilled are likely to produce only from the shallow Antrim at depths from about 750 to 1100 feet.

Each pad will be one acre or less in size, with access roads less than ¼ mile long, resulting in a total disturbed area per vertical well of less than 1.5 acres. Horizontal wells may be drilled using the vertical well as a pilot hole. Pits will not be used to collect drilling fluids or cuttings; cuttings will be collected in steel tanks and disposed at sites designated in the drilling plan and approved by the state. The source of drilling water may be a well drilled in the pad or surface water sources. A vertical well will take about two days to drill on a 24-7 schedule. After all drilling is completed, about 1/3 acre of the well pad will be reclaimed and the site will remain until the well ceases production. If a new CPF is required, up to four acres of additional disturbance may take place. If no production is established or when production ceases, the pads and roads will be reclaimed to state standards and the surface owners' wishes.

It is considered unlikely that new production clusters will be established as a result of leasing. Any production from new wells will probably be processed through existing CPFs, due to the relatively low current and projected prices of natural gas over the next ten years. Over half of the federal acreage is considered to have low Antrim production potential.

IX. Surface Disturbance Due to Oil and Gas Activity on All Lands

In the approximately 24,770 acre analysis area more than 200 wells have been drilled, most of them to the north and east of the federal tracts. Using 1.5 acres as a reasonable average disturbance per surface location, a total of about 300 acres have been disturbed as a result of oil and gas activity in the analysis area. Should leases issue, an additional short-term

disturbance of approximately 18 acres could result, and a long-term disturbance of up to twelve acres could result if production is established on all federal lands.

APPENDIX C – Stipulations and Notices

Notices

1. Surface disturbance will be limited to that necessary for reasonable, safe and prudent extraction of the oil and gas. Measures will be implemented to minimize erosion and sedimentation. Road and stream crossings will be planned so as to eliminate stream crossings whenever practical.
2. Lands adjacent to the proposed lease are in the Huron-Manistee National Forest. Processing of proposed surface use plans of operation on National Forest System lands includes site-specific analysis to determine effects to threatened, endangered, or sensitive species. This analysis may require surveys for certain plants and/or animals. Depending upon the species of concern, it may be necessary to survey through spring, summer, and fall. The extent of required surveys could delay permit issuance. Operators are encouraged to submit proposals as soon as possible to facilitate the scheduling of necessary survey work.
3. Portions of this lease parcel have had occurrences of certain threatened, endangered, or sensitive species or communities. At the time a drilling permit application or other request for surface use is filed, a site-specific review will be done to determine potential effects to these species. Depending upon the findings of the site-specific review, additional operating constraints, such as seasonal restrictions or re-location of the proposed wellsite, may be necessary to mitigate effects to threatened, endangered, or sensitive species or communities.
4. A cultural resources Phase I survey will be required prior at the time an Application for Permit to Drill/Notice of Staking is submitted. Cultural Resource surveys may also be required prior to the start of subsequent well operations which involve additional surface disturbance. Mitigation measures or movement of planned ground disturbance may be necessary to avoid adverse effects to cultural resources. The need and requirements for mitigation or alterations will be based on consultation between the lessee, Bureau of Land Management, the Michigan State Historic Preservation Office, and the Advisory Council on Historic Preservation.
5. Any approved APD may require a Discovery Plan for accidental archaeological discoveries that occur during ground disturbing activities that were detected during initial surveys. This may include consultation between the Bureau of Land Management, Michigan State Historic Preservation Office, and the Advisory Council on Historic Properties.

No Surface Occupancy Stipulation

No surface occupancy will be permitted within 300 feet of a navigable waterway.

Purpose: Protect surface water quality.

Exception: The BLM may grant exceptions for use of existing roadways and utility rights-of-way. Exceptions must be made in writing by the BLM.

Waiver/modification: No waivers or modifications will be made to this stipulation.

Controlled Surface Use Stipulation

On all portions of the lease, surface use must meet these performance measures:

a. Operator shall delineate soil types with *severe* erosion rating within area to be disturbed,
b. Operator shall prepare soil management plan identifying BMPs and other practices to be employed to minimize erosion, including storm contingency plan, topsoil stockpiling location(s), and road designs. Plan must be approved by BLM.

This stipulation affects the entire lease.

Purpose: Protect soil resources.

Exception: The BLM may grant exceptions to this stipulation in cases of trenching through existing utility rights-of-way and utilization without expansion of existing roads.

Modification: No modifications may be made to this stipulation.

Waiver: No waivers may be made to this stipulation.

Controlled Surface Use Stipulation

Surface occupancy on the entire lease is subject to the following:

> Operator shall delineate, within area to be disturbed, infestations of non-native, invasive plant species, including any species that is listed in *A Field Identification Guide to Invasive Plants in Michigan's Natural Communities* (Borland, et al, 2009). Operator shall preparation an invasive species control plan for approval by the BLM. Guides to the use of recommended best management practices for controlling the spread of invasive plant species are available from the Michigan Natural Features Inventory at http://mnfi.anr.msu.edu/. Many of the same practices that are employed for preventing soil erosion also function to prevent the spread of invasive species.

Purpose: Protecting native vegetation communities, agricultural production, and timber resources.

Exception/modification/waiver: No exceptions, modifications, or waivers will be made to this stipulation.