UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT-EASTERN STATES
Northeastern States Field Office
626 E. Wisconsin Avenue, Suite 200
Milwaukee, Wisconsin 53202-4617

In Reply Refer to:
3110(030)
NEPA #DOI-BLM-ES-0030-2013-0011-EA

June 21, 2013

FED EX TRACKING NUMBER: 8689 7543 3195

Memorandum

To: Eastern States, State Director (ES-930)

From: Acting Field Manager

Subject: Recommendation to Offer Split-Estate Lands in Grand Traverse County, Michigan for Competitive Oil and Gas Leasing.

By letter dated October 28, 2005, an Expression of Interest (EOI-366) for oil and gas leasing was filed with the Eastern States Office for lands totaling 40 acres in Grand Traverse County, Michigan. Also, by letter dated November 11, 2011, an Expression of Interest (EOI-1579) for oil and gas leasing was filed with the Eastern States Office for lands totaling 80 acres in Grand Traverse County, Michigan. The lands nominated in EOI-1579 overlap the nominated lands in EOI-366, for a total request of 80 acres. All of the lands nominated under EOI-366 and EOI-1579 are private lands overlying 50% Federal minerals and final action has been taken on these lands.

The Northeastern States Field Office (MFO) has prepared an Environmental Assessment (EA), Finding of No Significant Impact (FONSI) and a Decision Record addressing the split estate lands nominated under EOI-266 (attached). Based upon the EA, I recommend this Decision Record be approved, subject to the BLM lease notices and stipulations found in Appendix C of the EA, and the lands be offered for competitive oil and gas leasing.

Please return one copy of the signed FONSI and Decision Record to the NSFO for our records. We are retaining a copy of the EA for our records. If you have questions regarding this memorandum, please contact Theresa Bodus at (414) 297-4120 or by e-mail at tbodus@blm.gov.

3 Attachments:
1-Environmental Assessment
2-Finding of No Significant Impact
3-Decision Record

FINDING OF NO SIGNIFICANT IMPACT

Environmental Assessment
Expression of Interest 366 and 1579
DOI-BLM-ES-030-2013-0011-EA

The proposed action is for the BLM to offer the federally owned oil and gas resources in Mayfield Township, Grand Traverse County, Michigan (T. 25 N., R. 11 W., Sec. 18, E½NE¼) containing 80 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-030-2013-0011-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

Tony Herrell, Associate State Director
Eastern States Office

9-13-13
Date

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-0030-2013-0011-EA
Expressions of Interest 366 and 1579

It is my decision to allow the Proposed Action to be implemented as described in the EA of Expressions of Interest (EOIs) 366 and 1579 (Michigan Meridian, Mayfield Township, Grand Traverse County, Michigan, T. 25 N., R. 11 W., Sec. 18, E½NE¼), totaling 80 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 Herrell — 9-13-13

Tony Herrell, Associate State Director — Date
BLM Eastern States Office

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

Environmental Assessment

NEPA #: DOI-BLM-ES-030-2013-0011-EA

Expressions of Interest 1579 and 366

Date:	June 2013
Type of Action:	Oil and Gas
Serial Number:	N/A
Location:	Michigan Meridian, Mayfield Township, Grand Traverse County, Michigan T25N, R11W, Sec. 18, E½NE¼
Project Acreage:	80 acres
Proponent Address:	N/A

Bureau of Land Management
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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.

Contents

CHAPTER 1 – PURPOSE OF AND NEED FOR ACTION 6
Purpose of the Proposed Action 6
Need for the Proposed Action 6
Management Objectives of the Action 6
Conformance with BLM Land Use Plan(s) 6
Relationship to Statutes, Regulations and Other Plans 6
Decision to Be Made 7
Scoping and Issues 7
Rationale for conducting external scoping 7
Issues identified through internal and external scoping 7
CHAPTER 2 – ALTERNATIVES, INCLUDING THE PROPOSED ACTION 7
Introduction 7
Location 7
Proposed Action 7
Connected Action – Drilling and Production 8
Site-Specific Applications for Permit to Drill (APDs) 8
Hydrocarbon Drilling Methods 8
Vertical Drilling 8
Well Completion 9
Production, Abandonment, and Site Reclamation 9
No-Action Alternative 9
CHAPTER 3 – DESCRIPTION OF THE AFFECTED ENVIRONMENT 9
Introduction 9
Air Quality 10
Climate Change 10
Cultural/Paleontology 11
Environmental Justice 12
Farmlands 13
Fish and Wildlife 13

Floodplains, Wetlands, and Riparian Zones 13
Geology/Mineral Resources/Energy Production 13
Hazardous Wastes 14
Invasive Species/Noxious Weeds 14
Native American Religious Concerns 14
Recreation 14
Socioeconomics 14
Soils 16
Sensitive Species 16
Vegetation 18
Visual Resources 18
Water Resources and Water Quality 18
Wild and Scenic Rivers and Wilderness 19
CHAPTER 4 – ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES 19
Introduction 19
Air Quality 20
Climate Change 20
Farmlands 21
Fish and Wildlife 21
Floodplains, Wetlands, and Riparian Zones 21
Geology/Mineral Resources/Energy Production 21
Hazardous Wastes 21
Invasive Species/Noxious Weeds 22
Recreation 22
Socioeconomics 23
Soils 24
Sensitive Species 24
Vegetation and Visual Resources 25
Cumulative Impacts to Vegetation and Visual Resources 25
Water Resources and Water Quality 25
PERSONS, GROUPS, AND AGENCIES CONSULTED 26
List of Persons, Agencies and Organizations Consulted 26

List of Preparers 29
REFERENCES 31
APPENDIX A – Figures 34
APPENDIX B – Reasonably Foreseeable Development Scenario 38
APPENDIX C – Notices and Stipulations 43

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 tracts 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 October 31, 2005, the BLM Northeastern States Field Office (NSFO) received a request from the BLM Eastern States Office (ESO) for a National Environmental Policy Act (NEPA) analysis report on 80 acres of land with the following legal description: Michigan Meridian, Mayfield Township, Grand Traverse County, Michigan, T. 25 N., R. 11 W., Sec. 18, N2NE. Later, on February 1, 2012, the NSFO received a request for a NEPA analysis report on Section 18, NENE, which is contained within the previous parcel. These nominations are located on private land.

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 such action meets the guidelines and regulations set forth by the NEPA 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 not to conduct limited external scoping due to the limited size of the Decision Area and the limited scale of projected development.

Issues identified through internal and external scoping

Following are the issues that were identified through internal and external scoping:

1. The proposed lease and surrounding areas have abundant wetlands.
2. The Decision Area contains steep slopes that may be highly erosion-prone.

CHAPTER 2 – ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Introduction

The NSFO has received two Expressions of Interest (EOIs) to lease a combined 80 acres of federal mineral estate for oil and gas development in Mayfield Township, Grand Traverse County, Michigan (Figure 1, Appendix A). Issuance of a competitive lease 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. The lease could be used to consolidate acreage to meet well spacing requirements, or the mineral estate may be acquired for speculative value. The BLM would 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 site is located on private land in the northwestern portion of Michigan's Lower Peninsula. A legal description of the requested parcel is found in **Chapter 1 - Need for the Proposed Action** above.

Proposed Action

The proposed action is to lease the nominated parcel. If approved, a lease 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 Michigan Department of Natural Resources (MDNR) for consultation. The lessee would be required, as a condition of approval, to comply with the recommendations of these consultations.

The state of Michigan has stipulated well spacing by target formations. Spacing for Niagaran wells is 80 acres. Since the entire proposed lease is only 80 acres, only one well could be drilled under this lease, and this EA will consider the potential impacts of one conventional well on one well pad. This EA will analyze impacts to natural resources based on the Reasonably Foreseeable Development Scenario (RFDS) in Appendix B. *This scenario is provided strictly for the purpose of analysis and does 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 3.7 acres.**

Drilling operations continue around the clock, and wells are generally drilled within 30 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 carbonate formations are completed using *acidization*, a process in which a few thousand gallons of hydrochloric acid solution is injected into the formation, where it opens up the fractures in the formation.

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.

The BLM 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 land owner.

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 nominated parcel, the distance within which directional drilling is likely to be viable, producing a total area of 3,050 acres (Appendix A, Figure 1). The Decision Area is within the Northern Lakes and Forests Level-III ecoregion and within the Manistee subbasin of the Northeastern Lake Michigan basin. The Decision Area is easily accessible by road. Most of the Decision Area is in agricultural production, and a nearly continuous swath of upland forest and wetlands occupies approximately 1,700 acres in the southern end.

Table 1. Technical Review.

Program	Reviewer	Signature	Date
Air Quality	Derek Strohl Natural Resources Specialist	Derek Strohl	6/20/13
Climate Change	Derek Strohl Natural Resources Specialist	Derek Strohl	6/20/13
Cultural/Paleontology	Jarrod Kellogg Archeologist	Jr Kellogg	6/21/13
Environmental Justice	Kurt Wadzinski Planning & Environmental Coordinator	Kurt J. Wadzinski	6/20/2013
Farmlands (Prime & Unique)	Derek Strohl Natural Resources Specialist	Derek Strohl	6/20/13

Table 1. Technical Review.

Program	Reviewer	Signature	Date
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	Jeff Nolder Geologist	JN	6/21/13
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 Archeologist		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
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

Grand Traverse 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). The impact of the proposed action on climate change will be discussed further in Chapter 4.

Cultural/Paleontology

Paleo-Indians first inhabited the Grand Traverse region at least 10,000 years ago; this is based on a spearpoint found in Grand Traverse County at the Skegemog Point site, one of the few Paleo-Indian sites found in Michigan's Lower Peninsula (National Park Service, 2013; Anderson, 2011). The area was sparsely settled until around 3000 BCE, with increased settlement beginning after 300 CE as the Hopewell Culture spread into Michigan from the south. However, while the Hopewell influence reached modern Traverse County in the form of mounds and agriculture, it was not as predominate as in southern Michigan (Fitting, 1978). Skegemog Point reached its most important phase during this period between 500 and 1500 CE, primarily as a farming and fishing village (National Park Service, 2012).

By the time of initial European exploration of the area, the Pottawatomi, a people with a distinct Algonquin dialect, occupied the northwest corner of the Lower Peninsula. French explorers entered the region around 1640, naming Grand Traverse Bay in reference to the nine mile distance early travelers took by foot across the foot of the bay to the shore of Lake Michigan (Grand Traverse County, Michigan, 2006). While this early contact had little direct effect on Native tribes in the region, it coincided with Iroquoian expansion, forcing the Pottawatomi to move south and west across Lake Michigan (Stone & Chaput, 1978). 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 end of the Revolutionary War, the Ottawa occupied three villages along Grand Traverse Bay (Feest & Feest, 1978).

The end of the Revolutionary War brought significant changes to the Native inhabitants. Although officially expelled from the region, British maintained several frontier posts, which coupled with American influence, brought a peak to fur trading in the area. However, unlike the British who gave the Native Americans a more favorable status, the United States viewed them as a conquered people. The War of 1812 exacerbated the situation, all but eliminated British influence and allowing the United States government to more freely deal with Native Americans as it saw fit. This new power paradigm resulted in a series of treaties between 1814 and 1825 in which Native tribes ceded most of Michigan to the United States (Stone & Chaput, 1978). In particular, the Treaty of 1836 ceded all remaining land in

the Lower Peninsula, as well as the eastern half of the Upper Peninsula, to the United States. This treaty also established a combined reservation for Ojibwa and Ottawa tribes along the Grand Traverse Bay (Kappler (ed.), 1904). This reservation, albeit in a smaller form, exists today as the Grand Traverse Indian Reservation, and is home to the Grand Traverse Bay Band of Chippewa and Ojibwa Indians, which also includes a small number of Pottawatomi Indians.

With the cession of the Lower Peninsula in 1836 and the creation of the State of Michigan the following year, American settlement increased. By the late 1830s a mission had been established along Grand Traverse Bay, and Grand Traverse County was created in 1851 (Grand Traverse County, Michigan, 2006). Timber and farming became the major industries in this portion of the state, along with fishing, although the remote nature of the region did not allow for extensive tree cutting until the latter half of the nineteenth century. By the 1870s, the Lower Peninsula, thanks primarily to forests in the north, would help make Michigan the leading supplier of lumber in the United States for over twenty years (Whitney, 1987). Today, the primary industries in Grand Traverse Country are agriculture and tourism.

There are twelve Historic Properties in Grand Traverse County listed in the National Register of Historic Places. Eleven are historic structures, including two bridges, two historic districts in the city of Grand Traverse, and a lighthouse. Skegemog Point is the sole prehistoric site from the county on the register (National Park Service, 2013). There are no known historic properties in or immediately adjacent to the EOI.

The BLM will consider potential cultural resources with each APD that is submitted under any lease(s) that would be approved pursuant to this EOI. This would require a complete cultural resources survey and records search to determine if any historic properties are present. No further analysis is currently warranted.

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 at a few sites in Michigan, the closest being approximately twenty miles to the southwest of the study area in Mesick. 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 240 acres of *prime farmland*, 1,140 acres of *farmland of local importance*, and 60 acres of land classified as *prime farmland if drained* (Figure 2, Appendix A). These lands are almost entirely concentrated in the Decision Area's northwest, northeast, and southeast quadrants.

Fish and Wildlife

The Decision Area is mostly agricultural land and undeveloped forest and wetland habitat (See **Vegetation** section below). The Decision Area likely harbors populations of diverse types of wildlife, including deer, grouse, rabbit, turkey, beaver, nesting and migratory birds, reptiles and amphibians, and insects. The Decision Area contains at least four small lakes, including 18.2-acre Fish Lake, with a maximum depth of 40 feet, 19-acre Bartlett Lake, which appears to be shallow, and two other, smaller, unnamed lakes. The southern half of the Decision Area contains a roughly 1,700-acre swath of wetlands and upland forests, and the northern half is dominated by open, agricultural lands that are dotted with small woodlots.

Floodplains, Wetlands, and Riparian Zones

National Wetland Inventory data for the Decision Area include 70 acres of emergent wetlands, 100 acres of forested and/or shrubby wetlands, and 50 acres of open water (Figure 3, Appendix A). Most of the wetlands are near the outer edges of the southern half of the Decision Area. There may be small wetlands interspersed throughout other portions of the Decision Area. The only flowing waters in the Decision Area are two ephemeral streams, totaling 3,600 feet. Due to the steepness of the slopes surrounding these waterways, there is probably little to no floodplain area associated with them.

Geology/Mineral Resources/Energy Production

The surface of the Decision Area consists of up to 1,000 feet of glacial sand and gravel and other material. At the base of the glacial material is the Ellsworth Shale of Late Devonian age. The region is situated within the northwestern quadrant of the 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 are estimated here to be somewhat less than three kilometers thick. Beneath the sedimentary section are crystalline basement rocks of the Granite-Rhyolite Province.

Oil, natural gas, and gas condensate of the Northern Michigan Reef Trend reservoirs have been produced in the county since 1970. Gas has been encountered in other formations including the Traverse Limestone, Antrim Shale and A1 Carbonate, but not in commercially viable quantities. Oil and gas are known to occur in the reef trend in relatively small, discrete reservoirs that are not usually interconnected. The 43 wells drilled in the vicinity of the Federal property have had a 35 percent success rate. More information regarding the area's geology can be found in the RFDS (Appendix B).

Hazardous Wastes

The Michigan Department of Environmental Quality's *Environmental Mapper* (Michigan Department of Environmental Quality, 2013a) shows two sites of environmental contamination and one closed leaking underground storage tank in the Decision Area.

Invasive Species/Noxious Weeds

Many invasive species are present in and around the Decision Area and throughout Michigan and the Midwest. Activities that may spread invasive species are regulated in Michigan by the Natural Resources and Environmental Protection Act 451 of 1994, Sections 324.41301-324.41325. 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 such as crop production and construction 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.

Native American Religious Concerns

The BLM sent letters on April 25, 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 received only one response from the Grand Traverse Band of Ottawa and Chippewa Indians. The letter, dated June 3, 2013, stated that the Grand Traverse Band is concerned that any fracking would require the use of water, which would harm off-reservation rights for hunting, gathering, fishing, and trapping, as provided in the 1836 Treaty of Washington. The BLM's responsibility for analysis is limited to the area of surface disturbance if or when a proposal for development is submitted; as the lease has not yet been submitted for sale, we do not know if hydraulic fracturing will be used. However, the Reasonably Foreseeable Development Scenario (Appendix B) for the proposed action indicates that hydrofracture is not typically used for well production in Northern Michigan Reef Trend reservoirs. If the successful bidder submits an Application for Permit to Drill (APD) the BLM will be able to conduct a site-specific analysis and better consider potential Native American religious and treaty concerns.

Recreation

Most of the Decision Area is privately owned. As described in the **Vegetation** and **Fish and Wildlife** sections, the small inland lakes, scattered woodlots, and the large block of forests and wetlands likely provide opportunities for hunting, fishing, trapping, hiking, and other nature-based recreation. The Decision Area includes 40 acres of state-owned land that is open to recreational use and includes public access to Fish Lake.

Socioeconomics

Grand Traverse County is located in the northwestern portion of Lower Michigan and borders the following counties: Antrim (northeast), Kalkaska (east), Wexford (south), Benzie (west), Leelanau

(northwest), and Manistee (southwest). Grand Traverse County is 464.33 square miles, with a population density of approximately 187 persons per square mile, higher than that for the state as a whole (174). Its estimated population in 2012 was 89,112 a 2.4% increase from the 2010 census (U.S. Census Bureau, 2013). The county seat is located in Traverse City, in the northern part of the county. The project area encompasses one forty acre northern parcel, one forty acre southern parcel, and a one mile buffer around the parcels, totaling 3,050 acres.

The distribution of population in Grand Traverse County is 92.9% White, 2.3% Hispanic or Latino, 1.7% Two or More Races, 1.4% African American, 1.2% Native American or Alaska Native, and 0.8% Asian. 78.3% of Grand Traverse County residents are 18 years of age or older, with 15.2% 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 41,781 housing units in the county with a homeownership rate from 2007-2011 of 76.4%, which is about 3% higher than the state as a whole. The median value of these owner-occupied homes was $172,800 for the period 2007-2011, much higher than that of the state ($137,300) (U.S. Census Bureau, 2013). 9.5% of housing units were categorized as "for seasonal, recreational, or occasional use," a much 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 $50,629 for Grand Traverse County, about $2,000 higher than for the state. Approximately 11% of persons lived below the poverty level, much lower than the 15.7% statewide that live below the poverty level. In 2011, 30% of Grand Traverse County households received some form of Social Security payment, over 20% of households received retirement income, and 10.6% of households received benefits from the Supplemental Nutrition Assistance Program (SNAP); all of these totals are close to the national averages for these respective categories (U.S. Department of Commerce, 2012c). 92.9% of the county population 25 years of age and over graduated from high school, over 4% higher than the state total. Almost 30% of county residents 25 years of age and older have a bachelor's degree compared to 25.3% for Michigan as a whole. About 3.5% 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 Grand Traverse County was 9.1% in February 2013, about a 1% decrease from the 10% rate in February 2012 and similar to Michigan's seasonally adjusted unemployment rate of 8.8% for February 2013. However, it is evident that employment in Grand Traverse County increases during the tourist season in summer-early fall, as the rate fluctuated between 8% in April 2012 and 6.5% in October 2012. This pattern also held during the previous three years (U.S. Department of Labor, 2013).

Between 2001 and 2011, services-related industries added the most employment (wage and salary jobs and proprietors) in Grand Traverse County (+5,014), led by health care and social assistance (+1,893) and finance and insurance (+1,038). Non-services-related industries decreased employment (-2,397), led by manufacturing (-1,624) and construction (-1,293). In 2011, the health care and social services

industry employed the most people in the county (9,618), followed by the retail trade (8,783) and government (6,511) (U.S. Department of Labor, 2012).

The mining industry also increased employment for the period 2001-2011, adding 574 wage and salary jobs and proprietors during that time, for a total of 1,610. Mining and mining-related employment represents less than 1% of the total employment in the county, however, the average annual wage for the mining industry in Grand Traverse County in 2011 was $93,842, about 145% higher than the average annual wage for all county residents ($38,309) (U.S. Department of Labor, 2012).

Demographically, Grand Traverse County is more affluent, has greater numbers of college graduates, is more homogenous and slightly older than the average county in the state of Michigan.

Soils

The Decision Area's soils are primarily glacially-derived loams and sands, with mucks in the wetland areas. Most of the Decision Area is dominated by slopes under 6 percent. The Decision Area contains 630 acres of slopes between 12 and 18 percent, 740 acres between 18 and 25 percent, and 140 acres between 25 and 45 percent (Figure 2, Appendix A). These steep slopes fill in most of the areas that are not identified as prime or unique farmlands, with the heaviest concentration in the southwest quadrant.

Sensitive Species

Three species are listed on the USFWS list of endangered species known to occur in Grand Traverse County, Michigan (U.S. Fish and Wildlife Service, 2013). One of them, Pitcher's thistle (*Cirsium pitcheri*), is a threatened species that dwells on dunes, which are clearly not present in the Decision Area. The remaining two may be present in the Decision Area:

- Kirtland's warbler (*Dendroica kirtlandii*), an endangered bird species that nests in young jack pine (*Pinus banksiana*) stands
- Eastern massasauga (*Sistrurus catenatus*), a candidate snake species that uses various open and shrubby wetland habitats and nearby uplands

There are also 20 additional state-listed species that have been reported in Grand Traverse County, 19 of which use habitats that may be present or are known to be present in the Decision Area (shaded rows in Table 2). Nine of these 19 species dwell primarily in wetland habitats.

Table 2. State-listed species present in Grand Traverse County, Michigan.

Scientific Name	Common Name	Status	Habitat	Habitat Present
Animals				
Accipiter gentilis	Northern goshawk	SC	Forests	L
Ammodramus savannarum	Grasshopper sparrow	SC	Open grasslands	P

Scientific Name	Common Name	Status	Habitat	Habitat Present
Atrytonopsis hianna	Dusted skipper	SC	Dry, open, sandy areas, dry prairie, pine barrens	P
Buteo lineatus	Red-shouldered hawk	T	Mature forests in or adjacent to wet meadows and swamps	P
Cistothorus palustris	Marsh wren	SC	Marshes	L
Coregonus artedi	Lake herring or Cisco	T	Deep inland lakes	N
Cygnus buccinator	Trumpeter swan	T	Wetlands with both open water and emergent vegetation	L
Dendroica kirtlandii	Kirtland's warbler	E, END	Young jack pine stands	P
Gavia immer	Common loon	T	Lakeshores	L
Glyptemys insculpta	Wood turtle	SC	Riparian habitats	L
Haliaeetus leucocephalus	Bald eagle	SC	Tall trees near open water	L
Ixobrychus exilis	Least bittern	T	Emergent vegetation	L
Lanius ludovicianus migrans	Migrant loggerhead shrike	E	Open areas with short vegetation and scattered trees, fencerows, or other perching structure	L
Pandion haliaetus	Osprey	SC	Tall structures above or near water	L
Rallus elegans	King rail	E	Marshes adjacent to uplands	L
Sistrurus catenatus catenatus	Eastern massasauga	SC, CAN	Variety of wetland habitats, primarily open, and adjacent uplands	L
Utterbackia imbecillis	Paper pondshell	SC	Ponds, lakes, and muddy backwaters	L

Scientific Name	Common Name	Status	Habitat	Habitat Present
Williamsonia fletcheri	Ebony boghaunter	SC	Ponds, bogs, fens; lowland shrub, forest openings, aquatic corridors	L
Plants				
Antennaria parvifolia	Pussy-toes	SC	Dunelands, dry prairies, oak savannas	P
Cirsium hillii	Hill's thistle	SC	Barrens	P
Cirsium pitcheri	Pitcher's thistle	T, THR	Dunes	N
Cypripedium arietinum	Ram's head lady's-slipper	SC	Mature, deeply-shaded, extensive cedar swamps	N
Pterospora andromedea	Pine-drops	T	In Michigan, mostly in forested dune communities	N
Tanacetum huronense	Lake Huron tansy	T	Great Lakes coastal habitats	N

Key: END – Federally endangered; CAN – Federal candidate; E – State endangered; T – State threatened; SC – State species concern; L – likely; N – not present; P – possible

Vegetation

Since the Decision Area is almost entirely privately owned, it is unlikely that a comprehensive vegetation survey has been done of the area. Aerial photos show about two-thirds of the area is in agricultural production and one-third of the area in a deciduous or mixed forest, with a few small conifer plantations scattered throughout. The small lakes and waterways are bordered by marshy wetlands. On November 5, 2012, a site visit by NSFO staff verified the agricultural use of the nominated parcels and much of the surrounding landscape.

Visual Resources

As described in **Vegetation** and other sections, the Decision Area consists of agricultural, forest, and wetland areas with homes and roads.

Water Resources and Water Quality

There are 87 water wells in the Decision Area (Figure 3, Appendix A). Of these wells, 77 draw water from less than 100 feet of depth, and all of them draw from less than 250 feet. Judging from the rural character of the Decision Area, it is assumed that most, if not all, of the wells are for residential or agricultural (non-irrigation) use.

Wild and Scenic Rivers and Wilderness

There are no designated Wild and Scenic Rivers or Wilderness Areas in the Decision Area.

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. 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 (2011) as maximum amounts that will not threaten a state's efforts to attain or maintain conformity with the NAAQS. Trucks using temporary roads are expected to create dust, depending on the volume of traffic, 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.

Farmlands

The proposed action could result in the conversion of up to 3.7 acres of prime or locally important farmland. Most of that acreage would be reclaimed for agricultural use after construction.

Fish and Wildlife

The proposed action could potentially result in the clearing of 3.7 acres of some combination of agricultural land and forest. Impacted areas would be reclaimed at the end of their use as well pads or construction areas. According to the RFDS, as much as 90 acres of land has been cleared for oil and gas development up to the present. In addition to the land cleared historically for oil and gas development, almost all of the Decision Area has been historically logged in the last century, before which the area was likely dominated by virgin white pine forest. Depending on locations of proposed wells and the timing of drilling, migratory birds could be impacted by the removal or degradation of stopover and/or nesting habitat. As with endangered species, these site- and time-specific factors would be considered in appropriate detail as APDs are submitted to the BLM.

Floodplains, Wetlands, and Riparian Zones

As stated in the lease notice (Appendix C), operators proposing to drill will be required to take steps to avoid impacting wetlands, in compliance with Executive Order 11990, the Clean Water Act, and state law. This will prevent 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 require that the applicant conduct a wetland survey of any area proposed for drilling in APDs, since regional wetland inventories often do not capture small wetlands.

Geology/Mineral Resources/Energy Production

The proposed action is unlikely to result in the discovery of a new hydrocarbon play and is likely to continue the ongoing depletion of the well-inventoried regional plays described in the RFDS (Appendix B).

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. The 3.7 acres described in the RFDS 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).

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. As of 2010, Grand Traverse County did not rank as one of the top 10 oil and gas producing counties in Michigan (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, Grand Traverse County did not receive any payments directly related to oil and gas production on federal lands (U.S. Department of Interior, 2013b). Some of the revenue generated by oil and gas production on the federal mineral estate in Grand Traverse 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 one well could potentially be drilled on these parcels. If the lease is sold and it leads to actual well drilling and economic production, it would likely bring very small 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 who are 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 very limited scale of oil and gas leasing in Grand Traverse 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 slope greater than 10 percent or 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 and to adhere to the recommendations provided by the Fish and Wildlife Service for avoiding and minimizing impacts to 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. Since most of the area adjacent to existing roads is open land, it is unlikely that more than three acres of timber would be removed. Cleared areas would be maintained for the duration of their uses as roads, staging areas, or well pads, and then restored as described in Chapter 2.

Cumulative Impacts to Vegetation and Visual Resources

Most of the Decision Area has been cleared and is currently in agricultural production, changing its visual resources to a rural character instead of a remote appearance. The vegetation has been converted to a mix of second-growth or younger forests, croplands, pastures, and old fields. 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. The BLM will mitigate these impacts by establishing 300-foot setbacks from waterways and complying with applicable wetland protection laws and policies. Likewise, the same Best Management Practices that are applied to protect potentially highly erodible soils will be used to protect surface waters from runoff.

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 *Michigan's Water Withdrawal Assessment Tool* (Institute of Water Research, 2013) and obtain a registration for the withdrawal.

Any approved drilling operation must adhere to BLM Onshore Order No. 2, which requires that casing and cementing programs be conducted as approved to protect and/or isolate all usable water zones, potentially productive zones, lost circulation zones, abnormally pressured zones, and any prospectively valuable deposits of minerals. Surface impacts can be limited with properly constructed wells, including adequate casing and cementing design and equipment testing. Recovery and treatment or disposal of flowback fluids are required by both BLM and the state of Michigan.

PERSONS, GROUPS, AND AGENCIES CONSULTED

Consultation and Coordination

List of Persons, Agencies and Organizations Consulted

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
Brian D. Conway, State Historic Preservation Officer	Antiquities Act, Section 106 of the National Historic Preservation Act, 36 CFR 800 (as amended)	Response from Brian Grennell, Cultural Resource Management Specialist (For Brian Conway), dated June 4, 2013, concurred with BLM that no historic properties will be affected by this EOI and to notify SHPO if the scope of work changes or if artifacts are discovered.
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, assumes no concerns or issues at this time.
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, assumes no concerns or issues at this time.
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.	No response, assumes no concerns or issues at this time.

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
	13007, and/or other statutes and executive orders	
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, assumes no concerns or issues at this time.
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.	Response from William Rasttetter, Tribal Attorney, dated June 3rd, 2013, voices concerns that fracking will harm rights promised to the tribe in the 1836 Treaty of Washington concerning off-reservation rights.
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, assumes no concerns or issues at this time.
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	No response, assumes no concerns or issues at this time.

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
	Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	
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, assumes no concerns or issues at this time.
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, assumes no concerns or issues at this time.
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.	No response, assumes no concerns or issues at this time.
Dennis Kequom, Chief Saginaw Chippewa Indian	36 CFR 800 (as amended),	No response, assumes no concerns or issues at

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
Tribe 7070 East Broadway Road Mt. Pleasant, MI 48858	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.	this time.
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 statutes and executive orders.	No response, assumes no concerns or issues at this time.

List of Preparers

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Preparer — June 20, 2013 Date

Planning & Environmental Coordinator — JUNE 20, 2013 Date

Assistant Field Manager, Natural Resources — 21 JUNE 13 Date

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APPENDIX A – Figures

Figure 1. Location of EOIs and Decision Area

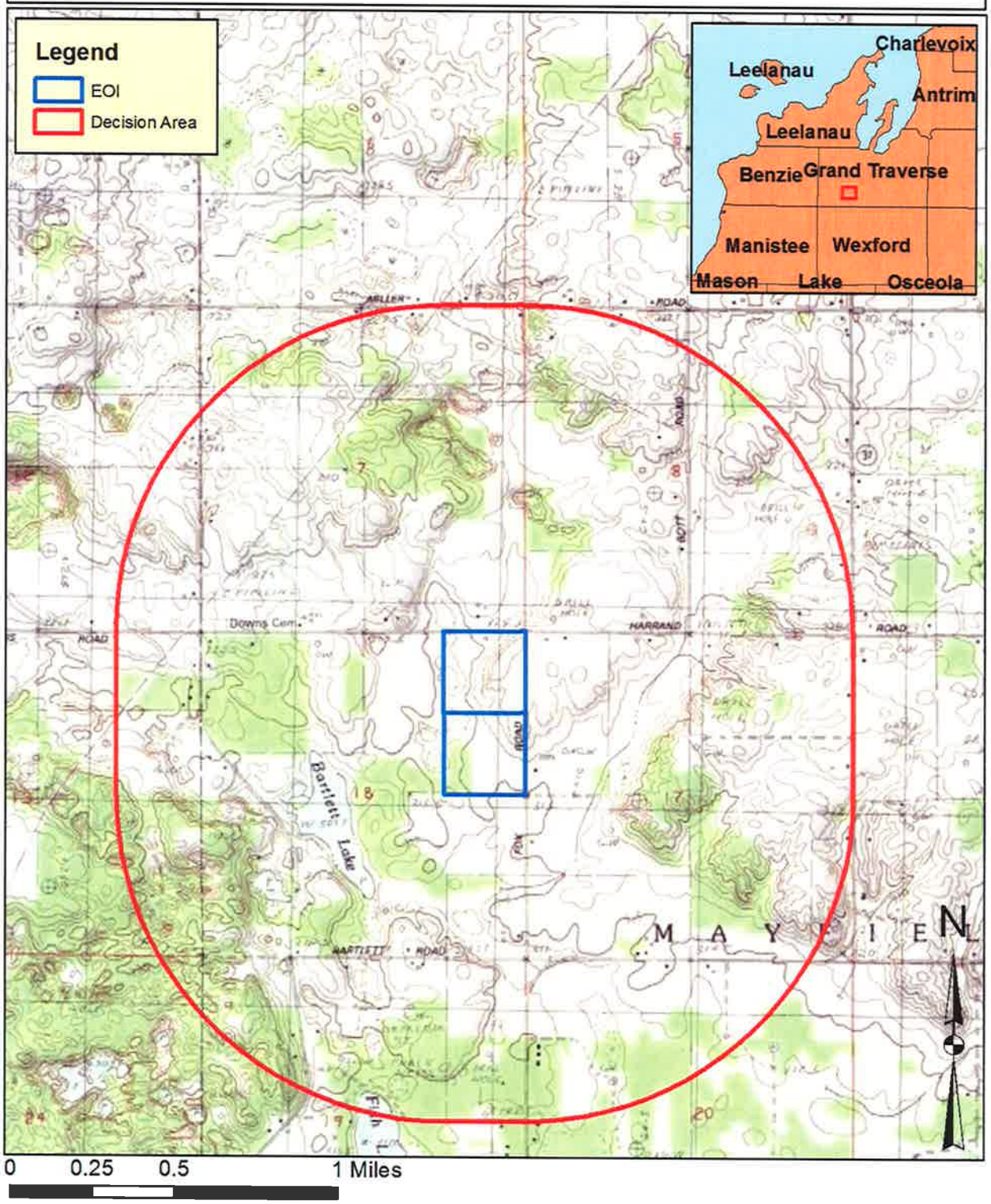

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Figure 2. Prime and unique farmlands and steep slopes

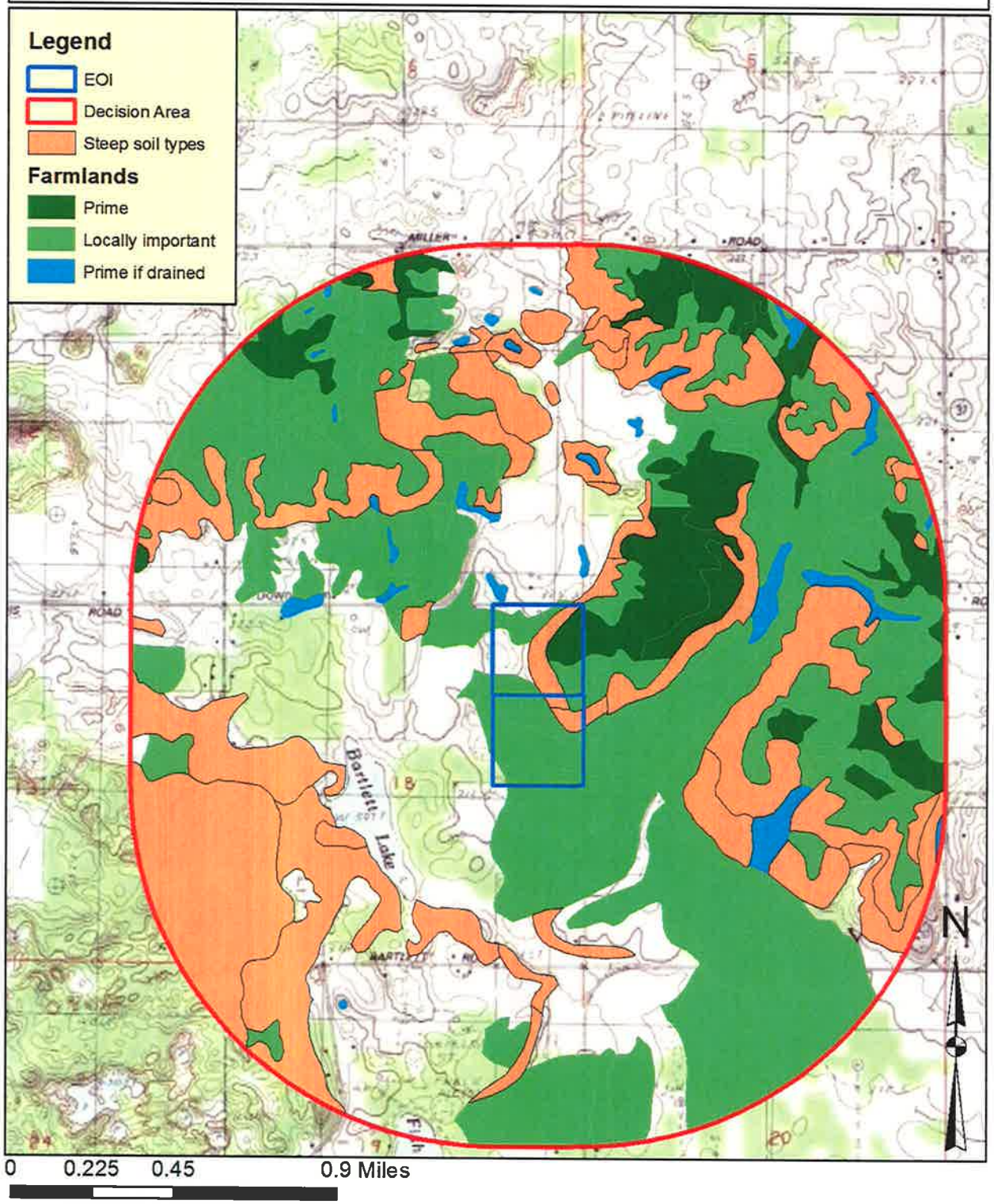

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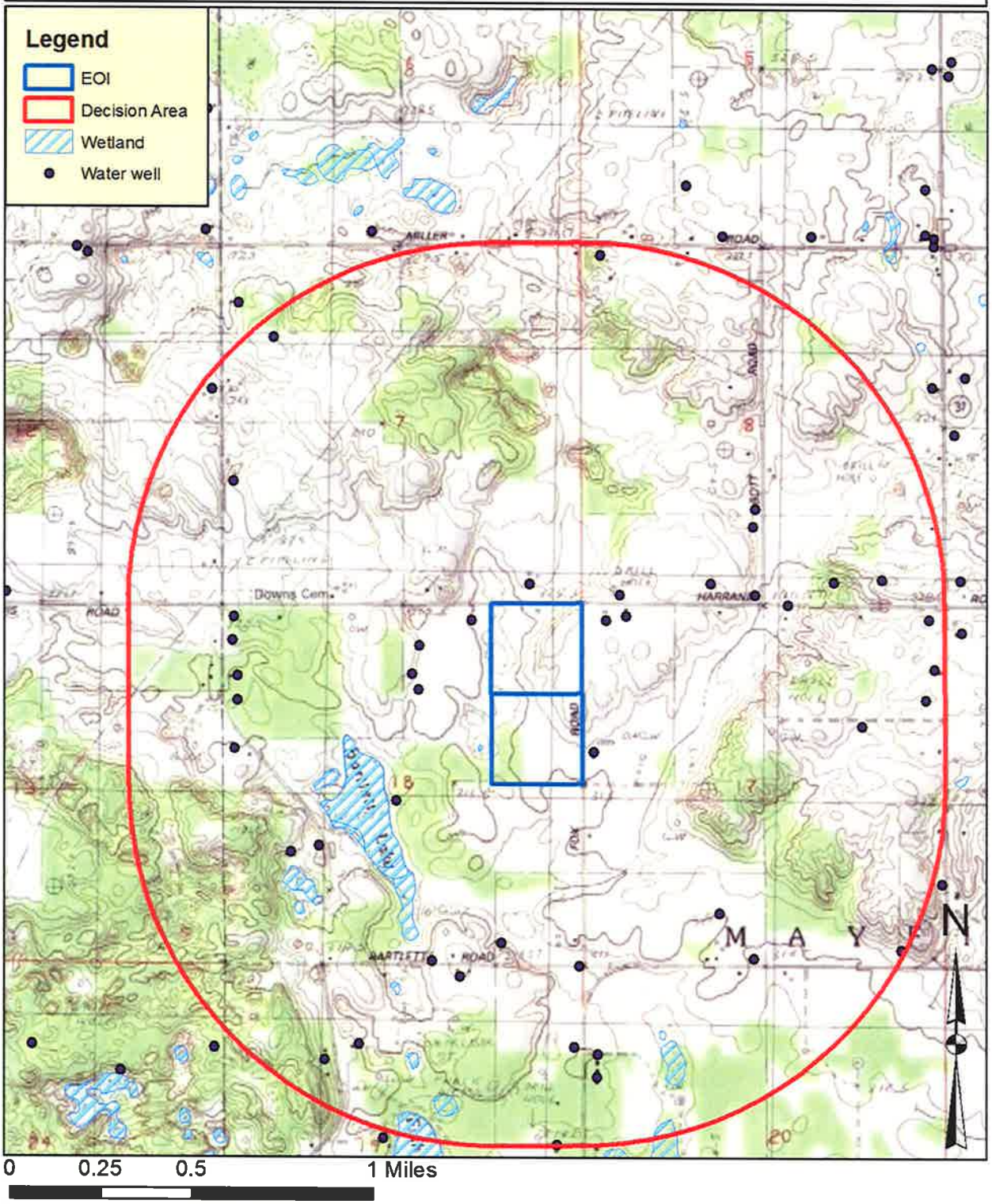
Figure 3. Wetlands and water wells



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APPENDIX B – Reasonably Foreseeable Development Scenario

I. Summary

The Reasonably Foreseeable Development Scenario (RFDS) for the approximately 3,050 acre analysis area indicates that, if a lease issues, one additional well could be drilled on or adjacent to the federal leasehold, thus approximately 4 additional acres would be disturbed as a result of this action.

The federal mineral estate would be included in a spacing unit approved by the state of Michigan after the type of well and its production, if any, is determined. Such a unit would be at least 80 acres, and would include the entire federal property within the unit boundaries. The only known productive formations in this area are pinnacle reef structures in the Niagaran Series, of middle Silurian age, which consists in the Michigan Basin of carbonate/salt sequences. Although additional wells could be drilled to formations shallower than the Niagaran, no production has been established from these formations and it is considered unlikely that any other formations will produce commercial quantities of oil and gas.

Long-term disturbance of two acres would occur if production is established. The initial production period of 5-10 years could be increased if the well is reworked or recompleted, but this would not be done unless the anticipated increased production is significant.

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) 366 and 1579, submitted by private entities in an area which has produced oil and associated natural gas since 1973. 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.

The federal government owns 50% of the mineral estate associated with the property. Private parties own the surface estate and 50% of the minerals. 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. Should a well be drilled directionally from a location off the lease, evidence of landowner permission for surface use would be required.

Information regarding the wells and the drilling results 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.

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 tract is located about one quarter mile northeast of Bartlett Lake and two and one quarter miles southwest of the village of Hannah, at the southwestern corner of the intersection of Harrand and Fox roads.

The property is in the headwaters of the Anderson Creek watershed, a tributary of the Manistee River. The surface is covered by up to 1000 feet of glacial material, the surface of which consists of outwash sand and gravel. At the base of the glacial material is the Ellsworth Shale of Late Devonian age. The property ranges in elevation from about 1,050 to 1,110 feet.

The region is situated within the northwestern quadrant of the 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 up to almost 5 kilometers in depth near Saginaw, roughly the center of the basin, but are estimated here to be somewhat less than three kilometers thick. Beneath the sedimentary section are crystalline basement rocks of the Granite-Rhyolite Province.

Economic Geology: Oil, natural gas and gas condensate of the Northern Michigan Reef Trend reservoirs have been produced in the county since 1970. The reefs, known as pinnacle reefs because of their great heights relative to the size of their bases, were formed by a combination of stromatoporoids and corals. The reefs range in area from a few square feet to many acres. They formed in a subsiding basin in warm, shallow waters, but their growth rates kept up with sedimentation rates, allowing them to reach heights of up to hundreds of feet. Reefs also formed along the flanks of the main trend, but shallower reefs were flushed of hydrocarbons by groundwater and deeper reefs were plugged by salt and did not form hydrocarbon reservoirs. The federal property is in the productive portion of the trend.

Vugs and other voids in the reef structure provide porosity and permeability, and the reservoir seal is provided by overlying impermeable anhydrites and carbonates. Most productive reefs are dolomitic, with porosity enhanced by the dolomitization process.

Gas shows have been encountered in other formations including the Traverse Limestone, Antrim Shale and A1 Carbonate, but have not indicated commercial potential.

IV. Past and Present Oil and Gas Exploration Activity

Geophysical Exploration:

The reef trend was discovered using high resolution seismic surveying equipment that was not generally available until the late 1960s. Prior to that time, a few reefs were discovered by the use of gravity surveys. Both seismic and gravity surveys are still used today, but the equipment and interpretive programs are far more sophisticated than those available in the 1960s. Exact locations of survey grids around the property are not known, but it is likely that all roads in the area have been geophysical survey routes many times. No survey routes are known to have accessed the Federal mineral tract.

Exploratory drilling: Exploration increased greatly after appropriate geophysical tools became available. The presence of the reefs had been known from chance drilling encounters, but the reefs could not be detected with any degree of certainty.

Of the 43 tests drilled within one mile of the federal property, 15 produced commercial hydrocarbons, a success rate of 35%. Three of these wells, all drilled near the southwest perimeter of the analysis area, produced natural gas and condensate; the remainder produced oil with associated gas. Initial production potential of the oil wells ranged from 36 barrels of oil per day (bopd) to 960 bopd, but state rules limit daily production to 150 bopd or less. Because each individual reef structure must be targeted separately, every reef test can be considered exploratory in nature.

The federal mineral tract has been under oil and gas lease three times in the past, beginning in 1968, but only once, in 1987, has the leasing resulted in a test of the federal minerals. Mack Oil drilled directionally about 200 feet into the NE ¼ NE ¼ from adjacent private lands. The Yanska 1-7B (API# 21-055-33669-0202, permit number 40241) was plugged and abandoned as a dry hole.

V. Past and Present Oil and Gas Development Activity

Production was first established in the analysis area in 1973. Since that time, two oil wells and seven dry holes have been drilled within ¼ mile of the property, but the federal tract has never been committed to a communization agreement.

A typical reef well will produce hydrocarbons for a period of 5-10 years before depletion. Often, however, a good well will be reworked, either through acidizing or by recompletion in different zones. An oil well drilled in 1973 just over ¼ mile southeast of the federal tract is still producing after being reworked several times. Several others drilled in the mid-1970s are also still producing after multiple reworking actions.

The size of the well pad depends on the number and type of wells anticipated and the equipment to be housed at the site, but is typically from 1.5 to 3 acres. Operators often will drill a vertical hole and, if it is unsuccessful, will drill one or more directional holes from the same well pad. Directional drilling gives an operator a better chance of intersecting a reef structure. If a productive reef structure is found, the well is completed by acidizing the producing interval (hydrofracture is not used in reef well completions). Oil is separated from the gas and stored in tanks at the site or is pumped through gathering lines to a remote tank battery. Gas is placed in a pipeline buried in the access road and sent to a compressor station. The produced brines may be pumped down disposal wells or may be used for injection to increase oil output at other locations.

Some operators drill wells with horizontal segments to maximize reef production. Horizontal drilling requires somewhat larger pads to accommodate the additional equipment and supplies necessary but may intersect more than one reef structure from a single pad. Because hydrofracture is not used in the process, the pads do not have to accommodate the large number of supply trailers, pumps and other equipment used in operations in unconventional reservoirs, such as shale. A horizontal well drilled by Shell Western in 1997 approximately 1.5 miles east of the federal tract intersected multiple pay zones.

VI. Oil and Gas Occurrence Potential

Oil and gas are known to occur in the reef trend in relatively small, discrete reservoirs that are not usually interconnected. In the vicinity of the federal property a success rate of 35% for 43 wells drilled indicates a reasonable occurrence potential.

VII. Oil and Gas Development Potential

Oil and gas have been developed in the area since 1973. Existing infrastructure for oil and gas development in the area is available, sufficient for any operations proposed and will require no upgrades if a lease issues. Vertical, directional and horizontal drilling techniques have all been used to access the reef reservoirs. Hydrogen sulfide ("sour gas") has been a problem in portions of the northern reef trend, but has not been encountered in more than trace concentrations in this area.

VIII. RFD Baseline Scenario Assumptions and Discussion

The unleased federal minerals are not in a production unit but are located next to production units to the east and west. The minimum production unit for Niagaran oil wells is 80 acres, but this acreage may be expanded by decision of the state of Michigan Oil and Gas Board. Only one producing Niagaran well can be drilled on this property. No other formations in this area are known to be capable of production. Should a horizontal well be proposed, spacing acreage would be increased and the operator would make spacing arrangements with the state.

It is assumed that all drilling will be done from a single well pad located either on the surface of the tract or from adjacent private land. The pad is unlikely to exceed three acres and any access road will be less than ¼ mile long, resulting in a total disturbed area of 3.66 acres. Pits will not be used to collect drill

cuttings; cuttings will be collected in steel tanks and disposed at sites designated in the drilling plan and approved by the state. Drilling water will be taken from a water well drilled in the pad. After all drilling is completed, 1.5-2 acres of the well pad will be reclaimed and the site will remain until the well ceases production. If no production is established or when production ceases, the entire site will be reclaimed to state standards and the surface owners' wishes.

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

In the approximately 3,050 acre analysis area 43 wells have been drilled from 36 surface locations. Using 2.5 acres as a reasonable average surface disturbance per surface location, a total of 90 acres has been disturbed as a result of oil and gas activity. Should a lease issue, an additional short-term disturbance of just under 4 acres could result, and a long-term disturbance of up to two acres could result if production is established.

APPENDIX C – Notices and Stipulations

LEASE NOTICES

1. The area that may be developed contains wetlands, including some wetlands that do not have saturated soils year-round. Disturbance in or discharge into wetlands must comply with the Clean Water Act, notably Sections 401 (Water Quality Certification) and 404 (wetland filling), and Part 303 of Michigan's Natural Resources and Environmental Protection Act. Applicants for drilling permits will be required to conduct a wetland survey of areas to be disturbed.
2. Applicants for drilling permits will be required to conduct a cultural resources Phase I survey. 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.
3. Applicants for drilling permits may be required to submit a Discovery Plan for accidental archaeological discoveries occurring during ground-disturbing activities that were not 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.