FINDING OF NO SIGNIFICANT IMPACT

Environmental Assessment
Expression of Interest 266
DOI-BLM-ES-030-2013-0017-EA

The proposed action is for the BLM to offer the federally owned oil and gas resources in Pentwater Township, Oceana County, Michigan (T. 16 N., R. 18 W., Sec. 2, NE¼NE¼ and NE¼SE¼) containing 80.28 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-030-2013-0017-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
Fax 414-297-4409

DECISION RECORD

Environmental Assessment
DOI-BLM-ES-0030-2013-0017-EA
Expression of Interest 266

It is my decision to allow the Proposed Action to be implemented as described in the EA of Expression of Interest (EOI) 266 (Michigan Meridian, Pentwater Township, Oceana County, Michigan, T. 16 N., R. 18 W., Sec. 2, NE¼NE¼ and NE¼SE¼), totaling 80.28 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-030-2013-0017-EA

Expression of Interest 266

Date:	August 2013
Type of Action:	Oil and Gas
Serial Number:	N/A
Location:	Michigan Meridian, Pentwater Township, Oceana County, Michigan T. 16 N., R. 18 W., Sec. 2, NE¼NE¼ and NE¼SE¼
Project Acreage:	80.28 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)
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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.

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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 tracts considered for lease in this analysis were nominated by an Expression of Interest (EOI) 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 November 4, 2004, 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 80.28 acres of land as described on the title page. This nomination is located on private lands.

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 to conduct limited external scoping because the surface of the requested lease parcels and surrounding lands are owned by private parties other than the BLM.

Process for conducting external scoping

External scoping consisted of informing the private surface owners of the requested lease parcels by certified letter of the lease request and inviting them to provide information about features on their land that could be adversely affected by oil and gas development. On April 29, 2013, BLM NSFO staff conducted a conference call with the private surface owner of the NE¼NE¼ parcel to address his concerns and questions. In addition, on May 13, 2013, BLM NSFO staff conducted a conference call with members of the Duna Vista Homeowners Association, many of whom are directly affected by the proposed action as private surface owners within the Decision Area, to explain the leasing process and to address concerns and questions regarding the project. Onsite visits were conducted at both nominated lease parcels on May 20, 2013. The BLM also obtained digital data from the state of Michigan showing the locations of various natural features, roads and trails, and administrative and management boundaries.

Issues identified through internal and external scoping

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

1. The proposed lease parcels and surrounding areas have abundant wetlands.
2. The Decision Area contains steep slopes that may be highly erosion-prone.
3. Michigan Department of Environmental Quality (DEQ) Pentwater-Summit Critical Dune Area is located within western portion of Project Area.
4. Private surface owners' are concerned about their rights regarding lease holder access to their properties for well pads, pipelines, and other construction.
5. The proposed lease parcels contain many private drinking water wells, and there are concerns regarding potential impacts of drilling on drinking water.

Issues identified through public comment period

The draft EA was posted to the BLM Eastern States public internet website for a 30-day public comment period that commenced on July 25, 2013. A total of 22 comments were received from the public during

this period. The following were the substantive concerns identified with the draft EA, with BLM responses to each:

Water concerns:

- Depletion of groundwater resources due to high levels of water used in production
  - The water used in the drilling of a vertical well to about 2,100 feet would be approximately 10,000 to 15,000 gallons. Completion operations would consume up to an additional 5,000 gallons. If a horizontal drainhole is drilled, water use would increase based on the length of the drainhole. The drilling of a 5,000 foot lateral would require about 40,000 gallons of water and completion would require another 10,000 to 15,000 gallons, depending on the number of perforations placed in the production tubing. In comparison, the average family of four will use about 300-400 gallons of water a day.
    Completions in these and other carbonate reservoirs do not involve hydraulic fracture operations. The sources of the water to be used will be determined at the Application for Permit to Drill (APD) stage, and will depend on the expense involved to drill a water well on the pad or to bring the water in by tanker from a remote source. All water used in drilling and completion operations, as well as water produced if production is established, will be injected into disposal wells approved by the state. Disposal wells target formations from which oil and gas have been produced in the past and are isolated from fresh water aquifers.
- Underestimation of number of private water wells in area. Need to correct for right amount.
  - The figure in the draft EA was derived from a shapefile called Wells_Hydra_Prop, downloaded in June 2013 from the Michigan Geographic Data Library (http://www.mcgi.state.mi.us/mgdl/?action=thm). This database was published in 2005, which explains a large component of its incompleteness. The BLM has since downloaded drinking water wells logs for each of the 6 sections in Mason and Oceana Counties that are overlapped by the Decision Area. These are available from Michigan Department of Environmental Quality's Scanned Water Well Record Retrieval System, available online at http://www.deq.state.mi.us/well-logs/default.asp. The BLM accessed these records on August 23, 2013. The total number of well logs in all six sections was 289. This figure has been changed on Page 19 of the final EA. This is most likely more than the total number of wells in the Decision Area, since the Decision Area does not occupy the entirety of the six sections.
- Safety of drinking water from private water wells and the threat to water quality
  - State of Michigan regulations require that pipe must be cemented in place between metal and steel casings and producing layers. Therefore, the likelihood of water contamination is unlikely.

Erosion concerns:

- Area is highly susceptible to erosion
    - A stipulation will require that the producer submit a soil management plan, to be approved by the BLM, before any permit to drill is approved. See stipulation on Page 45 for more details on the contents of the soil management plan.

Economic concerns:

- Tourism will be hurt by the proposed action
    - A lease notice has been added to Appendix C, as Lease Notice 6, on Page 44 of the final EA stating that the initial drilling phase can only occur between December 1 and March 15.
- Economic value of drilling not worth tradeoff of recreation/aesthetic values
    - The BLM does not offer these tracts for economic gain for the federal government but is required (43 CFR 3120) to address expressions of interest for oil and gas leasing received from an interested entity.
- Drilling will reduce property values
    - This is speculative and cannot be accurately evaluated.

Other concerns:

- On page 36 of the draft EA there is an error regarding miles from Lake Michigan of proposed action (should read ½ mile instead of 1 ½ miles).
    - This has been corrected to one half mile on Page 39 of the final EA.
- Federally listed species incorrectly states three species in the introduction to the Endangered Species section on Page 13 of the draft EA, but lists six in the table.
    - This has been corrected to six on Page 15 of the final EA.
- What are the setbacks from homes for new oil and gas wells?
    - Michigan state law requires a minimum 300 foot setback from "...existing structures used for public or private occupancy" (Natural Resources and Environmental Protection Act, Act No. 451 of the Public Acts of 1994, Part 615, Rule 324.301(v))
- Safety issues in case of gas release and previous hydrogen sulfide problems from area wells
    - Added narrative for the past hydrogen sulfide problems on area wells to Appendix B, Reasonably Foreseeable Development Scenario, Section V. Past and Present Oil and Gas Activity, Page 41 of the final EA.
- Vegetation in the area would be clearcut and destroyed
    - The proposed access route and pad location would be determined if and when an Application for Permit to Drill (APD) or Notice of Staking (NOS) is received. Representatives of the BLM, the lessee, the landowner and the Michigan Department of Environmental Quality would conduct a site visit to evaluate the location and any surface resources and uses present. At this time amendments to the proposed location and possible mitigating measures to be used would be

discussed. The total cleared area, which would include the well pad and access road, would be about two acres.

If commercial production is established a portion of the well pad of about one acre would be reclaimed. The remaining wellhead area, turnaround and storage/separator facility would continue to be used until the well is plugged and abandoned. If production is not established, or at abandonment, the area would be reclaimed to standards determined by the state and the landowner.

CHAPTER 2 – ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Introduction

The NSFO has received an Expression of Interest (EOI) to lease a combined 80.28 acres of federal mineral estate for oil and gas development in Pentwater Township, Oceana County, Michigan (Figure 1, Appendix A). This competitive lease would provide the lessee exclusive rights to explore and develop federal oil and gas minerals on the lease but would not authorize surface-disturbing activities or obligate a leaseholder 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 lands in the western portion of Michigan's Lower Peninsula, near the eastern shore of Lake Michigan.

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

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 80.28 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. 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 solution of hydrochloric acid 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 to be expected during the productive life of a well, and separation, dehydration and other production processing may be necessary. Construction of temporary on-site and additional off-site facilities may be needed to handle this processing.

A lease notice in these proposed leases would encourage the use of non-invasive cover plants 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 EOI, the distance within which directional drilling is likely to be viable, but omits the portions of this buffer within Lake Michigan and Bass Lake, producing a Decision Area totaling 2,323 acres (Appendix A, Figure 1). This area includes a portion of Mason County. Other wetlands were not omitted from the Decision Area because they may contain upland areas that are large enough to permit development that were not captured on the 1:24,000 basemap. The Decision Area is within the Eastern Temperate Forests level-I ecoregion, the Mixed Wood Plains level-II ecoregion, and the Southern Michigan/Northern Indiana Drift Plains level-III ecoregion. The Decision Area is within the Pere Marquette-White subbasin of the Northeastern Lake Michigan basin.

Table 1. Technical Review.

Program	Reviewer	Signature	Date
Air Quality	Derek Strohl Natural Resources Specialist		8/30/13
Climate Change	Derek Strohl Natural Resources Specialist		8/30/13
Cultural/Paleontology	Jarrod Kellogg Archeologist	JXK	8/30/2013
Environmental Justice	Kurt Wadzinski Planning & Environmental Coordinator	Kurt J. Wadzinski	8/30/2013
Farmlands (Prime & Unique)	Derek Strohl Natural Resources Specialist		8/30/13
Fish and Wildlife	Derek Strohl Natural Resources Specialist		8/30/13
Floodplains	Derek Strohl Natural Resources Specialist		8/30/13
Geology/Mineral Resources/Energy Production	Jeff Nolder Geologist		8/30/13
Hazardous Wastes	Derek Strohl Natural Resources Specialist		8/30/13
Invasive Species/Noxious Weeds	Derek Strohl Natural Resources Specialist		8/30/13

Table 1. Technical Review.

Program	Reviewer	Signature	Date
Native American Religious Concerns	Jarrod Kellogg Archeologist	JXK	8/30/2013
Recreation	Derek Strohl Natural Resources Specialist		8/30/13
Socioeconomics	Kurt Wadzinski Planning & Environmental Coordinator	Kurt J. Wadzinski	8/30/2013
Soils	Derek Strohl Natural Resources Specialist		8/30/13
Endangered Species	Derek Strohl Natural Resources Specialist		8/30/13
Vegetation	Derek Strohl Natural Resources Specialist		8/30/13
Visual Resources	Derek Strohl Natural Resources Specialist		8/30/13
Water Resources/Quality (Drinking, Surface & Ground)	Derek Strohl Natural Resources Specialist		8/30/13
Wetlands/Riparian Zones	Derek Strohl Natural Resources Specialist		8/30/13
Wild & Scenic Rivers	Derek Strohl Natural Resources Specialist		8/30/13
Wilderness	Derek Strohl Natural Resources Specialist		8/30/13

Air Quality

Oceana 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 the potency of CO_2 and expressed in terms of CO_2e (carbon dioxide equivalent). 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 portions of Michigan's Lower Peninsula at least 10,000 years ago (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 Oceana County in the form of mounds and agriculture, 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 area of current Oceana County, with French explorers noting their presence upon entering the region around 1640. However, there are relatively few archeological sites which can be definitely described as Pottawatomi in origin. One of these sites, the Dumaw Creek site, is located in Oceana County. Dated to about 1600, the site is a large summer village located on the edge of a forest, adjacent to prairies and near water sources. The Pottawatomi at this time used a seasonal economy reliant on farming, hunting, fishing, and the gathering of wild food (Clifton, 1978).

While initial European contact had little effect on Native tribes in the in the Upper Great Lakes region, it 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 (Feest & Feest, 1978). Changes were further exacerbated with the end of the Revolutionary War. Although officially expelled from the region, the British maintained several frontier posts, which coupled with American influence, brought a peak to fur trading in the area.

The War of 1812 brought further changes to Native Americans in the Great Lakes, usually to their detriment. Unlike the British who gave the Native Americans favorable status, the United States viewed them as an impediment to expansion. With British influence being all but eliminated from the region, the United States had a free hand in dealing with the local Tribes 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 (Feest & Feest, 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.

With the cession of the Lower Peninsula in 1836 and the creation of the state of Michigan the following year, American settlement increased. 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).

There are seven Historic Properties in Oceana County listed in the National Register of Historic Places. Five are historic structures; two are prehistoric village/mound sites, including the Dumaw Creek site (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 a few sites in Michigan. 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.

Endangered Species

Six species are listed on the USFWS list of endangered species known to occur in Oceana and Mason Counties, Michigan:

- Pitcher's thistle (*Cirsium pitcheri*), a threatened species that dwells on dunes
- Kirtland's warbler (*Dendroica kirtlandii*), an endangered bird species that nests in young jack pine (*Pinus banksiana*) stands
- Karner blue butterfly (*Lycaeides melissa samuelis*), an endangered insect that dwells in sandy barrens containing wild lupine (*Lupinus perennis*), its sole larval host plant
- Eastern massasauga (*Sistrurus catenatus*), a candidate snake that dwells in various types of open wetlands and adjacent open habitats
- Piping plover (*Charadrius melodus*), an endangered bird that dwells on Great Lakes beaches
- Indiana bat (*Myotis sodalis*), an endangered mammal that roosts in mature trees near waterways, where it forages

There are several dozen additional species that are listed by the state of Michigan as *endangered*, *threatened*, or *special-concern* and that are known to occur in Mason and Oceana Counties. Most of these species are associated with wetlands or dunes.

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 project area is located in a township frequented predominately by recreational users, retirees, tourists, and summer vacationers. According to the RFDS (Appendix B), 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 (Prime and Unique)

The Decision Area contains 335 acres of *farmland of local importance* (Figure 2, Appendix A). These lands are concentrated in the central and east-central portions of the Decision Area.

Fish and Wildlife

The Decision Area is composed mostly of woodlands and low-density residential and commercial development (See **Vegetation** and **Visual Resources** sections below). The Decision Area likely harbors populations of diverse types of wildlife, including deer, rabbit, turkey, nesting birds, reptiles and amphibians, and insects.

Floodplains, Wetlands, and Riparian Zones

National Wetland Inventory data for the Decision Area include 36 acres of emergent wetlands, 480 acres of forested and/or shrubby wetlands, and ten acres of open water (Figure 3, Appendix A). Most of this acreage is in the Eastern half of the Decision Area. As stated in the introduction to Chapter 3, the Decision Area omits Lake Michigan and Bass Lake, since development in those open waters is out of the question. The Decision Area does not omit the rest of the wetlands depicted in the National Wetland Inventory because those areas may contain upland areas that are large enough to permit development but small enough to be missed by the coarse wetland mapping process.

The Decision Area contains six miles of streams, and most of this length has associated floodplains. Operators proposing to drill will be required to conduct a wetland survey of the area to be disturbed and to take steps to avoid impacting them, in compliance with Executive Order 11990, the Clean Water Act, and State law.

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 as of yet 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. In the vicinity of the federal property a success rate of 35% for 43 wells drilled indicates a reasonable occurrence potential. 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* (2013a) shows three sites of environmental contamination and one open leaking underground storage tank in the Decision Area. Three of these features are near the south end of Bass Lake, and the fourth, which is called the Pentwater Oil Field, is located near the eastern edge of the Decision Area, along Pere Marquette Highway. These hazardous wastes are detailed in Table 2, below.

Table 2. Hazardous Wastes in Decision Area.

Name of hazardous waste feature	Type of facility	Type(s) of contaminant	Discovery date(s)
Wishing Well	Gas station, leaking underground storage tanks	Gasoline and diesel fuel	1994 and 2012
Broadway Road Groundwater Contamination	Private households	Isopropyl benzene; sec-Butylbenzene	1993
Neilson #1 (PN 16972)	Oil and gas extraction	Not listed	2005
Pentwater Oil Field	Oil and gas extraction	Benzene, chlorine, ethylbenzene, toluene, xylenes, crude oil	2005

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 regulate 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, 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 June 10, 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

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.

Socioeconomics

Oceana County is located in the western part of Lower Michigan, bordered on the west by Lake Michigan, to the north by Mason County, by Muskegon County to the south, and Newaygo County to the east. Oceana County is 512.07 square miles, with a population density of approximately 52 persons per square mile. Its estimated population in 2012 was 26,310, a 1% decrease from the 2010 census. The county seat is located in the city of Hart, in the west-central part of the county. The project area encompasses one 40.28 acre northern parcel (NE¼NE¼), one 40 acre southern parcel (NE¼SE¼), and a one mile buffer, mostly within the Township of Pentwater.

The distribution of population in Oceana County is 83.1% White, 14% Hispanic or Latino, 1.5% Two or More Races, 1.4% Native American or Alaska Native, 0.7% African American, and 0.4% Asian. 75.3% of Oceana County residents are 18 years of age or older, with 17.5% 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.

In 2011, there were 15,869 housing units in the county with a homeownership rate from 2007-2011 of 84%, which is over 10% higher than the state as a whole. The median value of these owner-occupied homes was $110,900 for the period 2007-2011, much lower than that of the state ($137,300).

For the period 2007-2011, median household income was $40,422 for Oceana County, over $8,200 lower than for the state. Approximately 19% of persons lived below the poverty level, much higher than the 15.7% statewide that live below the poverty level. In 2011, 39.1% of Oceana County households received some form of Social Security payment, over 24% of households received retirement income, and 16.7% of households received benefits from the Supplemental Nutrition Assistance Program (SNAP); all of these totals are much higher than the national averages for these respective categories. 83% of the county population 25 years of age and over graduated from high school, over five percent lower than the state. 14.8% of county residents 25 years of age and older have a bachelor's degree compared to 25.3% for Michigan as a whole. About 10% 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. Department of Commerce, 2013b).

The seasonal unemployment rate for Oceana County was 14.1% in February 2013, a 0.8% decrease from the 14.9% rate in February 2012 but 5.3% higher than Michigan's seasonally adjusted unemployment rate of 8.8% for February 2013. However, it is evident that employment in Oceana County increases

during the tourist season between summer and early fall, as the rate fluctuated between 11% in April 2012 and 8.6% in October 2012. This pattern also held during the previous three years (U.S. Department of Labor, 2013).

Between 2007 and 2011, the education, health care and social assistance industry sector (wage and salary jobs and proprietors) employed the most people in Oceana County (2,224) followed by manufacturing (2,044); agriculture, forestry, fishing and hunting, and mining (1,300); and retail trade (1,089). Accommodations and food services gained the most employment in the county between 2001 and 2011 (194), followed by manufacturing (149) and wholesale trade (71); construction (-204) and retail trade (-153) lost the most employment during this period. (U.S. Department of Commerce, 2012a).

According to the Department of Commerce (2013), Oceana County jobs in mining shrunk from seventeen in 1998 to just seven in 2011, all involved with oil and gas extraction, which is about 0.2% of the county's employment. The average wages for the seven mining jobs are unknown, but in 2011 the average annual wage for mining jobs in the U.S. was $97,237 (U.S. Department of Labor, 2012).

Demographically, Oceana County is less affluent, has significantly less college graduates, and is more homogenous and older than the average county in the State of Michigan. Factors that may be influencing this demographic profile are the number of retirees living in the county, migrant farm workers, and the reliance on summer/fall tourism in generating income.

Soils

The soils within the Decision Area are primarily sands, and these sands form Lake Michigan dunes in the western half of the Decision Area. These soils are very fragile, and the Dune Protection and Management Act protects the dunes in Michigan. The Michigan Department of Natural Resources administers the Act by regulating certain types of development on critical dunes. The Decision Area contains 300 acres of critical dunes (Figure 2, Appendix A). Twenty percent of the Decision Area has mapped soil types with a *severe* erosion hazard rating, and five percent of the Decision Area has a *moderate* erosion hazard rating.

Vegetation

Aerial photos and a site visit on May 21, 2013, show the majority of the Decision Area covered in broadleaf, deciduous forests or open wetlands.

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 approximately 290 water wells in the Decision Area (Figure 3, Appendix A). Many of these draw water from less than 50 feet of depth, and all of them draw from less than 350 feet. Judging from the rural character of the Decision Area, it is assumed that most of the wells are for residential use. The Michigan Department of Environmental Quality's *Water Well Viewer* (2013c) shows the sites of

environmental contamination that are discussed in the **Hazardous Wastes** section along with a few dozen wells that have been tested for nitrates and a few wells that were tested for arsenic. All of those wells tested appear to have no-detect results or, in a few cases of nitrate testing, under 5 mg/L, which is a safe level for drinking water. These results do not apply directly to the proposed action, since they do not indicate levels for contaminants that would result from oil and gas development.

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 not certain if any wells 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 emissions or geographic 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, 2012).
- 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 sources 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.

Endangered 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. 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.

Farmlands (Prime and Unique)

The proposed action could result in the conversion of up to 3.7 acres of locally important farmland. Most of that acreage would be reclaimed 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.

Floodplains, Wetlands, and Riparian Zones

A notice (Appendix C) states that lessees must comply with state and Federal laws and regulations designed to protect wetlands. Direct filling of wetlands will not be permitted except in cases of widening existing roads or temporary disturbance for the purpose of laying pipelines. Because wells could potentially be directionally drilled, prohibiting surface occupancy in wetlands would not necessarily prevent accessing the minerals under the wetlands. The BLM will require the applicant to conduct a wetland survey of any area proposed for drilling, 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 limestone 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 of 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.

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. Oceana County does 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, Oceana County did not receive any payments directly related to oil and gas production on federal lands; however, the county did receive over $79,000 and local school districts received approximately $21,000 from U.S. Forest Service land payments (U.S. Department of Interior, 2013b). Some of the revenue generated by oil and gas production on the federal mineral estate in Oceana 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 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. The project would likely bring very small revenues in the form of royalty payments, severance taxes, and rent monies to the state and county; 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 or 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 Oceana County and the potential drilling of one well on the proposed parcels, 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. The BLM would require operators to delineate soils with moderate or severe erosion hazard ratings and to develop a soil conservation plan before permitting any soil disturbance. If an operator wishes to drill outside of the lease, where stipulations do not apply, then the BLM would incorporate soil-conserving BMPs as conditions of approval into the drilling permit. The Michigan DNR has 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.

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, crops, pastures, and old fields. Were well construction to take place in a forest, the impact would be greater than the impact of selective or clear-cut logging, as follows:

- Complete vegetation removal – while prescribed forestry practices leave trees of selected species and ages as well as shrubs and herbaceous vegetation, well pad construction would result in total vegetation 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 up to approximately 25 years, until the wells were abandoned.

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, through conditions of approval, 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 the online *Water Withdrawal Assessment Tool* (Institute of Water Research, 2012) and obtain a registration for the withdrawal.

Any approved drilling operation must adhere to BLM Onshore Order No. 2 (Bureau of Land Management, 2007), 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 DEQ.

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)	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.
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.

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
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.
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.	No response to date.
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.
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 to date.

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BLM Preparers

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Preparer — Aug 30 2013 Date

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Assistant Field Manager, Natural Resources ACTING — Aug. 30, 2013 Date

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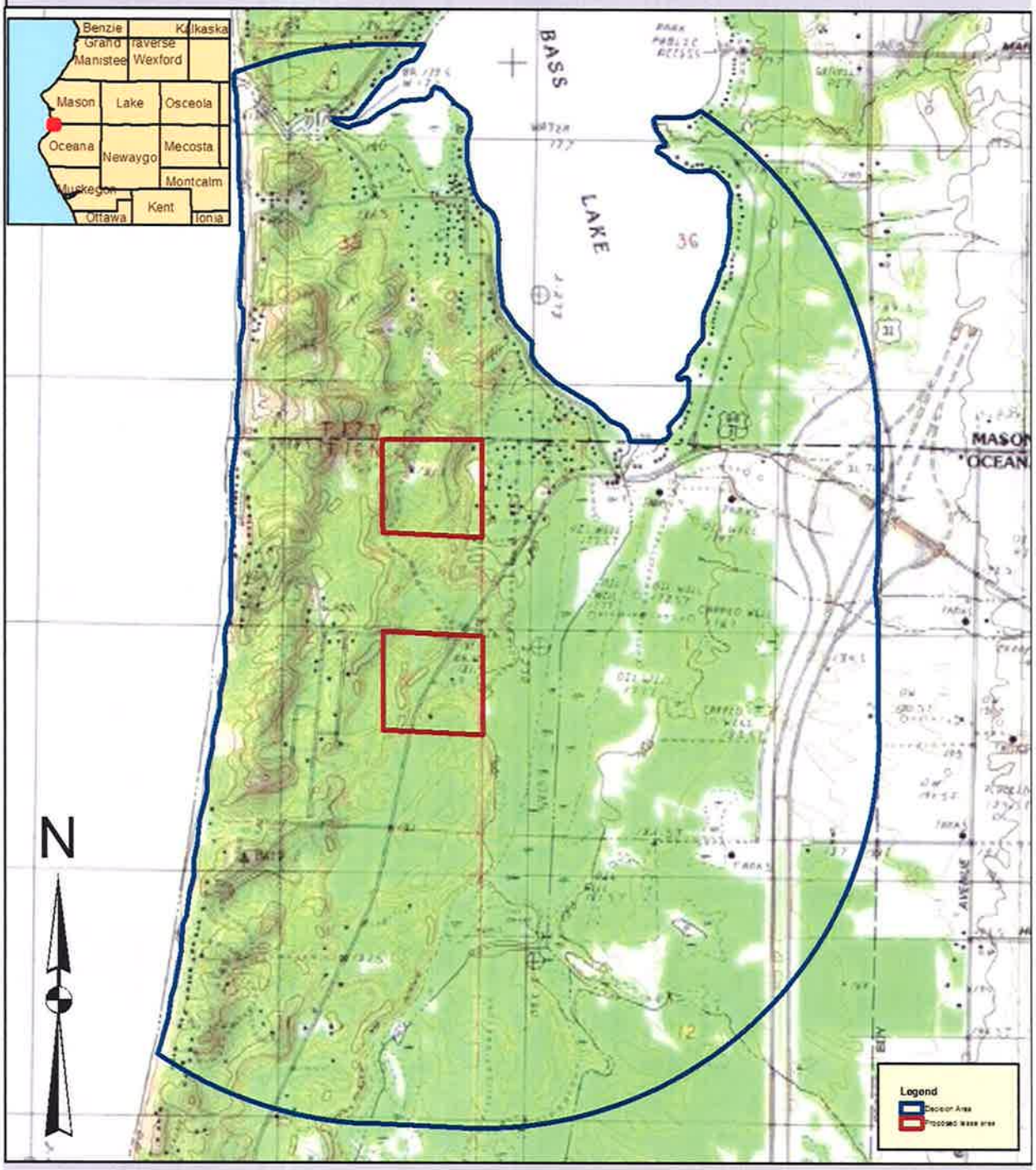
APPENDIX A – Figures

Figure 1. Overview.



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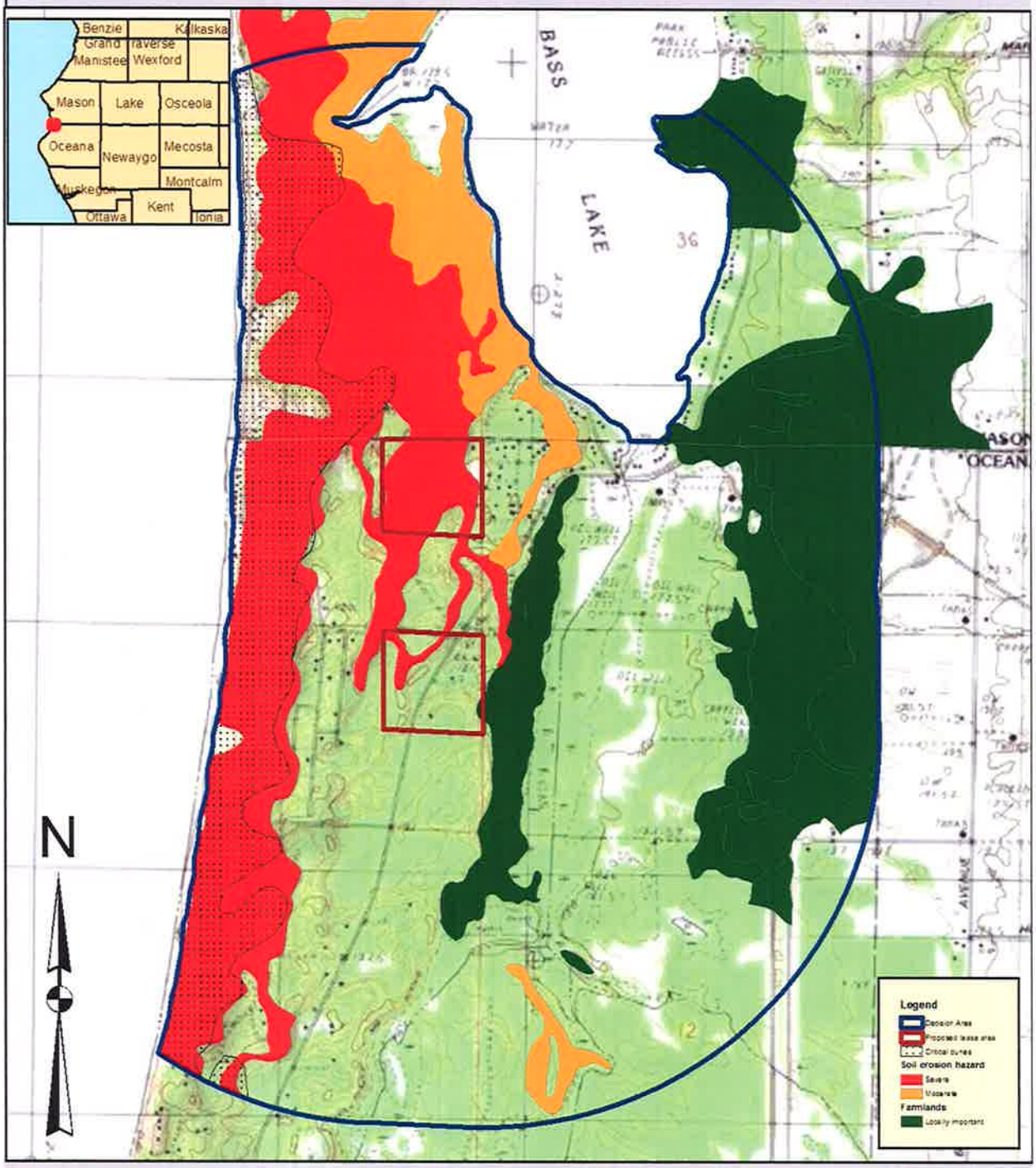
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed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

Figure 2. Highly erosive soils, critical dunes, and locally important farmlands.



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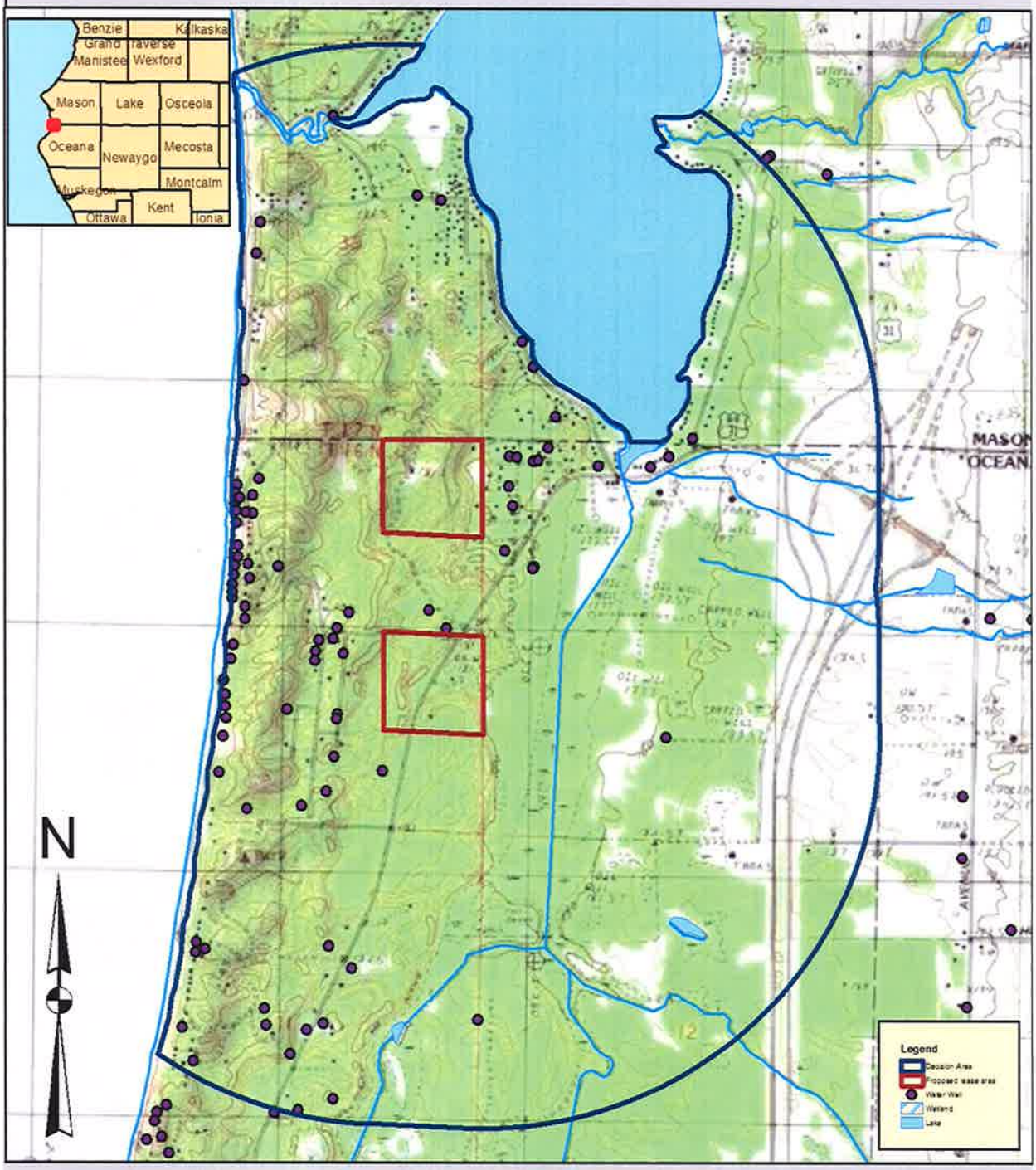
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed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

Figure 3. Wetlands, waterways, and water wells.



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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.

APPENDIX B – Reasonably Foreseeable Development Scenario

I. Summary

The Reasonably Foreseeable Development Scenario (RFDS) for the approximately 2,323 acre analysis area indicates that, if a lease issues, one additional well could be drilled on or adjacent to the federal leasehold, thus approximately two additional acres would be disturbed as a result of this action. It is unlikely that an existing or abandoned pad could be occupied. If the well produces in commercial quantities, about one acre would be occupied for production operations.

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. The size of the unit for a vertical well would be 20 acres. Should a horizontal drainhole be proposed, the unit acreage would be increased. The Traverse Limestone and the Dundee Limestone, of Devonian age, have produced oil in the area with associated gas. Two wells to the Niagaran A2 Carbonate, of middle Silurian age, produced gas (one during a blowout), but due to low production volumes and high hydrogen sulfide (H2S) content in the gas, it is unlikely to be targeted.

Long-term disturbance of 1.5 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) 266, submitted by private entities in an area which has produced oil since 1948. 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 the mineral estate associated with the properties and private parties own the surface estate. 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:

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 energy 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 located about one quarter mile and three quarter miles southwest of Bass Lake, along the Oceana – Mason County border two miles northeast of the village of Pentwater. Access to the area is provided by the South Pere Marquette Highway (US Route 31 Business), which bisects the southern tract.

The properties are about 1/2 and 2/3 mile from the Lake Michigan shore, and are drained by an unnamed wetlands stream which flows northward into Bass Lake. The bedrock surface of the Coldwater Shale is covered by up to 550 feet of glacial material, which at the land surface consists of lacustrine sand and gravel. Elevations on the tracts range from about 600 to more than 630 feet. The surface is classified as a state Designated Dune Area, but the federal tracts are not in the restricted Critical Dune Area which lies closer to the lake.

The region is situated within the western 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 five kilometers in depth 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.

Economic Geology: Oil with associated natural gas production, first established in the area in 1948, has come from the Traverse Lime and the Dundee carbonate reservoirs. More recently, small volumes of oil were produced from the Reed City Dolomite. The shallow reservoirs (from about 1600 to 2200 feet) are structurally controlled, perhaps by draping over deeper Silurian reefs. The best production is associated with zones of partial to complete dolomitization. The oil pools, designated the Pentwater 6-16N-17W, are largely depleted now, with most wells plugged and abandoned after about five years of production;

a few wells still produce small amounts of oil. As of 1989, the pools had collectively produced about 6.9 million barrels of oil and over a billion cubic feet of gas from 143 wells. A vertical well drilled on the southern flank of the structure in 2010 expanded the productive area slightly, but a planned horizontal drainhole from that well was never drilled.

Gas shows have been encountered in other formations including the Antrim Shale and A2 Carbonate, but have not indicated commercial potential. The A2 Carbonate was produced for a short time from one well in the 1970s, but its production totals were included with another gas pool which had cumulative production of about 150 million cubic feet. The low volumes produced, coupled with the high H_2S content of the gas, did not support further development. Most of the associated gas produced from the Traverse and Dundee zones was vented or flared.

IV. Past and Present Oil and Gas Exploration Activity

Geophysical Exploration:
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 at times. No survey routes are known to have accessed the federal mineral tract. It does not appear that geophysical exploration played a role in the discovery of the original oil fields.

Exploratory drilling:
After discovery of oil in the county in 1933, exploratory drilling expanded rapidly to adjacent townships. The Pentwater pools, both discovered in 1948, were rapidly developed and by the early 1950s the field had been delineated. Later attempts to expand the boundaries of production failed.

One federal well, the Federal Government 1 (API# 21-127-14399-0000, permit 14399), was drilled in the northeastern corner of the NE¼NE¼ in 1948 by Carter Oil. After acid treatment, it produced oil at an open flow rate of 240 barrels/day from the Dundee at depths of 2,103 to 2,112 feet. It was plugged and abandoned at the end of 1952. The Traverse Limestone porosity zone in this well tested water.

In 2010 Stoney Creek Production drilled the Noffke 1-1 vertical outpost well that produced 15 barrels a day from the Traverse, Stony Point, Dundee and Reed City carbonates. The company had planned and permitted a horizontal drainhole but the hole was never drilled.

V. Past and Present Oil and Gas Development Activity

Of the 39 tests drilled within one mile of the federal property, 33 produced commercial hydrocarbons, a success rate of 85%. With one exception the wells were drilled between 1948 and 1952. Three of the wells produce small amounts of oil today. Very little development activity has taken place in the area since the 1970s.

The availability of technology capable of accurate, closely controlled horizontal drilling is changing development capabilities in the industry. Horizontal drainholes may be drilled into "depleted"

reservoirs to salvage hydrocarbons that had been left in the ground by previous production methods. This technology is in use today in a variety of reservoirs in Michigan, and is especially effective in carbonate reservoirs. Pools such as the Pentwater may be amenable to horizontal drilling and completions.

A typical vertical well in this area requires a well pad of less than one acre and a 16-20 foot wide access road of about 1200' or less, for a surface disturbance of about 1.5 acres or less. A horizontal drainhole would require a slightly larger pad of about 1.25-1.5 acres. The pad size also depends on the facilities maintained at the site, such as tank batteries, separators, and flares to burn associated gas. The state does not permit in-ground sumps for drilling fluids, so steel tanks must be used during the drilling and testing of wells. Storage of oil at remote locations would require gathering lines to be buried in the access road and follow existing rights-of-way to the tank site.

Operators often will drill a vertical hole and, if it is unsuccessful, may 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 potential formation(s). If production is likely, the well is completed by acidizing the producing interval. Hydraulic fracturing is not used in the formations likely to produce in this area. The well is tested and, if production is established, shut in for installation of a wellhead and gathering lines.

Oil is separated from the gas and stored in tanks at the site or is pumped through the gathering lines to a remote tank battery. Gas is typically vented or flared at the storage site. Brines produced with the oil may be pumped down state-approved disposal wells or may be used for injection to increase oil output at other locations. No horizontal drilling and completion has taken place in the Pentwater pools yet.

Hydrogen sulfide (H_2S) has been present in low concentrations in some of the wells in the Pentwater pools. In 1999, the operator of the three remaining Pentwater producing wells was cited by the state for venting, rather than flaring, associated gas and for poor maintenance of a tank battery, which allowed nuisance levels of H_2S to be detected by the public. The problem was corrected by flaring gas and making repairs at the tank battery.

If a lease is issued, both BLM and the state will monitor any well that may result. Both entities enforce regulations for the proper management of H_2S in drilling and production operations. If the regulations conflict, the more stringent regulation will apply.

VI. Oil and Gas Occurrence Potential

Oil and gas are known to occur in dolomitized segments of the Traverse Limestone and the Dundee Dolomite on the Pentwater structure. In the vicinity of the federal property a success rate of 85% for 43 wells drilled indicates a reasonable occurrence potential. The northern property produced oil from the Dundee, but the Traverse tested water, indicating that its position on the structure was below the oil-water interface. The southern property appears to be off the productive portion of the structure, as

evidenced by a dry hole drilled about three hundred feet from the eastern boundary. It is unlikely that this tract will be drilled.

VII. Oil and Gas Development Potential

Oil and gas have been developed in the area since 1948. The infrastructure for oil and gas development is available and would be sufficient for any proposed operations. Vertical drilling techniques have been used in the development of the Pentwater structure. H_2S is present in some of the oil wells, as well as some of the associated gas. The State of Michigan regulates exploration and production from H_2S wells, which includes contingency planning, signage, flaring or special processing requirements.

VIII. RFD Baseline Scenario Assumptions and Discussion

The unleased Federal minerals are not in a production unit. The northern property is located about one-half mile west and northwest of three wells still in production. The minimum production unit for the oil wells in this field is 20 acres, but this acreage may be expanded by decision of the State of Michigan Oil and Gas Board if horizontal development is proposed. Two producing vertical wells could be drilled on the northern property, although one production unit has already been occupied and depleted. It is not considered likely that more than one well will be attempted. Any wells drilled are likely to produce only from the Dundee reservoir. Based on past drilling, the southern property is unlikely to produce oil.

It is assumed that all drilling will be done from a single well pad located either on the surface of the tract or on adjacent private land. The pad is unlikely to exceed 1.5 acres and any access road will be less than ¼ mile long, resulting in a total disturbed area of 2 acres. 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. Drilling water may be sourced by a water well drilled in the pad or by surface water sources. A vertical well will take two to three days to drill on a 24-7 schedule. After drilling is done, about one acre of the well pad will be reclaimed, leaving a wellhead, a turn-around area, the access road and a storage facility.

The site will remain until the well ceases production at which time the well will be plugged and abandoned. 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 2,323 acre analysis area 39 wells have been drilled from 39 surface locations. Using 2 acres as a reasonable average surface disturbance per surface location, a total of 78 acres has been disturbed as a result of oil and gas activity in the analysis area. Should a lease issue, an additional short-term disturbance of approximately two acres could result, and a long-term disturbance of up to one acre could result if production is established.

X. References

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Varnes, K.L., eds., 1995 National Assessment of United States Oil and Gas Resources--Results, methodology, and supporting data: U.S. Geological Survey Digital Data Series DDS-30, 62 p., 25 figs.

Michigan Oil and Gas News, 1991, Michigan Oil and Gas Story: County by County; Michigan Oil and Gas News

U.S. Geological Survey, 1983, Pentwater 7 1/2' Topographic Quadrangle, scale 1:24,000 (Provisional Edition)

State of Michigan: http://ww2.deq.state.mi.us/GeoWebFace/#

APPENDIX C – Notices and Stipulations

LEASE NOTICES

1. The requested area contains residences, a freeway, Lake Michigan and an inland lake, and minerals under State of Michigan ownership that are classified as *non-development*. Any minerals development must comply with state laws and regulations pertaining to oil and gas development in and near these types of features.
2. The potentially developable lands surrounding the lease contain Critical Dune Areas. Under the Natural Resources and Environmental Protection Act (Act 451 of 1994), drilling and disposal facilities, except those that were in existence on July 5, 1989, are prohibited in Critical Dune Areas.
3. The area that may be developed contains many wetlands. 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 the Natural Resources and Environmental Protection Act of 1994. Applicants for drilling permits will be required to conduct a wetland survey of areas to be disturbed.
4. 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.
5. 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.
6. The initial drilling phase can only occur between December 1 and March 15.

Controlled Surface Use Stipulation

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

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

This stipulation affects the entire lease.

Purpose: Minimize soil erosion in an area that is highly prone to erosion.

Exception: No exceptions may be made to this stipulation.

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 prepare 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 and timber resources.

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

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