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Bureau of Land Management
Northeastern States District
LLESM03200

Environmental Assessment

NEPA #: DOI-BLM-ES-030-2015-0001-EA

Expressions of Interest 72, 861, 892, 1605

Date: July 2015

Type of Action: Oil and Gas

Serial Number: N/A

Locations: Newaygo and Lake Counties, Michigan. See Chapter 2.2 for Legal Land Description.

Project Acreage: 16,556.59 acres

Proponent Addresses: Proprietary

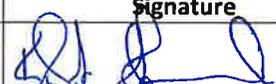
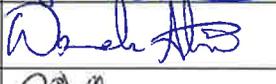
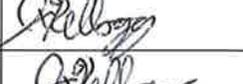
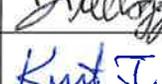
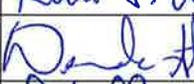
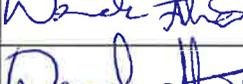
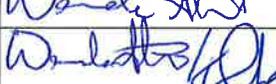
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MISSION STATEMENT

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.

Technical Review.

Program	Reviewer	Signature	Date
Air Quality	Kyle Schumacher Natural Resources Specialist		7/13/15
Climate Change	Kyle Schumacher Natural Resources Specialist		7/13/15
Cultural/Paleontology	Jarrold Kellogg Archaeologist		7/13/15
Environmental Justice	Kurt Wadzinski Planning & Environmental Coordinator		7/13/15
Fish and Wildlife	Kyle Schumacher Natural Resources Specialist		7/13/15
Geology/Mineral Resources/Energy Production	Derek Strohl Natural Resources Specialist		7/13/15
Hazardous Wastes	Kyle Schumacher Natural Resources Specialist		7/13/15
Invasive Species/Noxious Weeds	Derek Strohl Natural Resources Specialist		7/13/15
Native American Religious Concerns	Jarrold Kellogg Archaeologist		7/13/15
Recreation	Jarrold Kellogg Archaeologist		7/13/15
Socioeconomics	Kurt Wadzinski Planning & Environmental Coordinator		7/13/15
Soils	Derek Strohl Natural Resources Specialist		7/13/15
Special-Status Species	Kyle Schumacher Natural Resources Specialist		7/13/15
Vegetation	Derek Strohl Natural Resources Specialist		7/13/15
Visual Resources	Derek Strohl Natural Resources Specialist		7/13/15
Water Resources and Water Quality	Derek Strohl and Kyle Schumacher Natural Resources Specialists		7/13/15


Preparer

7/13/15
Date


Planning & Environmental Coordinator

7/13/15
Date


Associate Field Manager

13 July 15
Date

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1. PURPOSE OF AND NEED FOR ACTION

1.1 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.

1.2 Need for the Proposed Action

The need for the proposed action is to respond to Expressions of Interest (EOIs) nominating certain parcels for leasing by private industry. The United States Forest Service (USFS), as the surface management agency (SMA) of the parcels, provided the Bureau of Land Management (BLM) with authorization to lease the parcels competitively by letters dated December 13, 2012 (EOI 72); March 19, 2013 (EOI 1605); June 27, 2013 (EOI 861); and July 18, 2013 (EOI 892).

The oil and gas leasing program managed by the BLM encourages private exploration and development of domestic oil and gas reserves, 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.

1.3 Management Objectives of the Action

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

1.4 Conformance with 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 2006 Huron-Manistee National Forests (HMNF) Land and Resource Management Plan (LRMP) and its associated Final Environmental Impact Statement (FEIS) and Record of Decision (ROD), as amended. The BLM was a cooperating agency in the creation of the USFS FEIS, and after an independent review to ensure that BLM comments were addressed satisfactorily, BLM adopted the USFS FEIS (40 CFR 1506.3). This EA is tiered to the analysis described in the USFS FEIS.

The BLM *Michigan Resource Management Plan (RMP)* (1985), available at the NSFO, 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.).

1.5 Relationship to Statutes, Regulations and Other Plans

This EA was prepared in accordance with the National Environmental Policy Act 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 (Departmental Manual 516, Environmental Quality); the National Historic Preservation Act (NHPA); the American Indian Religious Freedom Act (AIRFA); the Native American Graves Protection and Repatriation Act (NAGPRA); 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.

1.6 Decision to Be Made

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

1.7 Scoping and Issues

1.7.1 Rationale for conducting external scoping

Scoping occurred throughout the process of developing the 2006 Huron Manistee National Forest Land and Resource Management Plan (LRMP) Final Supplemental Environmental Impact Statement (EIS), which addressed oil and gas leasing actions across the forest (U.S. Department of Agriculture, 2012a).

2 ALTERNATIVES, INCLUDING THE PROPOSED ACTION

2.1 Introduction

The NSFO has received EOIs to lease 16,556.59 acres of federal mineral estate for oil and gas development in Beaver, Denver, Goodwell, Home, Lilley, Lincoln, Merrill, Monroe, Troy, and Wilcox Townships in Newaygo County, Michigan, and Peacock and Dover Townships in Lake County, Michigan. Issuance of competitive leases would give the lessee(s) exclusive rights to explore and develop Federal oil and gas minerals but would not authorize surface-disturbing activities or obligate the company to drill a well on the lease. A lease may be used to consolidate acreage to meet well spacing requirements. A lease may also be acquired for speculative value. The BLM will require applicants to adhere to lease stipulations, which have been formulated through the development of the HMNF LRMP.

The proposed nominations, if approved, would be offered for competitive sale with stipulations and notices generated through this environmental analysis 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 USFS before any ground disturbance is authorized. In an APD, an applicant identifies a proposed drill site and provides 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 USFS conducts an onsite inspection with the applicant.

Requirements pertaining to NEPA and the Endangered Species Act (ESA) must also be met at the APD stage. In cases that could potentially affect Federally-listed or State-listed species, a site-specific biological assessment (BA) is written, including the results of any required biological surveys. The BA is submitted to the U.S. Fish and Wildlife Service (USFWS) for consultation. The lessee would be required, as a condition of approval, to comply with the recommendations of these consultations.

The BLM manages the subsurface mineral estate, and the USDA Forest Service manages the surface, according to their 2006 HMNF Land and Resource Management Plan (LRMP) as Amended January 2012, or current version, which has previously gone through Section 7 consultation. The analysis included up to 772.5 acres of disturbance associated with the possibility of approximately 194 wells within the Huron-Manistee National Forest boundary. Of the 194 wells, approximately 88 wells will actually be on national forest system lands. The HMNF consists of 969,727 acres of federally-owned surface available for leasing, of which only about 480,000 acres of subsurface are federally-owned. These EOIs would make available approximately 16,556 acres (less than 2%) of the approximately 969,727 analyzed as available for leasing in the 2006 HMNF LRMP. If a lease is approved, the lessee would have ten years to conduct oil and gas exploration. After ten years the leases would expire unless the leases are held by producing oil and/or gas wells. Currently there are 77 authorized federal leases on the HMNF, covering approximately 60,000 acres, and 32 producing oil and gas wells on national forest system lands. Considering the acreage of existing leases and the corresponding number of producing wells, there could potentially be as many as nine wells drilled; however, based on the geology in the area, it is likely that two or less wells will be drilled on these parcels.

2.2 Location

The sites are located on USFS lands in the northwestern portion of Michigan's Lower Peninsula. Legal descriptions of the requested parcels are as follows:

EOI-72: 160 total acres

Newaygo County, Michigan Meridian
T. 14 N., R. 11 W., Sec. 20, E1/2SW, Sec. 21, E1/2SE.

EOI-861: 15,805.95 total acres

Newaygo County, Michigan Meridian
(100% Federal minerals): T. 14 N., R. 12 W., Sec. 6, NWNE; Sec. 7, All; Sec. 18, NWNE, NENW;
T. 14 N., R. 13 W., Sec. 1, Part of entire section exc. 100' wide Pere Marquette RR R/W containing 9.4 ac.; Sec. 2, Part of NE exc. 4.6875 ac. in NW corner of SWNE. Also exc. 100' wide Pere Marquette RR R/W containing 4.27 ac.; Sec. 6, SESW; NWNW; Sec. 7, NWNE; Sec. 12, NE, E1/4NW exc. Pere Marquette RR R/W, Pt. SE lying E of PMRR, W3/4NW;
T. 14 N., R. 14 W., Sec. 1, S1/2SENE, NESE, S1/2SE; Sec. 3, Part Lot exc. N 79 rods; Sec. 10, SENW; Sec. 11, Pt. of N1/2SENE exc. 1 ac., S1/2SE, SESW exc. 5 ac. off W side 80 rods N&S and 10 rods wide, NESW; Sec. 12, SENW, W1/2NW, S1/2SW, NE, NENW, N1/2SW, W1/2SE;
T. 15 N., R. 12 W., Sec. 4, S1/2SW; Sec. 8, S1/2NE; Sec. 16, N1/2NW, E3/4SENW, E1/2SW, SESE; Sec. 17, E1/2SW; Sec. 20, SENE, NESE; Sec. 21,

NWSW, SWNW, NENW, SWNE; Sec. 30, E1/2NE; Sec. 31, NE; Sec. 32, N1/2NW exc. NWNENW, SW, S1/2SESE;

T. 15 N., R. 13 W., Sec. 25, N1/2NE; Sec. 26, E1/2NW, NWNE, N 30 ac. SE, N1/2S1/2S1/2SE; Sec. 30, W1/2NW;

T. 15 N., R. 14 W., Sec. 2, NWNW, S1/2NW, N1/2SW, Pt.

N1/2S1/2SW lying W of So. Branch of Pere Marquette River; Sec. 3, N1/2NE, W1/2; Sec. 11, S1/2NE; Sec. 12, SWNE; Sec. 13, NENE, E1/2SW; Sec. 14, S1/2S1/2NE, S1/2SE; Sec. 16, S1/2NE; Sec. 23, W1/2NE, E1/2NENW, E1/2SENW, E1/2SW, N1/2SE, SESE; Sec. 24, W1/2SWSW, Pt. E1/2SW (all lying north of centerline of county road), N1/2NE; Sec. 25, NWNE, S1/2NE, SENW, SESW, SE; Sec. 26, SENE, NESE, S1/2SE, S1/2SW, NWSE; Sec. 34, N1/2NE; Sec. 35, S1/2NW, S1/2NE, S1/2 of Lot 1; Sec. 36, NW, N1/2SW;

T. 16 N., R. 13 W., Sec. 15, E1/2SE, W1/2NW; Sec. 16, S1/2; Sec. 17, SESW, S1/2SE; Sec. 19, NESE; Sec. 20, N1/2, W1/2SW; Sec. 24, SESWNENW, S1/2SEENENW, NWNW, N1/2S1/2NW, S1/2SW, SE, W1/2NWNWNW, NWSWNENW; Sec. 25, All; Sec. 27, Pt. E1/2SWSW; Sec. 29, NWNW, SW, SESE; Sec. 30, E1/2SE, NWSW; Sec. 31, Pt. of Entire Section, exc. a strip 66' wide containing 9.52 ac. running across NWNW, S1/2NW, NESW, S1/2SE & SESE; Sec. 34, SWNE, NENW, NESW, N1/2SE, Pt. S1/2NW exc. 2.98 ac. in PMRR, Pt. NWNW lying E of E line of PMRR R/W, SESW, SWSE; Sec. 36, NWSW, SESE.

T. 16 N., R. 14 W., Sec. 8, N1/2NE, SENE; Sec. 10, SENE; Sec. 11, SE; Sec. 12, SWSW; Sec. 13, NENE, S1/2NE, S1/2SW, SWSE, N1/2SE; Sec. 14, SESE; Sec. 23, E1/2NE, SWNE, S1/2NW, SW; Sec. 24, NE, W1/2NW, SW, W1/2SE, SESE; Sec. 25, NW, NE, NESW, S1/2SW, N1/2SE; Sec. 26, E1/2, NW, N1/2SW;

(91.67% Federal minerals): Michigan Meridian, T. 16 N., R. 13 W., Sec. 19, NE; **(87.5% Federal minerals):** Michigan Meridian, T. 16 N. R. 14 W., Sec. 13, SESE; Sec. 24, NENW, NESE; Sec. 25, NWSW;

(75% Federal minerals): Michigan Meridian, T. 16 N., R. 13 W., Sec. 17, SENE, NESE; Sec. 18, N2, E1/2SW, SE; Sec. 19, NWNW, E1/2NW, E1/2SW, W1/2SE, SESE; Sec. 20, SE, E1/2SW; Sec. 29, NENW, S1/2NW, NE, W1/2SE, NESE; Sec. 30, E1/2NE, E1/2NW, W1/2E1/2;

(50% Federal minerals): Michigan Meridian, T. 15 N., R. 12 W., Sec. 5, Pt. N1/2 lying W of Little S. Branch PM River exc. parcel beg. at SE corner of SWNE, thence W 10 rods, thence N to said river, then SE'ly along river to beg.; Pt. N1/2 lying E of Little S. Branch PM River exc. 330' of SWNE lying E of said river, also exc. SENE and NENE; Michigan Meridian, T. 15 N., R. 14 W., Sec. 23, W3/4NW; Michigan Meridian, T. 16 N., R. 12 W., Sec. 32, SWSW;

(1/3 Federal minerals): Michigan Meridian, T. 15 N., R. 12 W., Sec. 32, E3/4N3/4S1/2NE;

(1/8 Federal minerals): Michigan Meridian, T. 15 N., R. 14 W., Sec. 35, NWNE.

EOI-1605: 110.64 total acres

Lake County, Michigan Meridian

T. 19 N., R. 13 W., Sec. 17, W2NENNWNW; Part of N1/2SWNW containing 7 acres lying north of railroad; Part of N1/2SWNW containing 8.64 acres; Part lying South of the railroad except strip 2 rods wide on West boundary; Also except strip 30' wide on East boundary; SESENW; Sec. 18, N1/2NW.

EOI-892: 480 total acres

Lake County, Michigan Meridian

T. 20 N., R. 11 W., Sec. 8, E1/2SW; Sec. 16, N1/2NW, N1/2NE, SENE, E1/2SE, SWSE; Sec. 23, S1/2NE.

2.3 Proposed Action

The proposed action is to lease the nominated parcels described in Chapter 2.2. If approved, a lease or leases would be offered for competitive sale with stipulations and notices generated through this environmental analysis process and other consultations.

2.4 No-Action Alternative

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

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 Introduction

The nominated lease parcels are all located in lower Michigan and within the Manistee portion of the HMNFs in Newaygo and Lake Counties. The area is within the Northern Lakes and Forests Level-III ecoregion and the Pere Marquette-White and Manistee watersheds, both of which drain to Lake Michigan. The nominated lease parcels are accessible by a network of improved and unimproved roads. About 5,550 acres of the nominated lease parcels fall within areas where well density restrictions apply under the HMNF LRMP. These include portions of Condon Lakes East and Loda Lake Semiprimitive Motorized Areas, where the LRMP permits one surface location per 160 acres, and Condon Lakes West, where the LRMP permits one surface location per 640 acres.

3.2 Air Resources

The primary sources of air pollution are dust from blowing wind on disturbed or exposed soil, exhaust emissions from motorized equipment, oil and gas development, agriculture, and industrial sources. The Environmental Protection Agency (EPA) was given the authority for air quality protection with the provision to delegate this authority to the state as appropriate under Federal law. The Michigan Department of Environmental Quality (MDEQ) has been delegated most of the authority for air quality protection in Michigan. The Clean Air Act (CAA) of 1970, as amended, requires the establishment of National Ambient Air Quality Standards (NAAQS). NAAQS pollutants include carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM₁₀ & PM_{2.5}), sulfur dioxide (SO₂), and lead (Pb). The NAAQS pollutants are monitored in Michigan by the MDEQ. The CAA identifies two types of national ambient air quality standards. Primary standards define levels of air quality that the Administrator of the EPA judges to be necessary, with an adequate margin of safety, to protect the public health. Secondary standards define levels of air quality that the Administrator of the EPA judges to be necessary to protect the public from any known or anticipated adverse effects of a pollutant. Both primary and secondary standards that are currently in effect are shown in Table 1.

The entire state of Michigan is currently designated “Attainment” with the NAAQS for:

- Carbon Monoxide (CO)

- Nitrogen Dioxide (NO₂)
- Ozone (O₃)
- Particulate Matter Less than 10 microns (PM₁₀)
- Annual and 24-hour PM_{2.5} (fine particles)

There are only two standards not met within the state of Michigan:

- Sulfur Dioxide (SO₂) – in Wayne County, a corridor that runs along U.S. 75 extending east to the shoreline border was recently designated by MDEQ with the new 2010 Standard. It should be noted that this area is on the east side of the Lower Peninsula.
- Lead (Pb) – All Michigan Counties meet the Lead (Pb) NAAQS except for a small area in Ionia County (less than 1 square mile in Belding) about 50 miles southeast of the proposed project area.

Table 1. National Ambient Air Quality Standards (U.S. Environmental Protection Agency, 2012a)

Pollutant [final rule cited]	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Time
Carbon Monoxide [76 FR 54294, 8/31/2011]	9 ppm (10 mg/m ³)	8-hour ⁽¹⁾	None	
	35 ppm (40 mg/m ³)	1-hour ⁽¹⁾		
Lead [73 FR 66964, 11/12/2008]	0.15 µg/m ³ ⁽¹⁾	Rolling 3-Month Average	Same as Primary	
Nitrogen Dioxide [75 FR 6474, 2/9/2010] [61 FR 52852, 10/8/1996]	53 ppb ⁽²⁾	Annual (Arithmetic Average)	Same as Primary	
	100 ppb	1-hour	None	
Particulate Matter (PM₁₀) 12/14/2012	150 µg/m ³	24-hour	Same as Primary	
Particulate Matter (PM_{2.5}) 12/14/2012	12.0 µg/m ³	Annual (Arithmetic Average)	15.0 µg/m ³	Annual (Arithmetic Average)
	35 µg/m ³	24-hour	Same as Primary	
Ozone [73 FR 16436, 3/27/2008]	0.075 ppm ⁽³⁾	8-hour	Same as Primary	
Sulfur Dioxide [75 FR 35520, 6/22/2010] [38 FR 25678, 9/14/1973]	75 ppb ⁽⁴⁾	1-hour	0.5 ppm	3-hour ⁽¹⁾

as of October 2011

- (1) Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m³ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved. The official level of the annual NO₂ standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.
- (2) The official level of the annual NO₂ standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard. The official level of the annual NO₂ standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.
- (3) Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour ozone standard (0.12

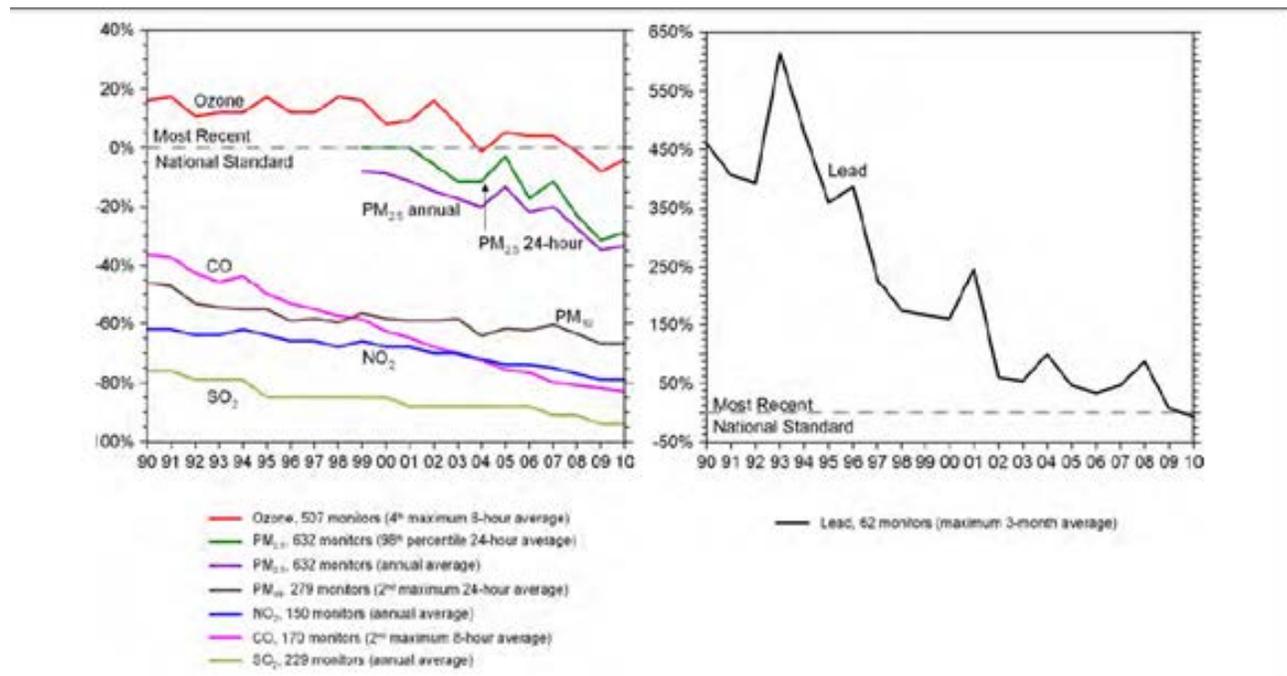
ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard (“anti-backsliding”). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

- (4) Final rule signed June 2, 2010. The 1971 annual and 24-hour SO₂ standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

According to the U.S. Environmental Protection Agency (EPA)(2012b), since 1990, nationwide air quality has improved significantly for six common air pollutants (Figure 1). These six pollutants are ground-level ozone, particle pollution [particles 2.5 micrometers in diameter and smaller (PM_{2.5}) and particles 10 micrometers and smaller (PM₁₀)], lead, nitrogen dioxide (NO₂), carbon monoxide (CO), and sulfur dioxide (SO₂). Nationally, air pollution was lower in 2010 than in 1990 for:

- 8-hour ozone, by 17%
- 24-hour PM₁₀ , by 38%
- 3-month average lead, by 83%
- annual NO₂ , by 45%
- 8-hour CO, by 73%
- annual SO₂ , by 75%

Figure 1. Comparison of national levels of the six common pollutants to the most recent NAAQS, 1990-2010. National levels are averages across all monitors with complete data for the time period.



Note: Air quality data for PM_{2.5} starts in 1999 (U.S. Environmental Protection Agency, 2012b).

Nationally, annual PM_{2.5} concentrations were 24% lower in 2010 compared to 2001 and 24-hour PM_{2.5} concentrations were 28% lower in 2010 compared to 2001. Ozone levels did not improve in much of the East until 2002, after which there was a significant decline. Eight-hour ozone concentrations were 13% lower in 2010 than in 2001. This decline is largely due to reductions in oxides of nitrogen (NO_x) emissions required by EPA rules including the NO_x State Implementation Plan (SIP) call, preliminary implementation of the Clean Air Interstate Rule (CAIR), and Tier 2 Light Duty Vehicle Emissions Standards (U.S. Environmental Protection Agency, 2012b). In January 2015, the Cross-State Air Pollution Rule (CSAPR) replaced the CAIR and went into effect in Michigan and in 27 other eastern states, with the goal of significantly improving air quality by reducing power plant emissions that contribute to ozone and/or fine particle pollution in other states (U.S. Environmental Protection Agency, 2015a).

The EPA concludes that total emissions of toxic air pollutants have decreased by approximately 42% between 1990 and 2005. Control programs for mobile sources and facilities such as chemical plants, dry cleaners, coke ovens, and incinerators are primarily responsible for these reductions. The EPA also found that monitored concentrations of toxic pollutants such as benzene, 1,3-butadiene, ethylbenzene, and toluene decreased by 5% or more per year between 2003 and 2010 at more than half of ambient monitoring sites. Other toxic air pollutants of concern to public health such as carbon tetrachloride, formaldehyde, and several metals, declined at most sites as well (U.S. Environmental Protection Agency, 2012b).

3.2.1 Visibility

Visibility, also referred to as visual range, is a subjective measure of the distance that light or an object can clearly be seen by an observer. Light extinction is used as a measure of visibility and is calculated from the monitored components of fine particle mass (aerosols) and relative humidity. It is expressed in terms of deciviews, a measure for describing perceived changes in visibility. One deciview is defined as a change in visibility that is just perceptible to an average person, which is approximately a 10% change in light extinction. Visibility can also be defined by standard visual range (SVR) measured in miles, which is the farthest distance at which an observer can see a black object viewed against the sky above the horizon. The larger the SVR, the cleaner the air. To estimate potential visibility impairment, monitored aerosol concentrations are used to reconstruct visibility conditions for each day monitored. The aerosol species include ammonium sulfate, ammonium nitrate, organic mass, elemental carbon, soil elements, and coarse mass (Malm, 1999). The daily values are then ranked from clearest to haziest and divided into three categories; the mean visibility for all days (average), the 20% of days with the clearest visibility (20% clearest), and the 20% of days with the worst visibility (20% haziest).

A wide variety of pollutants can impact visibility, including particulate matter, nitrogen dioxide, nitrates (compounds containing NO₃), and sulfates (compounds containing SO₄). Fine particles suspended in the atmosphere decrease visibility by blocking, reflecting, or absorbing light.

Two types of visibility impairment can be caused by emission sources: plume impairment and regional haze. Plume impairment occurs when a section of the atmosphere becomes visible due to the contrast

or color difference between a discrete pollutant plume and a viewed background, such as a landscape feature. Regional haze occurs when pollutants from widespread emission sources become mixed in the atmosphere and travel long distances (Malm, 1999).

There are three classifications of areas that attain NAAQS: Class I, Class II, and Class III. Congress established certain national parks and wilderness areas as mandatory Class I areas where only a small amount of air quality degradation is allowed. Since 1980, the Interagency Monitoring of Protected Visual Environments (IMPROVE) network has measured visibility in Class I areas. These areas are managed as high visual quality under the federal visual resource management (VRM) program. The 1977 Clean Air Act (CAA) Amendments, Section 169A declared “as a national goal the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I federal areas which impairment results from manmade air pollution” (42 U.S.C. § 7491(a)(1)). All other areas of the U.S. are designated as Class II, which allow a moderate amount of air quality degradation. No areas of the U.S. have been designated Class III, which would allow more air quality degradation. The CAA gives federal managers the affirmative responsibility, but no regulatory authority, to protect air quality-related values, including visibility, from degradation.

According to Figure 2 below from the EPA’s Regional Haze Program website (2012c), the Lower Peninsula of Michigan has no Mandatory Class I visibility areas. However, two Mandatory Class I locations exist in Michigan’s Upper Peninsula, Isle Royale National Park and Seney Wilderness Area, which are, respectively, approximately 170 and 430 miles northwest of the proposed parcels and are not likely to be impacted by any action taken on or within the area should the parcels be leased. Photochemical modeling has been performed to evaluate Michigan’s impact on other Class I areas. The criteria used to define one state’s “impact” on another state’s Class I area was not determined by the EPA; therefore, each state and RPO was given its own discretion to determine impacts. Based on the Midwest Regional Planning Organization (MRPO) modeling and using a 5% or more contribution to total light extinction as impact criteria, emissions sources within Michigan impact only Isle Royale and Seney (Michigan Department of Environmental Quality, 2010).

Based on the visibility analyses of other states, Michigan sources could impact areas within their jurisdiction in Acadia National Park (≈1100 miles east), Moosehorn Wilderness Area in Maine (≈1200 miles east), Great Gulf Wilderness Area in New Hampshire (≈900 miles east), Brigantine Wilderness Area in New Jersey (≈800 miles southeast), and Lye Brook Wilderness in Vermont (≈750 east) (Michigan Department of Environmental Quality, 2010).

Figure 2. Mandatory Class I Visibility Areas, United States



Prevention of Significant Deterioration (PSD) increments limit air quality degradation and ensure that areas with clean air continue to meet NAAQS, even during economic development. The PSD program goal is to maintain pristine air quality required to protect public health and welfare from air pollution effects and “to preserve, protect and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreation, scenic or historic value” (U.S. Environmental Protection Agency, 2013).

PSD increments have been established for NO₂, SO₂, and PM₁₀. Comparisons of potential PM₁₀, NO₂, and SO₂ concentrations with PSD increments are intended only to evaluate a threshold of concern. The allowable PSD increment depends on an area’s classification. Class I areas have lower increments, due to their protected status as pristine areas.

The Michigan Department of Natural Resources and Environment’s (DNRE) Reasonable Further Progress (RFP) plans modeled projection for 2018 include growth factors and the controls required by PSD, thus Michigan should attain its visibility goals even if new sources are permitted (Michigan Department of Environmental Quality, 2010).

3.2.2 Atmospheric Deposition

Atmospheric deposition refers to processes in which air pollutants are removed from the atmosphere and deposited into terrestrial and aquatic ecosystems. Air pollutants can be deposited by precipitation (rain and snow) or the gravitational settling of gaseous pollutants on soil, water, and vegetation. Much of the concern about deposition is due to secondary formation of acids and other compounds from emitted nitrogen and sulfur species, such as NO_x and SO₂, which can contribute to acidification of lakes, streams, and soils and affect other ecosystem characteristics, including nutrient cycling and biological diversity.

Substances deposited include:

- Acids, such as sulfuric (H₂SO₄) and nitric (HNO₃), sometimes referred to as acid rain
- Air toxics, such as pesticides, herbicides, and volatile organic compounds (VOC)
- Heavy metals, such as mercury
- Nutrients, such as nitrates (NO₃⁻) and ammonium (NH₄⁺)

The accurate measurement of atmospheric deposition is complicated by contributions to deposition by several components including but not limited to rain, snow, cloud water, particle settling, and gaseous pollutants. Deposition varies with precipitation and other meteorological variables (e.g., temperature, humidity, winds, and atmospheric stability), which in turn, vary with elevation and time.

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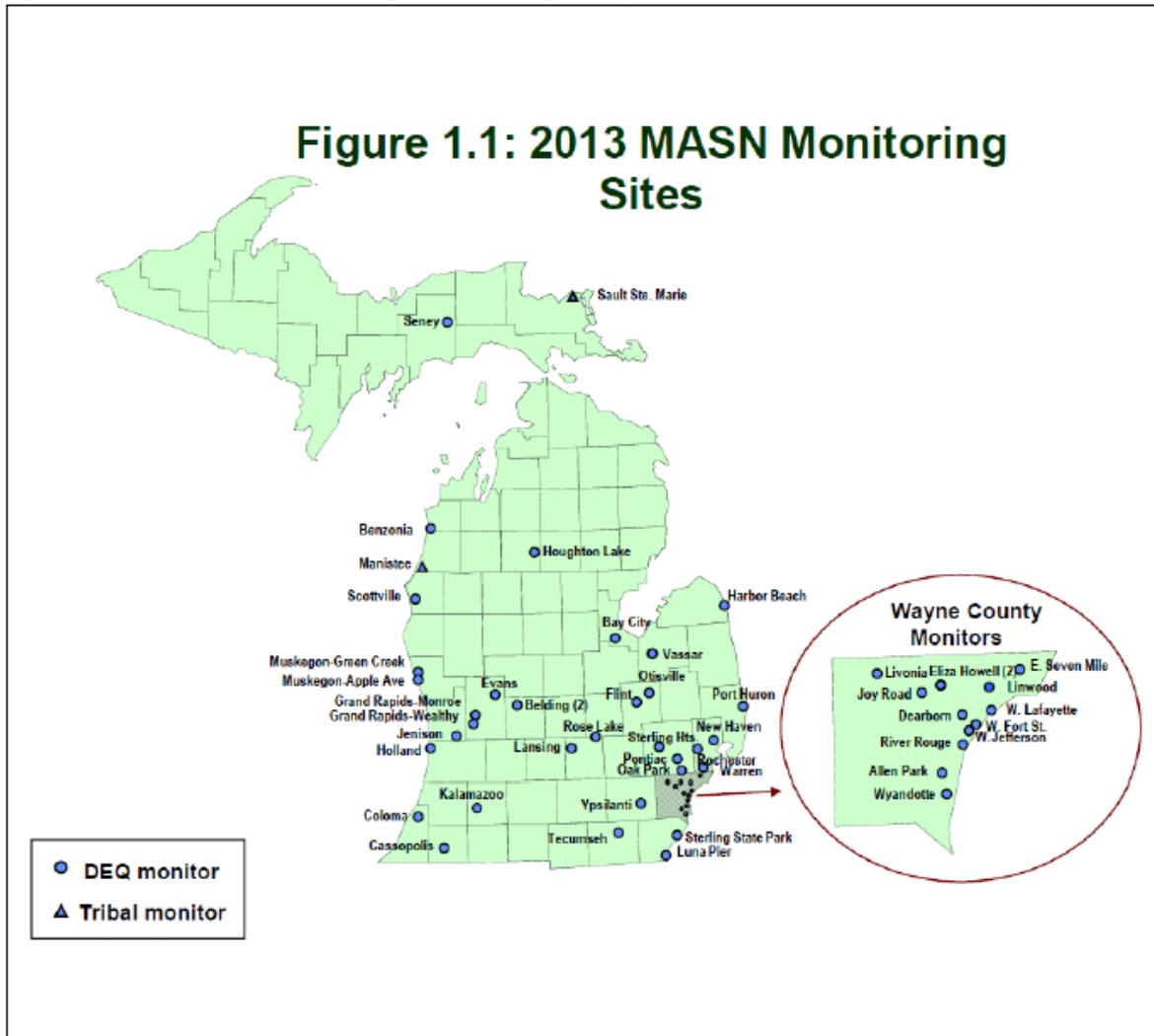
The USFS has established guidelines for Levels of Concern (LOC) for total deposition of nitrogen and sulfur compounds in Class I Wilderness Areas. Total nitrogen deposition of 1.5 kilograms (kg) per hectare (ha) per year or less is considered unlikely to harm terrestrial or aquatic ecosystems. For total sulfur deposition, the LOC is 5 kg per ha per year. The USFS is considering a sulfur LOC of 1.5 kg per ha per year. Note that these are the same LOCs the National Park Service uses (U.S. Forest Service, National Park Service, and U.S. Fish and Wildlife Service, 2010).

3.2.3 Current Pollution Concentrations

The Michigan Air Sampling Network (MASN) is operated by the MDEQ's Air Quality Division, as mandated by the EPA (40 CFR 50) and as part of the Michigan State Implementation Plan for Regional Haze. O₃ and PM_{2.5} monitors in Manistee County and Chippewa County are tribal monitors handled by the Little River Band of Ottawa Indians and the Inter-tribal Council of Michigan, respectively (Figure 3)(Michigan Department of Environmental Quality, 2014). The *2013 Annual Air Quality Report for Michigan* shows Lake and Newaygo Counties as lowest risk category for all NAAQS except for VOC (O₃) emissions in both, PM₁₀ for Newaygo County, PM_{2.5} for Lake County where levels were somewhat elevated. Both Lake and Newaygo Counties did not violate the 2008 standards nor did they contribute to a violation of ozone standards. It should also be noted that both Lake and Newaygo Counties were

also within the national standard for PM_{2.5} and PM₁₀ (Michigan Department of Environmental Quality, 2014).

Figure 3. 2013 MASN Monitoring Sites (Michigan Department of Environmental Quality, 2014)



3.2.4 Climate and Climate Change

Climate change refers to any significant change in measures of climate (e.g., temperature or precipitation) lasting for an extended period (decades or longer). Climate change may result from natural processes, such as changes in the sun's intensity and natural processes within the climate system (such as changes in ocean circulation), and human activities that change the atmosphere's composition (such as burning fossil fuels) and the land surface (such as urbanization) (Intergovernmental Panel on Climate Change (IPCC), 2007).

Northern Michigan is generally cooler in the summer and warmer in the winter than would be expected at its latitude, although this trend depends on proximity to the surrounding Great Lakes. Areas along the Great Lakes shorelines are generally warmer than interior areas with a growing season of approximately 160 days compared to 70 days interior. Average temperatures range from 20.5 in December – February to 64.9 in June through August. The area also receives substantial lake-effect snow along the Great Lakes coastlines. Annual precipitation for the area ranges from 28-34 inches. Winter and spring each account for approximately 20% of the annual precipitation with summer and fall each contributing approximately 30% of the annual precipitation (Handler et al., 2014).

Greenhouse gases (GHGs) are gases in the atmosphere composed of molecules that absorb and emit infrared electromagnetic radiation. When present in the atmosphere, these gases contribute to the greenhouse effect. The greenhouse effect is a process by which thermal radiation from a planetary surface is absorbed by atmospheric GHGs and is re-radiated in all directions. Since part of this re-radiation is back towards the surface and the lower atmosphere, it results in an elevation of the average surface temperature above what it would be in the absence of the gases. Some GHGs such as CO₂ occur naturally and are emitted to the atmosphere through natural processes and human activities. Other GHGs (e.g., fluorinated gases) are created and emitted solely through human activities. The primary GHGs that enter the atmosphere as a result of anthropogenic activities include CO₂, methane (CH₄), nitrous oxide (N₂O), and fluorinated gases such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Fluorinated gases are powerful GHGs that are emitted from a variety of industrial processes including production of refrigeration/cooling systems, foams and aerosols. Fluorinated gases are not primary to the activities authorized by the BLM and will not be discussed further in this document.

The *Michigan Greenhouse Gas Inventory 1990 and 2002* (University of Michigan, 2005) identifies activities in Michigan that accounted for approximately 62.59 million metric tons (MMt) of gross carbon dioxide equivalent (CO₂e) emissions in 2002, an amount equal to 3.3% of total U.S. gross GHG emissions. These emission estimates focus on activities in Michigan and are *consumption-based*. They exclude emissions associated with electricity that is exported from the state. Gross GHG emissions in Michigan increased 9% from 1990 to 2002, while national emissions rose by 13% from 1990 to 2002. Annual sequestration (removal) of GHG emissions due to forestry and other land-uses in Michigan were estimated at 15.14 MMtCO₂e in 1990. For 2002, it is possible to calculate annual sequestration using the same method, but requires caution as inconsistency in data and methodology for 1997 and 2002 values increase uncertainty in the annual storage value. Michigan's per capita emission rate of 6.23

Metric Tons Carbon Equivalent (MTCE) is less than the national value of 6.57 MTCE per capita in 2002. Unlike the national per capita average, which decreased from 1990 to 2002, Michigan's per capita emissions increased over the same period. Both Michigan and national rates exhibited comparable percentage increases in emissions, but the national population grew at a rate nearly double that of Michigan. This large difference in population growth explains why Michigan's per capita emissions rate increased and the national per capita emissions rate decreased from 1990 to 2002 (University of Michigan, 2005).

Ongoing scientific research has identified the potential impacts of anthropogenic GHG emissions and changes in biological sequestration due to land management activities on global climate. Through complex interactions on a regional and global scale, these GHG emissions and net losses of biological carbon sinks may cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the earth back into space. Although still debated, GHG levels have varied for millennia, and it is theorized that recent industrialization and burning of fossil carbon sources have caused CO₂e concentrations to increase dramatically, and are likely to contribute to overall global climatic changes. The IPCC (2007) recently concluded that "warming of the climate system is unequivocal" and "most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations".

It is important to note that GHGs will have a sustained climatic impact over different temporal scales. For example, recent emissions of CO₂ can influence climate for 100 years. In contrast, black carbon is a relatively short-lived pollutant, as it remains in the atmosphere for only about a week. It is estimated that black carbon is the second greatest contributor to global climate change behind CO₂ (Ramanathan and Carmichael, 2008). Without additional meteorological monitoring systems, it is difficult to determine the spatial and temporal variability and change of climatic conditions, but increasing concentrations of GHGs may accelerate the rate of climate change in either a positive or negative direction depending upon location and site specific factors.

Global mean surface temperatures have increased nearly 1.0°C (1.8°F) from 1890 to 2006 (National Aeronautics and Space Administration Goddard Institute for Space Studies, 2007). In 2001, the IPCC (2007) indicated that by the year 2100, global average surface temperatures would increase 1.4 to 5.8°C (2.5 to 10.4°F) above 1990 levels. The National Academy of Sciences (Hansen et al., 2006) has confirmed these findings, but also indicated that there are uncertainties regarding how climate change may affect different regions. Observations and predictive models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Data indicates that northern latitudes (above 24° N) have exhibited temperature increases of nearly 1.2°C (2.1°F) since 1900, with nearly a 1.0°C (1.8°F) increase since 1970 alone. It also shows temperature and precipitation trends for the conterminous United States. For both parameters we see varying rates of change, but overall increases in both temperature and precipitation.

The lack of scientific tools designed to predict climate change at regional or local scales limits the ability to quantify potential future impacts. However, potential impacts to air quality due to climate change are

likely to be varied. Oil and gas development activities can generate CO₂ and CH₄. CO₂ emissions result from the use of combustion engines, while CH₄ can be released during processing.

Because GHGs circulate freely throughout Earth's atmosphere, the planning area for this resource is the entire globe. The largest component of global anthropogenic GHG emissions is CO₂. Global anthropogenic carbon emissions reached about 7,000,000,000 metric tons per year in 2000 and an estimated 9,170,000,000 metric tons per year in 2010 (Boden, et al, 2013). Oil and gas production is a major contributor of GHGs. In 2006, natural gas production accounted for 8% of global methane emissions, and oil production accounted for 0.5% of global methane emissions (URS Corporation, 2010). A description of the potential GHG emissions associated with the proposed leasing activities is included in Chapter 4.

3.3 Environmental Justice

Executive Order 12898 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 nominated lease parcels are located in a rural area. According to the RFDS, potential drilling within the project area is not anticipated to involve more than three wells. 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.

3.4 Fish and Wildlife

3.4.1 General Description

The nominated lease parcels consist mostly of low rolling coniferous and deciduous forests and wetlands (See **Floodplains, Wetlands, and Riparian Zones** and **Vegetation** sections below). Some of the forest areas have had mechanical thinning allowing for more understory growth where other areas remain as dense stands or old growth. The nominated lease parcels include populations of diverse types of wildlife, including deer, grouse, rabbit, turkey, beaver, nesting birds, reptiles and amphibians, fish, and insects.

Data received by the HMNF show that there exists American marten core habitat and travel corridors within some parcels of EOI 861 and 892 and in all of EOI 1605.

3.4.2 Sensitive Species

Three species are listed with the USFWS known to occur in the four counties that are included in the nominated lease parcels (U.S. Fish and Wildlife Service, 2015):

1. Karner blue butterfly (*Lycaeides Melissa samuelis*) – *Endangered*

A number of parcels within EOI 861 and all of EOI 1605 are within a Karner blue butterfly management area separated into multiple management units. This species was listed at the time of the 2006 HMNF LRMP EIS ROD and was consulted on at that time. Stipulations will be

applied based on the 2006 HMNF LRMP EIS ROD as will site-specific conditions of approval should an application for permit to drill be submitted.

Habitat Requirements

Karner blues are found in the northern range of wild lupine habitat. Wild lupine (*Lupinus perennis*) is an attractively flowered plant that occurs in pine barrens and oak savannas in Indiana, Michigan, Minnesota, New Hampshire, New York, and Wisconsin. The Karner blue's habitat is a patchwork of pine and scrub oak scattered among open grassy areas. Historically, a network of these openings among the trees was maintained by wildfire and at one time the butterfly was found in this habitat in a nearly continuous narrow band across 10 states and one province. Today it has been eliminated from at least five of these states.

Feeding Habits

Karner blue caterpillars feed only on the leaves of the wild lupine plant. Adults feed on the nectar of flowering plants. This severely restricts where they can survive.

Reproduction

The Karner blue butterfly usually has two generations, and thus two hatches, each year. In April, the first group of caterpillars hatch from eggs that were laid the previous year. The caterpillars feed only on wild lupine plant leaves. By about mid-May, the caterpillars pupate and adult butterflies emerge from their cocoon-like chrysalis by the end of May or in early June. These adults mate, laying their eggs in June on or near wild lupine plants. The eggs hatch in about one week and the caterpillars feed for about three weeks. They then pupate and the summer's second generation of adult butterflies appears in July. These adults mate and lay eggs that will not hatch until the following spring.

2. Northern long-eared bat (*Myotis septentrionalis*) – Proposed as Endangered

Section 7 consultation with the Fish and Wildlife Service has been completed for the Northern long-eared bat and lease notifications will be applied to the lease as will site-specific conditions of approval should an application for permit to drill be received.

Habitat Requirements

During summer, Northern long-eared bats roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. Males and non-reproductive females may roost in cooler places, like caves and mines. This bat seems opportunistic in selecting roosts, using tree species based on their suitability to retain bark or provide cavities or crevices. The bat has also been found, rarely, roosting in structures like barns and sheds. Northern long-eared bats spend winter hibernating in caves and mines. These shelters are called hibernaculum. They prefer to hibernate in large caves or mines with large passages and entrances, constant temperatures, and high humidity and no air currents. Specific areas with very high humidity may cause droplets of water to form on the bat's fur. Within the hibernaculum, surveyors find them in small crevices or cracks, often with only the nose and ears visible.

Feeding Habits

Northern long-eared bats emerge at dusk to fly through the understory of forested hillsides and ridges feeding on moths, flies, leafhoppers, caddisflies, and beetles, which they catch while in flight using echolocation. This bat also feeds by gleaning motionless insects from vegetation and water surfaces.

Reproduction

Breeding begins in late summer or early fall when males begin swarming near hibernaculum. After copulation, females store sperm during hibernation until spring, when they emerge from their hibernaculum, ovulate, and the stored sperm fertilizes an egg. This strategy is called delayed fertilization. After fertilization, pregnant females migrate to summer areas where they roost in small colonies and give birth to a single pup. Maternity colonies, with young, generally have 30 to 60 bats, although larger maternity colonies have been observed. Most females within a maternity colony give birth around the same time, which may occur from late May or early June to late July, depending where the colony is located within the species' range. Young bats start flying by 18 to 21 days after birth. Adult northern long-eared bats can live up to 19 years.

3. Eastern massasauga (*Sistrurus catenatus*) – Candidate Species

The Eastern massasauga is a venomous pitviper rattlesnake species found primarily in the United States. Habitat for the Eastern massasauga occurs in many of the westerly parcels of EOI 861. This species was listed as a candidate species at the time of the 2006 HMNF LRMP EIS ROD and included mitigation and avoidance measures. Stipulations will be applied based on the 2006 HMNF LRMP EIS ROD as will site-specific conditions of approval should an application for permit to drill be submitted.

Habitat Requirements

Massasaugas live in wet areas including wet prairies, marshes and low areas along rivers and lakes. In many areas, massasaugas also use adjacent uplands during part of the year. They often hibernate in crayfish burrows but they may also be found under logs and tree roots or in small mammal burrows. Unlike other rattlesnakes, massasaugas hibernate alone.

Feeding Habits

Massasaugas eat small rodents like mice and voles but they will sometimes eat frogs and other snakes. They hunt by sitting and waiting. Heat sensitive pits near the snakes' eyes alert the snake to the presence of prey. They can find their prey by sight, by feeling vibrations, by sensing heat given off by their prey, and/or by detecting chemicals given off by the animal (like odors).

Reproduction

Like all rattlesnakes, massasaugas bear live young. The young actually hatch from eggs while still in the female's body. Depending on the health of the individual, adult females may bear young every year or every other year. When food is especially scarce they may only have young every three years. Massasaugas that have young every year, mate in the spring and bear their young in late summer or early fall. In contrast, snakes that have young every other year, mate in autumn and bear young the next summer. Litter size varies from 5 to 19 young.

Indiana bat habitat is not found within any of the nominated lease parcels, but does occur west of the parcels out towards Lake Michigan.

3.4.3 Migratory Birds

A review of the migratory birds of concern on the Fish and Wildlife Services website on November 18, 2014 showed 21 migratory bird species of concern within Lake and Newaygo Counties. Please see Table 2 below for more information.

Table 2. Migratory Birds of Concern

Species	BCC	Seasonal Occurrence in Project Area
American Bittern	Yes	Breeding
Bald Eagle	Yes	Year-round
Black Tern	Yes	Breeding
Black Billed Cuckoo	Yes	Breeding
Blue-winged Warbler	Yes	Breeding
Bobolink	Yes	Breeding
Brown Thrasher	Yes	Breeding
Canada Warbler	Yes	Breeding
Common Tern	Yes	Breeding
Dickcissel	Yes	Breeding
Golden-Winged Warbler	Yes	Breeding
Henslow's sparrow	Yes	Breeding
Least Bittern	Yes	Breeding
Marsh Wren	Yes	Breeding
Pied-billed Grebe	Yes	Breeding
Prothonotary Warbler	Yes	Breeding
Red-headed Woodpecker	Yes	Breeding
Short-eared Owl	Yes	Wintering
Upland Sandpiper	Yes	Breeding
Willow Flycatcher	Yes	Breeding
Wood Thrush	Yes	Breeding

3.5 Geology/Mineral Resources/Energy Production

The Lower Peninsula of Michigan is underlain by a large depression in the Earth's crust, known as the Michigan Basin. Various structures within this basin have produced hydrocarbons, which tend to migrate upward through permeable rocks until they are trapped by an impermeable layer. These traps fall into five main types in Michigan:

- Lower-tier, mid-Michigan rift-related fields;
- Upper-tier, mid-Michigan rift-related fields;
- Salina-Niagaran pinnacle reef fields;
- Salt-related, shallow structure fields; and
- Antrim Shale fields.

All of these sources have been extensively explored and developed in Michigan, and most exploration aims at locating pockets of bypassed gas and oil.

3.6 Wastes, Hazardous or Solid

The Resource Conservation and Recovery Act (RCRA) of 1976 established a comprehensive program for managing hazardous wastes from the time they are produced until their disposal. The EPA regulations define solid wastes as any “discarded materials” subject to a number of exclusions. On January 6, 1988, EPA determined that oil and gas exploration, development and production wastes would not be regulated as hazardous wastes under the RCRA. The Comprehensive Environmental Response Compensation and Liability Act (CERCLA) of 1980, deals with the release (spillage, leaking dumping, accumulation, etc.), or threat of a release of hazardous substances into the environment. Despite many oil and gas constituent wastes being exempt from hazardous waste regulations, certain RCRA exempt contaminants could be subject to regulations as a hazardous substance under CERCLA.

No hazardous or solid waste disposal sites are known to exist on the lease tracts. Should a parcel be leased and developed, generation and temporary storage of waste materials (solid and liquid) would likely occur. Waste materials would be managed in accordance with Onshore Orders 1 & 7, RCRA, applicable Michigan DEQ regulations. Fluid handling would be evaluated at the development stage and fluids associated with any subsequent drilling, completions and/or production would either be treated, evaporated, or transferred to an approved Michigan DEQ treatment facility. Solids would be treated onsite or transferred to a Michigan DEQ approved facility.

3.7 Invasive Species/Noxious Weeds

Many invasive species are present in and around the nominated lease parcels and throughout Michigan and the Midwest. The *Natural Resources and Environmental Protection Act 451 of 1994*, Sections 324.41301-324.41325, regulates activities that may spread invasive species in Michigan. The Emerald ash borer (*Agrilus planipennis*), an insect that attacks all species of ash trees (genus *Fraxinus*) 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.

While invasive species inventories of large areas are rarely complete or comprehensive, the Forest Service has noted the presence of a few species in particular within or near the nominated lease parcels:

- Autumn olive (*Elaeagnus umbellata*)
- Common periwinkle (*Vinca minor*)
- Tatarian honeysuckle (*Lonicera tatarica*)
- Garlic mustard (*Alliaria petiolata*)

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

3.8 Cultural/Paleontology

A cultural resource is a location of human activity, occupation, or use identifiable through field inventory, historical documentation, or oral evidence. Cultural resources include both historic and prehistoric archaeological sites, structures, places of architectural significance, locations with important public and scientific uses, and may include traditional cultural properties, which are definite locations of traditional and or cultural importance to specific social and or cultural groups. Cultural resources include but are not limited to the following types: prehistoric archaeological resource, ethnographic resource, and historic-period archaeological and built environment resources. Cultural resources may be, but are not necessarily eligible, for the National Register of Historic Places (NRHP).

Most of the footprint within the proposed project area has not been surveyed for cultural resources. A records search conducted with the HMNF indicated a total of 18 previously recorded archeological sites located within or immediately adjacent to the lease area, which includes two prehistoric and 16 historic sites. The majority of these sites do not have determinations of eligibility for inclusion in the National Register of Historic Places (NHRP), but the Bass Lake Farm, part of which is located within the southeastern parcel of EOI-861, is listed in the NHRP. Originally acquired by the Hanson family in the early 1900s, the farm included a summer home and artist studio. Thomas E. Hunt, a friend of the family, created a “scientific farm” on the property where he planted a variety of crops, including an apple and peach orchard, and constructed several additional structures including barns, a bunkhouse, and ice house. The Hansen family sold the property to the U.S. Department of Agriculture as “sub-marginal” land during the Depression. In 1937 the Federated Garden Clubs of Michigan began to restore the area and succeeded in having the Secretary of Agriculture declare the Loda Lake National Wildflower Sanctuary in 1949 (U.S. Department of Agriculture, 2015). The sanctuary is currently a recreation site managed by the HMNF and includes a variety of trails and interpretive displays discussing both the natural and historic value of the area.

There are two additional sites within the general vicinity of Loda Lake, a prehistoric mound and Park City, a turn of the 20th century logging town. In accordance with BLM policy, both sites will be considered eligible until a formal evaluation is completed or needed.

Consultation was initiated with the Michigan State Historic Preservation Office (MISHPO) on December 19, 2014. In a letter to the BLM dated March 11, 2015, the MISHPO concurred, “no historic properties are affected within the area of potential effects of this undertaking.”

Paleontology

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

Locations with paleontological remains are referred to as localities. 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 necessary at this time.

3.9 Native American Religious Concerns

On December 17, 2014, the BLM sent letters to five Federally Recognized Indian Tribes and to twelve Indian tribes that have a known connection to the nominated lease parcels 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 at this time.

3.10 Recreation

Northern Michigan and the HMNF are renowned throughout the Great Lakes region and Upper Midwest for year-round recreational opportunities. Fishing, hunting, hiking, bird watching, canoeing, cross country skiing, and snowmobiling are but a few of the activities available to visitors on state, private, and HMNF managed land in both dispersed and developed locations. Historically, most of the visitors come from larger, urban areas in southern Michigan and bordering states such as Illinois, Indiana, and Ohio.

The majority of the leasing area is within the Baldwin Ranger District. Because the EOI and Forest land is widely dispersed throughout the area several recreation sites may be affected by increased traffic from development activities. The recreation sites found within or immediately adjacent to the proposed EOIs and more likely to be directly impacted are listed below in Table 3.

Table 3. Recreation Sites Within or Adjacent to Proposed EOIs

Name	Type/Activities
Condon Lake Backcountry Campsites	Dispersed camping area.
Highbanks Campground	Camping, fishing, boating.
Indian Lake Campground	Camping, fishing, boating.
Loda Lake Wildflower Sanctuary	Fishing, boating, hiking, interpretive site for historic and natural resources.
Kenosha Campsites	Dispersed camping area.

Name	Type/Activities
North Country National Scenic Trail	Trail; hiking, cross-country skiing, snowshoeing.
Nichols Lake North Recreation Area	Fishing, boating, swimming, cross country skiing, snowshoeing, hiking, trailhead for the North Country Trail.
Sawkaw Lake Backcountry Campsites	Dispersed camping, fishing.
Walk Up Lake Recreation Area	Camping, boating, fishing.

3.11 Socioeconomics

Newaygo County

Newaygo County is located in the west central area of Lower Michigan and borders the following counties: Osceola (northeast), Mecosta (east), Kent (south), Oceana (west), Mason (northwest), and Muskegon (southwest). Newaygo County is 813.20 square miles, with a population density of approximately 60 persons per square mile, and is more densely populated than the state as a whole (174 persons per square mile). Its estimated population in 2013 was 48,001 a 0.9% decrease from the 2010 census (U.S. Department of Commerce, 2015a). The distribution of population in Newaygo County is 90.7% White, 5.8% Hispanic or Latino, 1.4% Two or More Races, 1.2% African American, 0.9% Native American or Alaska Native, and 0.4% Asian. 76.5% of Newaygo County residents are 18 years of age or older, with 17.3% aged 65 years or older; the State of Michigan has a population 18 years of age and older of 77.3%, with 15% aged 65 or older (U.S. Department of Commerce, 2015a). The county seat is located in White Cloud, in the central part of the county.

Housing

In 2013, there were 24,940 housing units in the county with a homeownership rate from 2009-2013 of 72.8%, about the same as the state as a whole. The median value of these owner-occupied homes was \$104,100 for the period 2009-2013, lower than that of the state (\$121,700) (U.S. Department of Commerce, 2015a). 19.8% of housing units were categorized as “for seasonal, recreational, or occasional use,” a much higher amount than for the United States as a nation (3.9%) (U.S. Department of Commerce, 2013a).

Income

For the period 2009-2013, median household income was \$42,571 for Newaygo County, about \$6,000 less than for the average for the state. Approximately 18.6% of persons lived below the poverty level,

slightly higher than the 16.8% statewide that live below the poverty level. In 2013, 39% of Newaygo County households received some form of Social Security payment, 23.5% of households received retirement income, and 21.8% of households received benefits from the Supplemental Nutrition Assistance Program (SNAP); all of these totals exceed the national averages for these respective categories (U.S. Department of Commerce, 2013b). 85.9% of the county population 25 years of age and over graduated from high school, 3% lower than the state total. 12.9% of county residents 25 years of age and older have a bachelor's degree compared to 25.9% for Michigan as a whole. About 5.2% 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, 2015a).

Employment

The seasonally adjusted unemployment rate for Newaygo County was 7.7% in July 2014, a 1.8% decrease from the 9.5% rate in July 2013 and the same as Michigan's seasonally adjusted unemployment rate of 7.7% for July 2014. (U.S. Department of Labor, 2014a).

Between 2001 and 2013, services-related industries added the most employment (wage and salary jobs and proprietors) in Newaygo County (+1,606), led by finance and insurance (+478), retail trade (+316) and administrative and waste services (+258). Non-services-related industries decreased employment (-226), led by construction (-161) and manufacturing (-76) and government lost the most employment during this period (-417). In 2013, government (2,442), retail trade (2,370) and the health care and social services industry (1,473) employed the most people in the county (U.S. Department of Commerce, 2014a).

According to the U.S. Department of Commerce (2014b), mining and mining-related employment for the period 1970-2000 indicates that there was a high of 26 wage and salary jobs and proprietors in 1990 to a low of 11 in 2000. In 2012, nonmetallic minerals mining employment represented .02% of the total employment in the county, down from .12% of total employment in 1998 (U.S. Department of Commerce, 2014c). There were also 8 self-employed proprietors involved with oil and gas extraction in the county (U.S. Department of Commerce, 2014d). Average annual wage for the mining industry in Newaygo County in 2013 was unknown but the average annual wage for the United States in the mining industry in 2013 was \$98,163, about 145% higher than the average annual wage for all county residents in all sectors (\$35,785) (U.S. Department of Labor, 2014b).

Demographically, Newaygo County is less affluent, less educated, more homogenous and slightly older than most counties in the State of Michigan.

Lake County

Lake County is located in the west central area of Lower Michigan and borders the following counties: Wexford (northeast), Osceola (east), Newaygo (south), Mason (west), Manistee (northwest), Mecosta (southeast) and Oceana (southwest). Lake County is 567.37 square miles, with a population density of approximately 20 persons per square mile is much less densely populated than the state as a whole (174 persons per square mile). Its estimated population in 2013 was 11,386 a 1.3% decrease from the 2010

census (U.S. Department of Commerce, 2015b). The distribution of population in Lake County is 85.2% White, 9.2% African American, 2.7% Two or More Races, 2.5% Hispanic or Latino, 0.9% Native American or Alaska Native, and 0.2% Asian. 82.8% of Lake County residents are 18 years of age or older, with 25.9% aged 65 years or older; the State of Michigan has a population 18 years of age and older of 77.3%, with 15% aged 65 or older (U.S. Department of Commerce, 2015b). The county seat is located in Baldwin, in the south central part of the county.

Housing

In 2013, there were 14,882 housing units in the county with a homeownership rate from 2009-2013 of 81.3%, which is about 9% higher than for the state as a whole. The median value of these owner-occupied homes was \$79,700 for the period 2009-2013, much lower than that of the state (\$121,700) (U.S. Department of Commerce, 2015b). 67.8% of housing units were categorized as “for seasonal, recreational, or occasional use,” a much higher amount than for the United States as a nation (3.9%) (U.S. Department of Commerce, 2013c).

Income

For the period 2009-2013, median household income was \$29,379 for Lake County, about \$20,000 less than for the average for the state. Approximately 27.9% of persons lived below the poverty level, much higher than the 16.8% statewide that live below the poverty level. In 2013, 54% of Lake County households received some form of Social Security payment, 29.1% of households received retirement income, and 25.9% of households received benefits from the Supplemental Nutrition Assistance Program (SNAP); all of these totals greatly exceed the national averages for these respective categories (U.S. Department of Commerce, 2013d). 80.3% of the county population 25 years of age and over graduated from high school, 8.6% lower than the state total. 8.4% of county residents 25 years of age and older have a bachelor’s degree compared to 25.9% for Michigan as a whole. About 2% 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, 2015b).

Employment

The seasonally adjusted unemployment rate for Lake County was 11.7% in July 2014, a 2.1% decrease from the 13.8% rate in July 2013 but 4 percentage points higher than Michigan’s seasonally adjusted unemployment rate of 7.7% for July 2014. (U.S. Department of Labor, 2014c).

Between 2001 and 2013, services-related industries added the most employment (wage and salary jobs and proprietors) in Lake County (+10), led by accommodation and food services (+47), health care and social assistance (+46) and administrative and waste services (+22). Non-services-related industries decreased employment (-21), led by construction (-92) and forestry, fishing, & related activities (-15), but manufacturing (+22) and farming (+10) actually gained employment during this period. In 2013, although government lost 94 total jobs from 2001, it still employed the most people in Lake County (489), followed by health care and social services (403) and retail trade (340)(U.S. Department of Commerce, 2014e).

According to the U.S. Department of Commerce (2014f), mining and mining-related employment for the period 1970-2000 indicates that there were 5 wage and salary jobs and proprietors in 1990 and 5 in 2000. In 2012, nonmetallic minerals mining employment represented .02% of the total employment in the county, down from .12% of total employment in 1998 (U.S. Department of Commerce, 2014g). There were also 5 self-employed proprietors involved with oil and gas extraction in the county (U.S. Department of Commerce, 2014h). Average annual wage for the mining industry in Lake County in 2013 was unknown but the average annual wage for the United States in the mining industry in 2013 was \$98,163, about 145% higher than the average annual wage for all county residents in all sectors (\$32,167) (U.S. Department of Labor, 2014d).

Demographically, Lake County is far less affluent, far less educated, more homogenous and much older than most counties in the State of Michigan. This could be attributed to the number of individuals receiving social security payments and retirees residing in the county and low numbers of college graduates influencing the average wage.

3.12 Soils

Soils in the nominated lease parcels are predominantly sands. Less than one percent of the nominated lease parcels contains highly erodible soil types, and about five percent of the nominated lease parcels contains potentially highly erodible soil types. These are scattered throughout most of EOI 861. The nominated lease parcels contain 40 acres of land classified as *prime farmland* and 950 acres classified as *farmland of local importance* (U.S. Department of Agriculture Natural Resources Conservation Service, 2013).

3.13 Vegetation

Most of the nominated lease parcels are forested. EOI 861 overlaps 5,933 acres identified by the USFS as old growth, 148 acres of the Loon Lake Candidate Research Natural Area, and 78 acres of the Loda Lake Wildflower Sanctuary. Both of these latter locations are off-limits to oil and gas activities. USFS data shows a breakdown in forest stand types in the nominated lease parcels as follows:

Stand type (dominant species)	Acres
Mixed oaks	3,547
Red pine	1,577
Quaking aspen	1,477
Black oak/scarlet oak/hickory	1,262
Black ash-American elm/red maple	1,087
Northern red oak	1,034
Open	870
Mixed lowland hardwoods	855
Lowland shrubs	741
Eastern white pine	727
Jack pine	669
Bigtooth aspen	662

Stand type (dominant species)	Acres
Mixed northern hardwoods	454
Red maple (wet site)	275
Jack pine-oak	262
Red pine-oak	252
Mixed swamp conifer	217
Northern white-cedar	174
Sugar maple-beech/yellow birch	100
Upland shrubs	46
Red maple (dry site)	29
Northern white cedar-aspen/paper birch	19
White oak	18
White spruce/balsam fir	9
Eastern white pine-northern red oak/white ash	8
Paper birch	7

3.14 Visual Resources

Most of the nominated lease parcels is undeveloped forest that is broadly accessible by improved roads. Lands within the nominated lease parcels include large patches of cultivated vegetation, such as pine plantations, regenerating aspens, croplands, and old fields. The nominated lease parcels includes several small urban areas.

3.15 Water Resources

The MDEQ regulates oil and gas operations in the state. The MDEQ has the responsibility to gather oil and gas production data, permit new wells, establish oil pool rules and oil and gas allowables, issue discharge permits, enforce rules and regulations of the division, monitor underground injection wells, and ensure that abandoned wells are properly plugged and the land is responsibly restored. The MDEQ administers the major environmental protection laws, most Clean Water Act regulations pertaining to surface and groundwater. The MDEQ also permits the use of produced water, within a certain range of salinity, for drilling, completion, and, possibly, cementing.

3.15.1 Surface Water Resources

Surface water hydrology within the area is typically influenced by geology, soil characteristics, precipitation and vegetation. The portion of the nominated lease parcels occupied by EOI 861 contains abundant wetlands, and the remaining requested areas contain a few small wetlands. Half of these wetlands are forested wetlands, and the remainder is composed of shrubby wetlands, open water, and marshes.

The nominated lease parcels contain portions of several small lakes and streams. Silver Creek flows through EOI 892. Several streams and unnamed tributaries flow through various portions of EOI 861:

- Cedar Creek
- Triple Lakes Creek

- Big South Branch Pere Marquette River
- Little South Branch Pere Marquette River
- Beaver Creek
- East Branch Heald Creek
- West Branch Heald Creek
- Martin Creek
- Tank Creek

Silver Creek and an unnamed tributary in EOI 892 are part of the Pine River *natural rivers zoning district*, and various streams intersecting EOI 861 are included in the White River and Pere Marquette River natural river zoning districts. The natural river zoning district may entail local zoning restrictions designed to protect the natural riparian habitat.

Water resources may be affected by many activities including fire/prescribed burns, military use, mineral extraction, recreation, transportation, and vegetation management activities. The most likely effects to hydrology will be to stream channel morphology, and water quality. Channel alterations can be measured in specific morphological parameters. Water nutrients can be measured in concentration per unit volume.

As of 2014, Martin Creek and East and West Branches Heald Creek had fish consumption advisories due to PCBs in the water. The Big South Branch Pere Marquette River, Little South Branch Pere Marquette River, Beaver Creek, and Tank Creek had fish consumption advisories due to PCBs in the water and in fish tissues (Michigan Department of Environmental Quality, 2013).

3.15.2 Ground Water Resources

Groundwater hydrology within the area is influence by geology and recharge rates. Groundwater quality and quantity can be influenced by precipitation, water supply wells, and various disposal activities.

Most of the nominated lease parcels are covered in unconfined glacial drift that may be an aquifer, with deeper sediments composed of interbedded aquifers and impermeable layers. According to the “Welogic Hydraulic Properties” database, the nominated lease parcels contain only three wells, all of them for household use (Michigan Department of Environmental Quality, 2005).

Most onshore produced water is injected deep underground for either enhanced recovery or disposal. With the passage of the Safe Drinking Water Act in 1974, the subsurface injection of fluids came under federal regulation. In 1980, the EPA promulgated the Underground Injection Control regulations. The program is designed to protect underground sources of drinking water.

4 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES

4.1 Introduction

This chapter assesses potential impacts associated with direct, indirect, and cumulative effects of the Proposed Action. As detailed in Chapter 2, the BLM and USFS expect the issuance of leases of the nominated parcels to be followed by drilling of up to three wells on these parcels over the next six years. The No-Action Alternative, which would be to withhold the Federal minerals from leasing, would have no impacts on resources.

General Direct Impacts on All Resources:

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

General Indirect Impacts on All Resources:

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

General Cumulative Impacts on All Resources:

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

4.2 Air Resources

4.2.1 Air Quality

The administrative act of offering any of the proposed parcels and the subsequent issuing of leases would have no direct impacts to air quality. Any potential effects to air quality would occur if and when

the leases were developed. Any proposed development project would be subject to additional analysis of possible air effects before approval. The analysis may include air quality modeling for the activity. Over the last 10 years, the development of the federal oil and gas mineral estate in the Northeastern States field office (NSFO) has resulted in an average of one to two wells being spudded annually. These wells would incrementally contribute a small percentage of the total emissions (including GHGs) from oil and gas activities in the NSFO.

An MOU between the Departments of the Interior and Agriculture and EPA (U.S. Department of Agriculture, U.S. Department of Interior, and U.S. Environmental Protection Agency, 2011) directs that air quality modeling 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 NAAQS or PSD increment

The proposed project area includes no Class I, sensitive Class II or non-attainment areas. Due to the small number of wells projected to follow a lease on the proposed tracts in relation to the current volume of hydrocarbon, development of the lease is not likely to exceed the emissions criteria, NAAQS or PSD increment or contribute to adverse cumulative air quality impacts. As a result, air quality modeling is not required for the proposed project and likely will not be required at the APD stage, if development occurs on the proposed lease. Operations may require additional permitting by the relevant state agency and will further insure that operations will not violate state or federal air quality standards.

The following sources of emissions are anticipated during oil and gas exploration or development:

- combustion engines (i.e. fossil fuel fired internal combustion engines used to supply electrical or hydraulic power for hydraulic fracturing to drive the pumps and rigs used to drill the well, drill out the hydraulic stage plugs and run the production tubing in the well);
- electric generators to power drill rig engines, pumps, and other equipment;
- compressors used to increase the pressure of the oil or gas for transport and use;
- tailpipe emissions from vehicles transporting equipment to the site);
- venting (i.e. fuel storage tanks vents and pressure control equipment);
- mobile emissions (i.e. vehicles bringing equipment, personnel, or supplies to the location); and
- fugitive sources (i.e. pneumatic valves, tank leaks, and dust).

A number of pollutants associated with combustion of fossil fuels are anticipated to be released during drilling including: CO, NO_x, SO₂, Pb, PM, CO₂, CH₄, and N₂O. Venting may release VOC/HAP, H₂S, and CH₄. Mobile source emissions are likely to include fugitive particulate matter from dust and NO_x associated with vehicle engine combustion, traffic and/or construction activities.

The actual emissions of each pollutant are dependent on the factors described in the previous paragraph. During the completion phase, the most significant emissions of criteria pollutants emitted by oil and gas operations in general are VOCs, particulate matter and NO₂. VOCs and NO_x contribute to the formation of ozone. The EPA's Natural Gas STAR Program (2014) is a voluntary program that identifies sources of fugitive methane sources and seeks to minimize fugitive CH₄ through careful tuning of existing equipment and technology upgrades. Data provided by STAR show that some of the largest air emissions in the natural gas industry occur as natural gas wells are fractured and are being prepared for production. During well completion, flowback, fracturing fluids, water, and reservoir gas come to the surface at high velocity and volume. This mixture includes a high volume of VOCs and CH₄, along with air toxins such as benzene, ethylbenzene, and n-hexane. The typical flowback process lasts from three to 10 days. Additional emissions from other processes and equipment during production and transportation of the oil and gas from the well to a processing facility may occur.

To reasonably quantify emissions associated with well exploration and production activities, certain types of information are needed. Such information includes a combination of activity data such as:

- The number, type, and duration of equipment needed to construct/reclaim, drill and complete (e.g. belly scrapers, rig, completions, supply trucks, compressor, and production facilities)
- The technologies which may be employed by a given company for drilling any new wells to reduce emissions (e.g. Selective Catalytic Reduction (SCR) on diesel powered drill rigs, natural gas fired drill rig engines, the use of "green" completion technology, and multi-stage flare stacks)
- Area of disturbance for each type of activity (e.g. roads, pads, pipelines, electrical lines, and compressor station)
- Compression per well (sales and field booster), or average horsepower for each type of compressor, if needed
- The number and type of facilities utilized for production operations.

The degree of impact will also vary according to the characteristics of the geological formations from which production occurs but emissions associated with oil and gas operations would incrementally contribute to increases in air quality emissions into the atmosphere.

Public health can be affected by ambient air pollution depending upon concentration of the emitted parameter and length/duration of exposure. Numerous scientific studies have linked air pollution to a variety of health problems including: (1) respiratory and cardiovascular disease, (2) decreased lung function, (3) increased frequency and severity of respiratory symptoms such as difficulty breathing and coughing, (4) increased susceptibility to respiratory infections, (5) effects on the nervous system, including the brain, such as IQ loss and impacts on learning, memory, and behavior, (6) cancer, and (7) premature death. Sensitive individuals or those at high risk appear to be at even greater risk for air pollution-related health effects, for example, those with pre-existing heart and lung diseases (e.g., heart failure/ischemic heart disease, asthma, emphysema, and chronic bronchitis), diabetics, older adults, and

children. Operations that would violate a state and/or federal air quality standard would not be approved.

Significant degradation of air quality may also damage ecosystem resources. For example, ozone can damage vegetation, adversely impacting the growth of plants and trees. These impacts can reduce the ability of plants to uptake CO₂ from the atmosphere and can then indirectly affect the larger ecosystems.

4.2.1.1 Mitigation

The BLM encourages industry to incorporate and implement Best Management Practices (BMPs) designed to reduce impacts to air quality by reducing emissions, surface disturbances, and dust from field production and operations. Typical measures include:

- Flared hydrocarbon gases at high temperatures in order to reduce emissions of incomplete combustion.
- Watering dirt roads during periods of high use to reduce fugitive dust emissions.
- Co-location wells and production facilities to reduce new surface disturbance.
- Implementation of directional drilling and horizontal completion technologies whereby one well provides access to petroleum resources that would normally require the drilling of several vertical wellbores.
- Requiring that vapor recovery systems be maintained and functional in areas where petroleum liquids are stored.
- Performing interim reclamation to reclaim areas of the pad not required for production facilities and to reduce the amount of dust from the pads.

Additionally, the BLM encourages oil and natural gas companies to adopt proven, cost-effective technologies and practices that improve operational efficiency and reduce natural gas emissions.

In October 2012, EPA promulgated air quality regulations for completion of hydraulically fractured gas wells (U.S. Environmental Protection Agency, 2015b). These rules require air pollution mitigation measures that reduce the emissions of volatile organic compounds during gas well completions. Mitigation includes utilizing a process known as a “Green” completion in which natural gas brought up during flowback is captured in tanks rather than in open fluid pits. The captured gas is automatically sent to the gathering line.

4.2.2 Visibility

Michigan contributes to two Class I areas in the State: Seney National Wildlife Refuge and Isle Royale National Park. Based on the Midwest Regional Planning Organization’s (MRPO) 2018 particulate Source apportionment modeling, Michigan contributes from using the Michigan Department of Natural Resources (MDNR) determination that a significant contribution to visibility impairment is a contribution over 5%. Michigan is not expected to significantly contribute to visibility impairment to any other Class I areas (Michigan Department of Environmental Quality, 2010).

Michigan had less than a 5% impact on Minnesota's Class I areas and was not indicated by Minnesota as contributing to their Class I areas. However, Michigan contributed less than 5% to all other Class I areas noted in the chapter three visibility section for Maine, New Hampshire, New Jersey and Vermont

4.2.3 Climate and Climate Change

The administrative act of leasing all or part of the 29 parcels covering approximately 16,556 acres would not result in any direct GHG emissions. However, regarding future development, the assessment of GHG emissions and climate change is in its formative phase. While it is not possible to accurately quantify potential GHG emissions in the affected area as a result of making the proposed tracts available for lease, a general assumption can be made and that is offering the proposed parcels may contribute to the installation and production of new wells, which may consequently lead to an increase in GHG emissions.

According to the *Michigan Greenhouse Gas Inventory 1990 and 2002* (University of Michigan Center for Sustainable Systems, 2005), expected climate changes in Michigan over the next century will likely show warmer average temperatures with longer periods of drought, most notably during the summer. The growing season is likely to extend by as much as ten weeks. Of significant cultural and economic concern to Michigan are the Great Lakes. It is estimated that the water levels of the Great Lakes will continue to decline, which could potentially be very costly to Michigan's fishing, tourism, and shipping industries.

Emissions from fossil fuel production were not reported in the *Michigan Greenhouse Gas Inventory 1990 and 2002* report; however, Michigan's GHG emissions grew approximately 9% from 1990 to 2002. Increases in energy emissions were the result of construction of new natural gas transmission and distribution pipelines and associated infrastructure, coke produced at coke plants, and increased use of hydrofluorocarbons (HFCs). It is worth noting that a significant portion of the emissions attributed to the natural gas industry are due to vented gas from processing plants, many of which are used for injection in enhanced oil recovery operations. Additionally, many technological advances in emission control technology have been implemented by the oil and gas industry to reduce emission levels.

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 CO₂ 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 CH₄ – CH₄ that escapes from wells (both gas and oil), oil storage, and various types of processing equipment. This is a major source of global CH₄ emissions. These emissions have been estimated for various aspects of the energy sector, and starting in 2011, producers are required under 40 C.F.R. §98, to estimate and report their CH₄ emissions to the EPA.

- Combustion of produced oil and gas – it is expected that operations will produce marketable quantities of oil and/or gas. Combustion of the oil and/or gas would release CO₂ into the atmosphere. Fossil fuel combustion is the largest source of global CO₂.

The assessment of GHG emissions, their relationship to global climatic patterns, and the resulting impacts, is an ongoing scientific process. It is not known with certainty the net impacts from the proposed action on climate – that is, while BLM actions may contribute to the climate change phenomenon, the specific effects of those actions on global climate are speculative given the current state of the science. The BLM does not have the ability to associate a BLM action’s contribution to climate change with impacts in any particular area. The science to be able to do so is not yet available. Inconsistencies in the results of scientific models designed to predict climate change on regional or local scales limits the ability to quantify potential future impacts of decisions made at this level and determining the significance of any discrete amount of GHG emissions is beyond the limits of existing science. When further information on the impact to climate change is known, such information would be incorporated in the BLM’s planning and NEPA documents as appropriate but an assessment of impacts on climate change from the release of GHG’s is outside the scope of this document because it is a global phenomenon.

In recent years, many states, tribes, and other organizations have initiated GHG inventories, tallying GHG emissions by economic sector. The EPA provides links to statewide GHG emissions inventories (U.S. Environmental Protection Agency, 2015c). Guidelines for estimating project-specific GHG emissions are available (URS Corporation 2010), but some additional data, including the volume of oil produced and the number of wells, are not available for the proposed action. Uncertainties regarding the numbers of wells and other factors make it impractical to project amounts of GHG that the proposed action would emit. At the APD stage, more site-specific information on oil and gas activities resulting in GHG impacts would be described in detail. Also at the APD stage, the BLM would evaluate operations, require mitigation measures, and encourage operators to participate in the voluntary STAR program.

4.3 Fish and Wildlife

4.3.1 General Description

As previously stated, it is not possible to predict whether or not a parcel would be sold and if it is sold, whether or not it would be developed. Should a lease be developed, surface disturbing and/or disruptive activities may occur on the parcels containing Karner blue butterfly, Northern long-eared bats, and Eastern massasauga rattlesnake. Subsequent actions from leasing these parcels could also result in habitat fragmentation and loss due to construction, drilling, and production activities, which could also lead to increased stress and habitat avoidance. Increased stress and avoidance of habitat could increase mortality rates in wildlife especially in times of drought or harsh winter conditions. The intensity of the subsequent development may have a different effect on short-term and long-term habitat viability. It is not possible at the lease offering stage to accurately predict whether a parcel would actually be leased at auction or the intensity of any subsequent development. Should any wells be drilled as a result of leasing these parcels, much of the well pad, utility corridors, and barrow ditches of access roads would

be placed into interim reclamation once the well is placed into production, which would signal a significant reduction in activity on the location, further reducing impacts to wildlife. Successful reclamation would replace wildlife habitat lost due to natural gas development. Interim and final reclamation would also create an uneven age vegetative stand that could attract wildlife and increase species diversity and/or richness in the project area.

4.3.2 Sensitive Species

Consultation was initiated on December 24, 2014 with the U.S. Fish and Wildlife Service regarding the Karner blue butterfly, northern long-eared bat, and the eastern massasauga. The BLM received written concurrence, on March 2, 2015, that the proposed project may affect, but is not likely to adversely affect these sensitive species with the lease stipulations and notices attached to this document as provided by the HMNF with the concurrence to lease these lands.. Additional site-specific analysis would be done at the time that an APD is received. This may require the operator to conduct surveys of areas that may contain endangered and/or sensitive state and federally listed species, based on available data, to apply site-specific conditions of approval to better protect or mitigate against impacts to the particular species that may be affected by each proposed project.

4.3.3 Migratory Birds

Post-lease actions (construction and drilling) during the migratory bird breeding and nesting periods in the vicinity of suitable nesting habitats with active nests may cause impacts to nesting birds, such as crushing of nests, including eggs or hatchlings, and/or egg or hatchling abandonment. Operations during the breeding season could result in take under the Migratory Bird Treaty Act (MBTA) including the resulting reduction in breeding success. Site-specific NEPA analysis for development proposals would address impacts minimization and mitigation measures needed based on habitats and species potentially affected.

4.3.4 Mitigation

Management practices identified on a case-by-case basis will be applied to surface disturbing activities to prevent destruction or loss and to maintain or enhance Special Status plant and animal species and their habitats.

Habitat containing threatened, endangered, proposed, and candidate plant species, as well as those plants listed on the HMNF and Michigan State sensitive species list, would potentially limit the location of utility/transportation facilities, wind energy, and/or communication sites. The sensitive species habitat would be avoided where possible, and, in situations where these areas would not be avoided, additional BMPs would minimize disturbance to the habitat.

A reclamation plan shall be submitted with the application for permit to drill. The plan should include, a native seed mix to meet the standards in the Forest Plan, a plan to control/eradicate any noxious or invasive species originating from oil and gas operations, and a plan to reclaim nonessential areas disturbed during construction activities (to be accomplished during the first appropriate season after well completion). Nonessential areas include portions of the well locations not needed for production operations, the borrow ditch and outslope portions of new road ROWs, entire pipeline ROWs

outside of road ROWs, and all roads and associated disturbed areas at nonproductive well locations. The HMNF reviewed all of the nominated lease parcels and applied lease stipulations and notifications (See Appendix B) to each parcel, which were reviewed and approved by the FWS.

4.4 Geology/Mineral Resources/Energy Production

Since the likely target formations have been thoroughly explored, it is unlikely that the proposed action will result in the discovery of important new hydrocarbon resources. The proposed action will continue the ongoing depletion of the plays.

4.5 Wastes, Hazardous or Solid

While the act of leasing federal minerals would produce no impacts on the environment from hazardous or solid wastes, subsequent exploration/development of the proposed lease could result in the introduction of hazardous and non-hazardous substances to the site. Hazardous substances may be produced, used, stored, transported or disposed of as a result of development on the proposed lease.

Projects would typically generate the following wastes: (1) discharge of drilling fluids and cuttings into the reserve pits; (2) wastes generated from used lubrication oils, hydraulic fluids, and other fluids used during production of oil and gas, some of which may be characteristic or listed hazardous waste; and (3) service company wastes from exploration and production activities as well as containment of some general trash. Certain wastes unique to the exploration, development, and production of crude oil and natural gas have been exempted from Federal Regulations as hazardous waste under Subtitle C of the RCRA of 1976. The exempt waste must be intrinsic to exploration, development or production activities and cannot be generated as part of a transportation or manufacturing operation. The drilling fluids, drill cuttings, and produced waters are classified as a RCRA exempt waste, and potential drilling that could occur would not introduce hazardous substances into the environment if they are managed and disposed of properly under federal, state, and local waste management regulations and guidelines. Properly used, stored, and disposed of hazardous and non-hazardous substances greatly decreases the potential for any impact on any environmental resources. Operators and the BLM can ensure hazardous and non-hazardous substances are properly managed through the preparation of a Spill Prevention, Control, and Countermeasure (SPCC) plan.

In hydraulic fracturing, chemical substances other than water make up a small percentage of the fluid composition; however, the very large volumes used require correspondingly large volumes of a variety of compounds. These substances range from the relatively benign to the highly toxic at certain concentrations. In addition to these added chemicals, naturally occurring toxicants such as heavy metals, volatile organics, and radioactive compounds are mobilized during extraction and return to the surface with the produced water. Of the millions of gallons of water used to hydraulically fracture a well one time, less than 30% to more than 70% may remain underground (Bamberger and Oswald, 2012). Although the risk is low, the potential exists for unplanned releases that could have serious effects on human health and environment. A number of chemical additives are used that could be hazardous, but are safe when properly handled according to requirements and long-standing industry practices. In addition, many of these additives are common chemicals which people regularly encounter in everyday life (Ground Water Protection Council & ALL Consulting, 2009).

Surface spills of drilling mud and additives, hydraulic fracturing fluids and additives, flowback water, and other produced water can happen at a variety of points in the development and production phases. Spills that occur can span a range of different spill sizes and causes of failure at any point in the process. For example, small spills often happen as the result of poor pipe connections or leaks; large spills sometimes occur as the result of a major well blowout, but such blowouts rarely occur. Additionally, spills from some parts of the phases may be the result of human error (i.e. vehicle collisions, improper handling, improper equipment operation or installation, etc.), while others stem from equipment failure (i.e. broken pipes, torn pit liners, leading tanks, etc.) or acts of nature (Fletcher, 2012). The most common cause of spills comes from equipment failure and corrosion (Wenzel, 2012).

The cause of the spill, the spill size, the hazard rating of the spilled material, response time to clean up the spill and the effectiveness of the cleanup, all play a critical role in determining the overall impact on the environment. The volume of a spill can significantly vary with spill types. Pipe spills are not expected to release more than 1,000 gallons into the environment, retaining pit spills and truck spills are not expected to release more than 10,000 gallons of fluid, and blowouts are expected to cause the largest spills, with the potential to release tens of thousands of gallons into the environment. Small spills occur with greater frequency than large spills. Secondary containment or recovery for small spills would likely minimize, if not eliminate, any potential release into the environment. However, for spills of several thousands of gallons of fluid, it is expected that less than half the fluid may be captured by secondary containment or recovery. The vast majority of operations do not incur reportable spills (5 gallons or more), indicating that the fluid management process can be, and usually is, managed safely and effectively (Fletcher, 2012).

4.5.1 Mitigation

Specific mitigation is deferred to the APD process. However, the following measures are common to most projects:

- all trash would be placed in a portable trash cage and hauled to an approved landfill, with no burial or burning of trash permitted;
- chemical toilets would be provided for human waste;
- fresh water zones encountered during drilling operations would be isolated by using casing and cementing procedures;
- a berm or dike would enclose all production facilities if a well is productive; and
- all waste from waste streams onsite would be removed to an approved disposal site.

Future development activities on these lease sale parcels would be regulated under the RCRA, Subtitle C regulations. Additionally, waste management requirements are included in the 12-point surface use plan and the 9-point drilling plan required for all APDs. Leaseholders proposing development would be required to have approved SPCC plans, if the applicable requirements of 40 C.F.R. §112 are met, and comply with all requirements for reporting of undesirable events. Lease bonds would not be released until all facilities have been removed, wells are plugged, and satisfactory reclamation has occurred.

The Forest Service would apply COAs at the APD stage regarding handling and disposing of wastes.

4.6 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 nominated lease parcels. This could introduce new species from outside the leased area or from one part of the nominated lease parcels 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 nominated lease parcels. While the last two variables would be unreasonable to attempt to quantify without site-specific analysis, we may consider various scenarios of infestation. Areas that are disturbed by pads or other development would be susceptible to direct infestation by non-native, invasive plant species that thrive in disturbed conditions. However, many of these species are able to propagate into undisturbed areas, and large areas of otherwise intact habitat could be infested by plant parts that are introduced into the nominated lease parcels 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. Second, oil and gas development may result in the propagation of invasive species 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 be introduced into the newly cleared area and quickly populate areas of disturbed soil.

4.7 Cultural/Paleontology

In accordance with BLM and USFS policy, all archeological sites identified within the lease areas will be avoided and declared no surface occupancy (NSO) during any proposed ground disturbing activities, when possible. Should development of the lease occur, site-specific Section 106 compliance measures including surveys, records search, and Tribal and SHPO consultation, will be conducted prior to any ground disturbing activities. No further analysis is necessary at this time.

4.8 Native American Religious Concerns

No response from consulted Native American Tribes has been received to date. Consultation will be reinitiated should any responses be received and upon any proposed development activity. No further analysis is warranted at this time.

4.9 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. Development activities will also indirectly effect developed recreation sites and possibly increase travel time to such sites because of increased vehicle traffic during drilling. 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. 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).

Developed recreation areas, including the North Country National Scenic Trail, will be declared NSO and will not be affected by any ground disturbing activities; however, truck traffic, noise, and visual impacts can be expected. Vehicle traffic will increase during initial exploration activities, possibly resulting in longer drive times for forest visitors. Recreation sites within 0.28 miles of drilling activities will be temporarily affected by the noise. However, because of the dense forest in the general area, visual impacts from drilling are expected to be minimal. With the exception of Loda Lake, North Country Trail, and trailheads, all recreation sites within the EOI are either closed during the winter or receive little visitation, meaning that all effects to recreation would be limited primarily to late spring, summer, and early fall.

4.9.1 Mitigation of Effects

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

4.10 Socioeconomics

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

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

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

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

For the state of Michigan in 2011, average wellhead prices were \$92.40 per barrel (bbl.) for crude oil and \$6.18 per thousand cubic feet (Mcf) for natural gas. Statewide average output per producing well was 1,642 bbls. of crude oil and 12,238 Mcf for natural gas from 4,092 producing crude oil wells and 10,310 producing natural gas wells, respectively. In 2011, the state of Michigan ranked 17th in both crude oil and natural gas production in the United States. As of 2011, neither Newaygo nor Lake Counties ranked as one of the top 10 oil and gas producing counties in Michigan (Independent Petroleum Association of America, 2013).

Federal revenues from oil and gas production disbursed to the state of Michigan in Fiscal Year 2014 totaled over \$1.6 million (U.S. Department of Interior, 2015). The proposed action and the associated RFDS indicate that potentially two to nine wells could be drilled on these parcels. Should the Federal government offer the lands for lease and it leads to actual well drilling and economic production, 25% of onshore lease revenues (bonus bids, rentals and royalties) from the production and sale of Federal minerals would be returned to the state for distribution to local governments. 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. Economic production would provide wages and salaries to employees, maintenance staff, and contractors employed in drilling wells, and sales to area hotels, restaurants, and other businesses that serve drillers for the duration of drilling and similar construction-related benefits later as wells are abandoned and sites restored.

In Fiscal Year 2013, neither Newaygo County nor Lake County received any payments directly related to oil and gas production on federal lands (U.S. Department of Interior, 2013). However, 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 2011, Michigan received over \$68 million in severance taxes from all oil and gas produced in the state (Independent Petroleum Association of America, 2013) and some of this money was disbursed to each county.

Exploration, drilling and production could create an inconvenience to people living adjacent to leases. 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. It is estimated that the average oil and gas well requires 320 to 1,365 truckloads of equipment to bring a well into production (National Park Service, 2008). Typically, truck traffic consists of the following:

- Drill Pad and Road Construction Equipment – 10 to 45 truckloads
- Drilling Rig – 30 truckloads
- Drilling Fluid and Materials – 25 to 50 truckloads
- Drilling Equipment (casing, drill pipe, etc.) 25 to 50 truckloads
- Completion Rig - 15 truckloads
- Completion Fluid and Materials – 10 to 20 truckloads
- Completion Equipment – (pipe, wellhead) 5 truckloads
- Fracture Stimulation Fluids and Materials – 100 to 1000 truckloads
- Fracture Stimulation Equipment (pump trucks, tanks) – 100 to 150 truckloads.

Local and state governments regulate heavy hauling on the roads in the area, but there are potential mitigation measures that can aid in reduction of truck traffic. Re-use of flowback wastewater can and does significantly reduce the road traffic associated with hauling water, which represents much of the traffic movement. Pipelines can be used to transport water to a drill site, further reducing the amount of road traffic very substantially (Massachusetts Institute of Technology, 2011).

Competition for housing could potentially occur in the area due to increased employment from additional drilling. Stipulations regarding drilling activities will be incorporated to minimize negative economic and social impacts to local residents and other recreationists that use these lands.

It is an assumption that the No Action Alternative (no lease option) may result in a reduction in domestic production of oil and gas. This would likely result in reduced Federal and state royalty income, and the potential for Federal minerals to be drained by wells on adjacent private or state land.

4.11 Soils

Because permitted well pads could be scattered at various locations throughout the nominated lease parcels, it is impossible to determine how much disturbance would take place on steep slopes and potentially highly erodible soils.

4.12 Vegetation

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

Most of the forested stands in the nominated lease parcels are prescribed for harvest within the foreseeable future. Well construction in a forest would have a different type of impact than the impact of selective or clear-cut logging. While forestry practices may leave selected trees as well as shrubs and

herbaceous vegetation, well pad construction would result in total clearing. Further, while clearcut areas would be allowed, under normal forestry use, to regenerate or would be actively planted, well pads would be maintained in a cleared state for the duration of construction or for the well's life.

The HMNF LRMP stipulates that roads, trails, and utilities in old-growth areas will use minimum width necessary to allow safe passage and meet design criteria.

4.13 Visual Resources

Visual resources will not be impacted by the act of leasing, but will likely be affected by oil and gas development and production activities that could occur on the lease. A majority of the visual issues related to oil and gas operations occur during the construction and drilling phase when there is increased activity on the roads and at the location to support road and pad construction, pipeline installation, drilling and completion operations, and for interim and final reclamation. Since drilling occurs around the clock, rig and location lighting are likely to be visible from a distance depending on rig orientation, height of the rig, topography, and forest cover. Increased traffic, especially over gravel or dirt roads, would increase particulate matter that may be visible from roads, residences, and/or by recreational users in the area. For the production life of the pad there will be a well head and possible lift system with production facilities and production tanks.

4.13.1 Mitigation

The HMNF LRMP stipulates that permanent structures associated with oil and gas be painted to blend in with the natural surroundings.

4.14 Water Resources, Surface/Ground

While the act of leasing federal minerals would produce no impacts to water resources, subsequent exploration and development of the proposed lease may produce impacts. Surface disturbance from the construction of well pads, access roads, pipelines, and utility corridors can result in degradation of surface water and groundwater quality from non-point source pollution, increased soil losses, and increased erosion.

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

4.14.1 Surface Water

Potential impacts to surface water that may occur due to construction of well pads, access roads, fracturing ponds, pipelines, utility lines and production include:

- Increased surface runoff and off-site sedimentation brought about by soil disturbance

- Increased salt loading and water quality impairment of surface waters
- Channel morphology changes due to road and pipeline crossings and possible contamination of surface waters by spills

The magnitude of these impacts to water resources would depend on the proximity of the disturbance to the drainage channel, slope aspect and gradient, degree and area of soil disturbance, amount of local precipitation, soil character, and duration and time before implementation mitigation or clean up measures can be put into place.

Direct impacts would likely be greatest shortly after the start of construction activities and would decrease in time due to decreased activity during production, natural stabilization and reclamation efforts. Construction activities would occur over a relatively short period; therefore, the majority of the disturbance would be temporary and localized. Flows of perennial, ephemeral, or intermittent rivers and streams could be directly affected in the short term by an increase in impervious surfaces resulting from the construction of the well pad and road. An increase in impervious surfaces provides for reduced infiltration that can then cause overland to move more quickly causing peak flow to potentially occur earlier, have a higher flow velocity and/or a larger volume than the channels are equipped for. Increased velocity and volume of peak flow can cause bank erosion, channel widening, downward incision, and disconnection to the floodplain. The potential hydrologic effect to low flow is reduced surface storage and groundwater recharge, which can then result in reduced base flow to perennial rivers and/or streams and potentially causing intermittent channels to become ephemeral. Hydrologic processes may be altered where the perennial, ephemeral, and intermittent river and stream system responds by changing physical parameters, such as channel configuration. These changes may in turn impact water quality and ultimately the aquatic ecosystem through eutrophication, changes in water temperature, and/ or a change in the food structure.

Minor long-term direct and indirect impacts to the watershed and hydrology could continue for the life of surface disturbance from water discharge from roads, road ditches, and well pads, but would decrease once all well pads and road surfacing material have been removed and sites have been reclaimed. Interim reclamation and re-vegetating the pad and road ditches would reduce this long-term impact. Short-term direct and indirect impacts to the watershed and hydrology from access roads that are not surfaced with impervious materials would occur and would likely decrease in time due to reclamation efforts.

4.14.2 Ground Water

Groundwater could be affected by multiple factors, including industrial, domestic, or agricultural activities through withdrawal, injection (including chemical injection), or mixing of materials from different geologic layers or the surface. Withdrawal of groundwater could affect local groundwater flow patterns and create changes in the quality or quantity of the remaining groundwater. Groundwater availability would be assessed by the Michigan DEQ on a project-by-project basis at the APD stage to determine the effect on local ground/surface water. As of February 28, 2006, all new withdrawals are prohibited from causing an adverse resource impact to the waters of the state. Use of the DEQ *Water Withdrawal Assessment Tool* (Michigan Department of Environmental Quality, 2015c) is required prior

to installation of any new or increased large quantity withdrawal. This potential would be assessed at the development stage should development be proposed. The drilling of horizontal wells, versus directional and vertical wells may initially appear to require a greater volume of water for drilling/completion purposes. However, a horizontal well develops a much larger area of the reservoir than a directional and/or vertical well and actually results in a lesser volume of fluids being required. Vertical and directional wells can easily require one well per 10 acres resulting in 64 wells per section. This is in contrast to one horizontal well per 640 acres or one per 320 acres which results in a net decrease in total fluid volumes needed and in surface disturbance acreages. Impacts to the quality of groundwater, should they occur, would likely be limited to near a well bore location due to inferred groundwater flow conditions in the area of the parcels.

Oil and gas contained in geologic formations is often not under sufficient hydraulic pressure to flow freely to a production well. The formation may have low permeability or the area immediately surrounding the well may become packed with cuttings. A number of techniques are used to increase or enhance the flow. They include hydraulic fracturing and acid introduction to dissolve the formation matrix and create larger void space(s). The use of these flow enhancement techniques and secondary recovery methods result in physical changes to the geologic formation that will affect the hydraulic properties of the formation. Typically, the effects of these techniques and methods are localized to the area immediately surrounding the individual well, are limited to the specific oil and gas reservoir, and do not impact adjacent aquifers.

There is an elevated public concern about the possibility of subsurface hydraulic fracturing operations creating fractures that extend well beyond the target formation to water aquifers, allowing CH₄, contaminants naturally occurring in formation water, and fracturing fluids to migrate from the target formation into drinking water supplies (Zoback, Kitasei, & Copithorne, 2010). Typically, thousands of feet of rock, including some impermeable, separate most major formations in the U.S. from the base of aquifers that contain drinkable water (U.S. Department of Energy, 2009). The direct contamination of underground sources of drinking water from fractures created by hydraulic fracturing would require hydrofractures to propagate several thousand feet beyond the upward boundary of the target formations through many layers of rock. It is extremely unlikely that the fractures would ever reach fresh water zones and contaminate freshwater aquifers (Zoback et al, 2010). The wells in the vicinity of the nominated lease parcels are tens to hundreds of feet deep, while productive oil and gas formations are thousands of feet below the surface.

Contamination of groundwater could occur without adequate cementing and casing of the proposed well bore. For fracturing fluid to escape the wellbore and affect the usable quality water or contaminate or cross contaminate aquifers, the fluid would have to breach several layers of steel casing and cement. Failure of the cement or casing surrounding the wellbore is a possible risk to water supplies. If the annulus is improperly sealed, natural gas, fracturing fluids, and formation water containing high concentrations of dissolved solids may be transferred directly along the outside of the wellbore among the target formation, drinking water aquifers, and layers of rock in between. Complying with BLM and state regulations regarding casing and cementing, implementing BMPs, testing casings and cement prior

to continuing to drill or introducing additional fluids, and continual monitoring during drilling and hydraulic fracturing, allows producers and regulators to check the integrity of casing and cement jobs and greatly reduce the chance of aquifer contamination.

Casing specifications are designed and submitted to the BLM. A BLM Petroleum Engineer independently verifies the casing program and the installation of the casing. Petroleum products and other chemicals used in the drilling and/or completion process could result in groundwater contamination through a variety of operational sources including but not limited to pipeline and well casing failure, well (gas and water) construction, and spills. Similarly, improper construction and management of reserve and evaporation pits could degrade ground water quality through leakage and leaching.

The potential for negative impacts to groundwater caused from completion activities such as hydraulic fracturing have not been confirmed, but based on its history of use, are not likely. A recent study completed on the Pinedale Anticline did not find a direct link to known detections of petroleum hydrocarbons to the hydraulic fracturing process (AMEC Environment & Infrastructure, Inc., 2013). Authorization of any proposed drilling projects would require full compliance with local, state, and federal directives, and stipulations that relate to surface and groundwater protection. The BLM would deny any APD that proposed drilling and/or a completion process deemed to not be protective of usable water zones as required by 43 C.F.R. §3162.5-2(d).

A high risk of fluid migration exists along the vertical pathways created by inadequately constructed wells and unplugged inactive wells. Brine or hydrocarbons can migrate to overlying or underlying aquifers in such wells. This problem is well known in the oil fields around Midland, Texas. Since the 1930s, most states have required that multiple barriers be included in well construction and abandonment to prevent migration of injected water, formation fluids, and produced fluids. These barriers include setting surface casing below all known aquifers and cementing the casing to the surface, and extending the casing from the surface to the production or injection interval and cementing the interval. Barriers that can be used to prevent fluid migration in abandoned wells include cement or mechanical plugs. These barriers should be installed at points where the casing has been cut, at the base of the lowermost aquifer, across the surface casing shoe, and at the surface. Individual states and the BLM have casing programs for oil and gas wells to limit cross contamination of aquifers.

Impacts of water use for oil and gas development and production depend on local water availability and competition for water from other users. Overall, impacts range from declining water levels at the regional or local scales and related decreases in base flow to streams (Nicot & Scanlon, 2012). Water supplied for hydraulic fracturing could come from surface or groundwater sources. If surface water is used, there could be a temporary decrease in the source's water levels depending upon the conditions at the time of withdrawal. The time it takes to return to baseline conditions is dependent on the amount of rainfall received and other competing uses of the resource.

Typically, when groundwater is used as a source of drilling/completion water, impacts to the aquifer would be minimal due to the size of the aquifers impacted and recharge potential across the entire aquifer. However, localized aquifer effects could be expected depending upon the rate of drawdown

and the density and/or intensity of the drilling activity. A cone of depression may occur in the immediate vicinity of the existing water well used to supply the drilling/completion water. With each rain event, the aquifer is expected to recharge to some degree, but it is unknown if or when it would recharge to baseline conditions after pumping ceases which is dependent upon surface conditions (whether impervious surface or not). The time it takes depends greatly on rainfall events, surface soil materials, drought conditions, and frequency of pumping that has already occurred and will continue to occur into the future.

The amount of water actually used for drilling/completion activities is highly dependent on a number of factors including:

- length of well bore,
- closed-loop or reserve pit drilling system,
- type of mud,
- whether hydraulic fracturing would be used during stimulation,
- whether recycled water would be used,
- dust abatement needs, and
- type and extent of construction, to name a few.

The impacts of water use on water quality and quantity would be analyzed in more detail during the APD review.

Any proposed drilling/completion activities would have to be in compliance with Onshore Order #2, 43 C.F.R. §3160 regulations, and not result in a violation of a federal and/or state law. If these conditions were not met, the proposal would be denied. As such, no significant impacts to groundwater from the proposed action are expected.

4.14.2.1 Mitigation

The BLM recommends BMPs requiring fluid impermeable containment systems (i.e. liners, dikes, berms) be placed in, under and/or around any tank, pit, drilling cellar, ditches associated with the drilling process, or other equipment that use, or has the potential to, leak/spill hazardous and non-hazardous fluids, to prevent chemicals from penetrating the soil and impacting the aquifer or from moving off-site to a surface water source.

The BLM will closely analyze areas proposed for drilling in APDs during the onsite inspection, since regional wetland inventories often do not capture small wetlands. EPA requires that Storm Water Pollution Prevention Plans and SPCCPs be in place to prevent any spill from reaching surface water due to rain events or accidental release of fluids related to production operations.

5 PERSONS, GROUPS, AND AGENCIES CONSULTED

Consultation and Coordination

5.1.1 List of Persons, Agencies and Organizations Consulted

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
U.S. Department of Agriculture, Forest Service, Huron-Manistee National Forests	Lease stipulations and restricted areas in Huron-Manistee National Forests	See Appendix C - Stipulations.
Brian D. Conway, State Historic Preservation Officer	Antiquities Act, Section 106 of the National Historic Preservation Act, 36 CFR 800 (as amended)	Letter to the BLM dated March 11, 2015. MISHPO concurred that “no historic properties are affected within the area of potential effects of this undertaking.”
Levi Carrick, Sr., Executive Council 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.
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.
Fred Kiogima, 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.	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian	No response to date.

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
Peshawbestown MI 49682-9275	Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	
Larry Romanelli, Tribal Ogema Little River Band of Ottawa Indians 375 River Street Manistee, MI 49660	36 CFR 800 (as amended), The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other by pads or other development statutes and executive orders.	No response to date.

5.1.2 List of Preparers

BLM Preparers

Name	Title	Responsible for the Following Section(s) of this Document
Derek Strohl	Natural Resources Specialist	Floodplains, Geology/Mineral Resources/Energy Resources, Invasive Species/Noxious Weeds, Recreation, Soils, Vegetation, Visual Resources, Water Resources, Wetland/Riparian Zones
Jarrod Kellogg	Archeologist	Cultural Resources, Paleontology, Native American Religious Concerns, Recreation
Kurt Wadzinski	Planning and Environmental Coordinator	Environmental Justice, Socioeconomics; Editor
Kyle Schumacher	Natural Resources Specialist	Air Quality, Climate Change, Hazardous Wastes, Water Quality, Wildlife, Bureau-Sensitive Species

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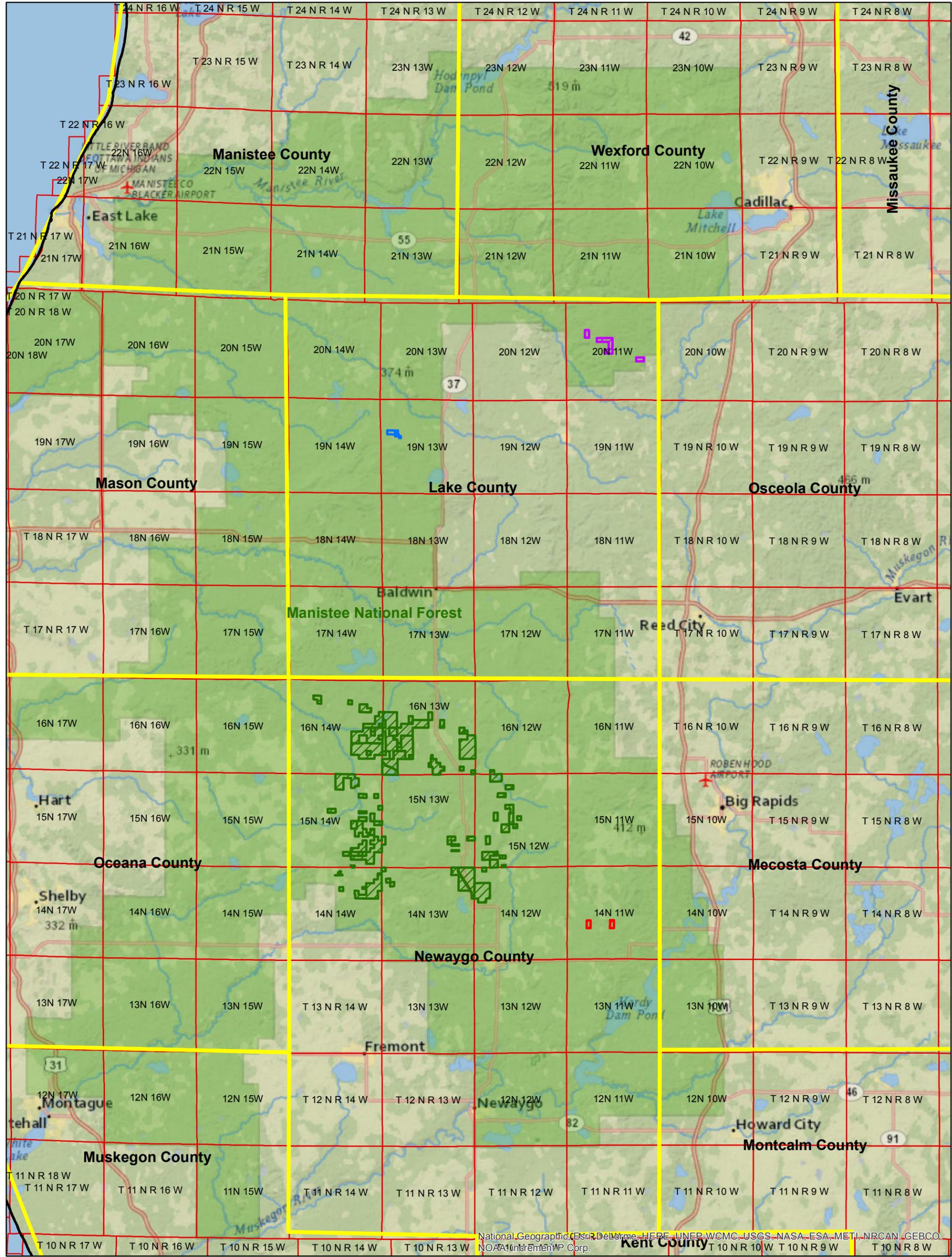
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7 APPENDIX A – Parcel Map



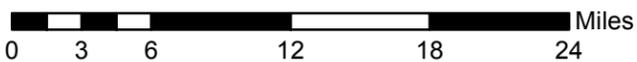
**Oil & Gas Expression of Interest
Michigan (EOI 72, 861, 892, 1605)
Lake and Newaygo Counties, Michigan**

- MI_EOI_72
- MI_EOI_861
- EOI_892
- MI_EOI_1605
- ES_Forest_Pro
- Michigan
- MI_County
- PLSSTownship



* No warranty is made by the Bureau of Land Management for use of map data for purposes otherwise intended by the BLM.

Map Produced By:
Department of Interior
Bureau of Land Management
Northeastern States Field Office
December 1, 2014



8 APPENDIX B – Lease Notices and Lease Stipulations

Lease notices are notifications of requirements that will apply to drilling. Their purpose is to draw attention to existing policies. Stipulations are restrictions on a lessee's right to access Federal minerals, such as prohibitions on using a portion of a parcel in order to protect a sensitive resource.

BLM Notice

A reclamation plan shall be submitted with the application for permit to drill and shall address control/eradication of noxious or invasive species originating from oil and gas operations and reclaiming nonessential areas disturbed during construction activities (to be accomplished during the first appropriate season after well completion). Nonessential areas include portions of the well locations not needed for production operations, the borrow ditch and outslope portions of new road ROWs, entire pipeline ROWs outside of road ROWs, and all roads and associated disturbed areas at nonproductive well locations.

USDA – FOREST SERVICE
STANDARD STIPULATIONS - LEASE
(FSM 2820)

Serial No.: EOI-██████
Lessee: _____
National Forest: Huron-Manistee
NF

The lessee is notified and agrees:

All work and any operations authorized under this permit shall be done according to an approved operating plan on file with the Forest Supervisor at 1755 S. Mitchell St. Cadillac, MI 49601. Plans generally require a minimum of 45 days for Forest Service review. Bureau of Land Management must also review and also approve.

Operating plan will contain information the Forest Officer determines reasonable for assessment of (1) public safety, (2) environmental damage, and (3) protection for surface resources. Content of such plans will vary according to location and type of activity and may contain:

1. Steps taken to provide public safety.
2. Location and extent of areas to be occupied during operations.
3. Operation methods including size and type of equipment.
4. Capacity, character, standards of construction and size of all structures and facilities to be built.
5. Location and size of areas where vegetation will be destroyed or soil lay bare.
6. Steps taken to prevent and control soil erosion.
7. Steps taken to prevent water pollution.
8. Character, amount, and time of use of explosives or fire, including safety precautions during their use.
9. Program proposed for rehabilitation and revegetation of disturbed land.

Copies of all permits obtained from State or Federal agencies pertaining to work might be required. Archeological studies, if required, will accompany plan.

The Forest Supervisor or his/her designated agent has authority to temporarily suspend or modify operations in whole or in part due to emergency forest conditions such as high fire danger or other unsafe situations.

The lessee must keep the Authorized Officer informed about progress of operations to the extent reasonably necessary for assuring public safety. This is especially important with geophysical inventory and testing activities because of their mobile nature. The Authorized Officer will alert the lessee to circumstances, which may affect safe and efficient conduct of work activities.

Terms of this lease are considered violated if not done according to these stipulations.

See Special Stipulations & Notifications

Lessee

R9-2800-6a (3/83)

Huron-Manistee National Forests

Lease Notices

Lease Notice #1) Operations under this lease will be consistent with the Standards and Guidelines found in the Huron-Manistee National Forests Land and Resource Management Plan and hereby incorporated into this lease in their entirety.

Lease Notice #2) Surface disturbance will be limited to that necessary for reasonable, safe and prudent extraction of the oil and gas. Measures will be implemented to minimize erosion and sedimentation. Road and stream crossings will be planned to eliminate stream crossings whenever practical.

Lease Notice #3) Processing of proposed surface use plans of operation on National Forest System lands includes site-specific analysis to determine effects to threatened, endangered, or sensitive species. This analysis may require surveys for certain plants and/or animals. Depending upon the species of concern, it may be necessary to survey through spring, summer, and fall. The extent of required surveys could delay permit issuance. Operators are encouraged to submit proposals as soon as possible to facilitate the scheduling of necessary survey work.

Lease Notice #4) All or portions of this lease parcel is located in Management Area 4.2, Roaded Natural Sandy Plains and Hills (Huron-Manistee National Forests Land and Resource Management Plan). A reclamation plan for all wells, pipelines, production facilities and access routes must be submitted to the Forest Line Officer in charge for approval. Disturbed areas will be restored after completion of drilling and/or production operations. Permanent vegetative cover will consist of a mixture of native warm season grasses. These will be scheduled for establishment just prior to the next growing season, generally late April, May or early June.

Lease Notice #5) Lands included in this lease parcel are being managed as a wildlife emphasis area or Karner blue butterfly management unit and occupancy is subject to more restrictive controls than routine areas.

Lease Notice #6) Portions of this lease parcel have had occurrences of certain threatened, endangered, or sensitive species or communities. At the time a drilling permit application or other request for surface use is filed, a site-specific review will be done to determine potential effects to these species. Depending upon the findings of the site-specific review, additional operating constraints, such as seasonal restrictions or re-location of the proposed wellsite, may be necessary to mitigate effects to threatened, endangered, or sensitive species or communities.

Lease Notice #7) Portions of this lease parcel contain known heritage resource sites. At the time a drilling permit application or other request for surface use is filed, a site-specific review will be done to determine potential effects to these sites. Depending upon the findings of the site-specific review, additional operating constraints, such as re-location of the proposed wellsite, may be necessary to mitigate effects to heritage resources.

Lease Notice #8) A portion of this lease parcel is in an area proposed for timber harvest activities. If oil and gas activities and timber harvesting are proposed concurrently, use conflicts between the oil and gas operator and timber purchaser would need to be resolved prior to issuance of a Federal drilling permit.

Lease Notice #9) Parcel is surrounded entirely by private land and access must be negotiated with adjacent landowners.

Lease Notice #10) This lease parcel is located in an area considered to be habitat for the northern long-eared bat (*Myotis septentrionalis*). At the time a drilling permit application or other request for surface use is filed, a site-specific review will be conducted and potential impacts to this species will be assessed. Depending upon the findings of the site-specific review, additional operating constraints, such as a seasonal restriction on tree felling, may be necessary to mitigate adverse effects.

Lease Stipulations

Stipulation #1) No surface occupancy is permitted on this parcel within 300 feet, measured at a perpendicular, from the normal high water mark of any river, stream, or lake. If site-specific examination determines that rivers, streams or lakes do not exist on the lease parcel, this stipulation may be waived.

Stipulation #2) No surface occupancy is permitted on this parcel due to the presence of wetlands. If site-specific examination determines that wetlands do not exist on the lease parcel, this stipulation may be waived.

Stipulation #3) All or portions of this lease parcel are located in an area managed as Old Growth. In accordance with the Huron-Manistee National Forests' Forest Plan, no surface occupancy is permitted on this parcel due to the lack of existing reasonable access. If an on-the-ground review of this tract indicates reasonable access does exist, this stipulation may be waived. Any subsequent surface occupancy would be limited to those existing roads and trails.

Stipulation #4) All or portions of this lease parcel are located in an area managed as Old Growth. Surface disturbing activities will take place outside of old growth where there are reasonable alternative locations. Due to the presence of existing reasonable access via roads/trails, surface occupancy is permitted, however, is limited to existing roads and trails.

Stipulation #5) All or portions of this lease parcel are located in an area managed as a semi-primitive nonmotorized area. Production facilities will be located outside the area when practical and needed pumps will be run by electric motors or equipped to minimize noise.

Stipulation #6) This parcel is located in an area managed as a semi-primitive nonmotorized area. The Huron-Manistee National Forests' Forest Plan limits surface location density in these areas. The maximum surface development density in this area is 1 surface location per 640 acres.

Stipulation #7) This parcel is located in an area managed as a semi-primitive nonmotorized area. Roads must use existing transportation corridors when compatible, feasible and practical.

Stipulation #8) This parcel is located within a Wild and Scenic River Corridor. No surface occupancy for oil and gas development will be permitted within this corridor.

Stipulation #9) All or portions of this lease parcel are located in potential Indiana bat habitat. Surface disturbing activities that involve tree removal will be prohibited between May 1 and August 31 if suitable Indiana bat habitat is found to be present. This stipulation may be waived if site-specific review of the proposal determines that suitable habitat is not present.

Stipulation #10) All or portions of this lease parcel are located within a 5-mile radius of Tippy Dam (Indiana bat hibernaculum). No surface occupancy will be permitted on all or portions of this lease for surface disturbing activities associated with site construction and/or oil and gas drilling between May 1 and October 20. This stipulation may be waived based on site-specific review of the proposal and identification of potential effects on the Indiana bat.

Stipulation #11) The North Country National Scenic Trail runs through all or portions of this lease parcel. No surface occupancy will be permitted for areas within 300 feet, measured at a perpendicular, from each side of the Trail. If site-specific examination determines that the North Country National Scenic Trail is not located on the lease parcel, this stipulation may be waived.

Stipulation #12) All or portions of this lease are located in an area of steep, fragile slopes. No surface occupancy is permitted on identified areas. This stipulation may be waived based on site-specific review of proposed location and soil types.

Stipulation #13) This parcel is located within the corridor of a Study Wild and Scenic River. No surface occupancy for oil and gas development will be permitted within this corridor.

Stipulation #14) All or portions of this lease are located near the River Road National Scenic Byway. No surface occupancy is permitted within 300 feet of the Byway.

Stipulation #15) All or portions of this lease are located in areas managed as Kirtland's warbler essential habitat. Surface location density restrictions as outlined below will apply in these areas:

Age of Essential Habitat	Maximum Development Density
0 to 25 years	1 surface location per 640 acres
26 to 40 years	1 surface location per 160 acres
Older than 40 years old	1 surface location per 640 acres

The priority for identifying surface locations are: 1) First priority will be stands (or inclusions of stands) that are not biologically appropriate for the development of breeding habitat for Kirtland's warbler, 2) Second priority will be stands within essential habitat that are greater

than 26 years old, and 3) Third priority will be stands within essential habitat that are 0 to 25 years old. Exceptions may be granted through consultation with the Forest Service and the U.S. Fish and Wildlife Service.

No drilling, exploration, construction or maintenance involving the use of heavy equipment shall take place within one-half mile of or create noise greater than 85 decibels in occupied habitat, between May 1 and September 30. In occupied habitat, proven wells can be operated between October 1 and April 30, but between May 1 and September 30 only if they are flowing or operated by bottom-hole pump and 1) the product is transported by buried pipeline; 2) collection and storage facilities are located off essential habitat where reasonable; 3) noise from production operations will be less than 85 decibels at 100 feet, and 4) access is limited to routine monitoring of the well.

Stipulation #16) All or portions of this lease are located in an area designated as a Research Natural Area. No surface occupancy for oil and gas development is permitted in areas so designated.

Stipulation #17) All or portions of this lease are located in an area designated as a Candidate Research Natural Area. No surface occupancy for oil and gas development is permitted in areas so designated.

Stipulation #18) A portion of this lease tract includes a Forest administrative site. No surface occupancy for oil and gas development will be permitted in this area.

Stipulation #19) A portion of this lease tract includes a Forest developed recreation site. No surface occupancy for oil and gas development will be permitted in this area.

Stipulation #20) A portion of this lease tract is involved in the North American Long-Term Soil Productivity Study. Until completion of this study, no surface occupancy will be permitted on those portions of the lease tract that are included in this study.

Stipulation #21) This parcel contains lands designated as occupied Karner blue butterfly habitat. No surface occupancy for oil and gas development is permitted in areas so designated.

Stipulation #22) This parcel is located in an area managed as a semi-primitive motorized area. The Huron-Manistee National Forests' Forest Plan limits surface location density in these areas. The maximum surface development density in this area is 1 surface location per 160 acres. Production facilities will be located outside the area when practical and needed pumps will be run by electric motors or equipped to minimize noise.

Stipulation #23) This parcel is located in an area managed as a Special Area or contains sensitive communities. No surface occupancy for oil and gas development is permitted in areas so designated.

Stipulation #24) No surface occupancy will be permitted for areas within 300 feet, measured at a perpendicular, from each side of existing and/or planned Visual Sensitivity Level 1 trails within the lease parcel. In areas with a high concentration of trails, this may preclude occupancy on the entire parcel.

Appendix II

EOI - Parcel Specific Lease Notices and Lease Stipulations

EOI 72

Manistee National Forest

	Acres
Total Acres Available	160.00
Acquired Lands 125008 218	160.00

ACQUIRED – Manistee NF

FS Parcel #1
EOI-72
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 14 N., R. 11 W., Michigan Meridian
Sec. 20, E2SW
Sec. 21, E2SE

160.00 Acres

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3 apply to all lands

Lease Stipulation #2 (i.e., No Surface Occupancy) applies to
Sec. 20, Pt. W2W2E2SW

EOI 861

Manistee National Forest

	Acres
Total Acres Available	15805.95
Public Domain Lands 145003 218	74.61
Acquired Lands 125008 218	15731.34

ACQUIRED – Manistee NF

FS Parcel #1 EOI-861 (1) ES-000- MIES	Michigan, Newaygo County, Manistee NF T. 16 N., R. 13 W., Michigan Meridian Sec. 24, SESWNENW, S2SEENENW, NWNW, N2S2NW, S2SW, SE, W2NWNENW, NWSWNENW Sec. 25, All Sec. 36, NWSW, SESE 1059.92 Acres Subject to: Forest Service Standard Lease Stipulations Lease Notices #1, #2, #3, and #10 apply to all lands Lease Notice #5 applies to Sec. 25, Pt. E2NE Lease Stipulation #2 (i.e., No Surface Occupancy) applies to Sec. 24, SESWNENW, S2SEENENW, NESENEW Lease Stipulation #21 (i.e., No Surface Occupancy) applies to Sec. 36, SESE
FS Parcel #2 EOI-861 (2) ES-000- MIES	Michigan, Newaygo County, Manistee NF T. 16 N., R. 13 W., Michigan Meridian Sec. 27, Pt. E2SWSW Sec. 34, SWNE, NENW, NESW, N2SE, Pt. S2NW exc. 2.98 ac. in PMRR, Pt. NWNW lying E of E line of PMRR R/W, SESW, SWSE 392.65 Acres Subject to: Forest Service Standard Lease Stipulations Lease Notices #1, #2, #3, and #10 apply to all lands Lease Stipulation #1 or #2 (i.e., No Surface Occupancy) applies to entire parcel except Sec. 27, S2 of Pt. E2SWSW; Sec. 34, E2NESE, SWSE, NWNESE, Pt. SWNW and Pt. NWNW lying east of PMRR

FS Parcel #3
EOI-861 (3)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 16 N., R. 13 W., Michigan Meridian
Sec. 15, E2SE, W2NW
Sec. 16, S2
Sec. 17, SESW, S2SE
Sec. 19, NESE
Sec. 20, N2, W2SW

962.32 Acres

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3, and #10 apply to all lands

Lease Notice #5 applies to Sec. 16

Lease Notice #6 applies to Sec. 15

Lease Stipulations #1, #2, #3, #11, or #19 (i.e., No Surface
Occupancy) applies to Sec. 16, Pt. SE south of Roosevelt Dr.;

Sec. 17, all; Sec. 19, all; Sec. 20, all

Lease Stipulation #4 (i.e., Occupancy only along existing roads)
applies to Sec. 16, Pt. SW south of Roosevelt Dr.

FS Parcel #4
EOI-861 (4)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 16 N., R. 13 W., Michigan Meridian
Sec. 29, NWNW, SW, SESE
Sec. 30, E2SE, NWSW
Sec. 31, Pt. of Entire Section, exc. a strip 66' wide containing
9.52 ac. running across NWNW, S2NW, NESW, S2SE & SESE

884.68 Acres

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3, and #10 apply to all lands

Lease Notice #5 applies to Sec. 31, Pt. S2NW south of 13 Mile
Rd.

Lease Notice #6 applies to Sec. 31

Lease Stipulations #1, #2, #3, #11, or #19 (i.e., No Surface
Occupancy) apply to Sec. 29, all; Sec. 30, SESE, E2NESE,
NWSW; Sec. 31, S2, entire N2 except Pt. S2NW S. of 13 Mile
Rd.

Lease Stipulation #4 applies to Sec. 30, W2NESE

Lease Stipulation #22 applies to Sec. 30, Pt. W2NESE, east of
FSR 5311

Lease Stipulations #5, #6, and #7 apply to Sec. 30, Pt.
W2NESE west of FSR 5311

FS Parcel #5
EOI-861 (5)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 16 N., R. 14 W., Michigan Meridian
Sec. 25, NW, NE, NESW, S2SW, N2SE
Sec. 26, E2, NW, N2SW

1080.00 Acres

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3, and #10 apply to all lands

Lease Stipulations #1, #2, #3 or #11 (i.e., No Surface

Occupancy) apply to Sec. 25, all lands; Sec. 26, E2

Lease Stipulation #4 applies to Sec. 26, NESW, S2NWSW

FS Parcel #6
EOI-861 (6)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 16 N., R. 14 W., Michigan Meridian
Sec. 23, E2NE, SWNE, S2NW, SW
Sec. 24, NE, W2NW, SW, W2SE, SESE

880.00 Acres

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3, and #10 apply to all lands

Lease Stipulations #1, #2, or #3 (i.e., No Surface Occupancy)

apply to Sec. 23, E2NE, SWNE; Sec. 24, all lands

FS Parcel #7
EOI-861 (7)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 16 N., R. 14 W., Michigan Meridian
Sec. 11, SE
Sec. 12, SWSW
Sec. 13, NENE, S2NE, S2SW, SWSE, N2SE
Sec. 14, SESE

560.00 Acres

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3, and #10 apply to all lands

Lease Notices #5 and #6 apply to Sec. 11 & 12, all lands

Lease Stipulations #1, #2 or #3 (i.e., No Surface Occupancy)

apply to Sec. 11, Pt. NESE, Pt. SESE; Sec. 12, S2SWSW; Sec.

13, all lands; Sec. 14, SESE

FS Parcel #8
EOI-861 (8)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 16 N., R. 14 W., Michigan Meridian
Sec. 8, N2NE, SENE

122.81 Acres

Subject to:

Lease Notices #1, #2, #3, #4, #5, and #10 apply to all lands
Forest Service Standard Lease Stipulations

FS Parcel #9
EOI-861 (9)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 15 N., R. 14 W., Michigan Meridian
Sec. 2, NWNW, S2NW, N2SW, Pt. N2S2SW lying W of So.
Branch of Pere Marquette River
Sec. 3, N2NE, W2
Sec. 11, S2NE
Sec. 12, SWNE

737.11 Acres

Subject to:

Forest Service Standard Lease Stipulations
Lease Stipulations #1, #2, #3, or #12 (i.e., No Surface
Occupancy) apply to all lands

FS Parcel #10
EOI-861 (10)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 15 N., R. 14 W., Michigan Meridian
Sec. 13, NENE, E2SW
Sec. 14, S2S2NE, S2SE
Sec. 16, S2NE

320.00 Acres

Subject to:

Forest Service Standard Lease Stipulations
Lease Notices #1, #2, #3, #5, and #10 apply to all lands
Lease Notice #6 applies to Sec. 14
Lease Notice #9 applies to Sec. 13, NESW
Lease Stipulations #1, #2 #3, or #12 (i.e., No Surface
Occupancy) apply to Sec. 13, SESW, NENE; Sec. 14, S2SE,
SWSWNE; Sec. 16, S2NE

FS Parcel #11
EOI-861 (11)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 15 N., R. 14 W., Michigan Meridian
Sec. 23, W2NE, E2NENW, E2SENW, E2SW, N2SE, SESE
Sec. 24, W2SWSW, Pt. E2SW (all lying north of centerline of
county road), N2NE

484.85 Acres

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3, #5, and #10 apply to all lands

Lease Stipulations #1, #2, or #3 (i.e., No Surface Occupancy)
apply to all lands except Sec. 24, Pt. E2SW exc. Pt.

W2N2E2SW

FS Parcel #12
EOI-861 (12)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 15 N., R. 13 W., Michigan Meridian
Sec. 30, W2NW

T. 15 N., R. 14 W., Michigan Meridian
Sec. 25, NWNE, S2NE, SENW, SESW, SE
Sec. 26, SENE, NESE, S2SE, S2SW, NWSE
Sec. 34, N2NE
Sec. 35, S2NW, S2NE, S2 of Lot 1
Sec. 36, NW, N2SW

1209.91 Acres

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3, and #10 apply to all lands

Lease Notice #5 applies to all lands in Sec. 25, Sec. 26, Sec. 35,
and Sec. 36

Lease Notice #6 applies to Sec. 26, Sec. 35

Lease Stipulation #1 or #2 (i.e., No Surface Occupancy) apply
to all lands except Sec. 26, S2S2SW; Sec. 35, S2NW, Sec. 34

FS Parcel #13
EOI-861 (13)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 14 N., R. 13 W., Michigan Meridian
Sec. 6, SESW
Sec. 7, NWNE

T. 14 N., R. 14 W., Michigan Meridian
Sec. 1, S2SENE, NESE, S2SE
Sec. 3, Part Lot 5 exc. N 79 rods of W 60 rods
Sec. 10, SENW
Sec. 11, Pt. of N2SENE exc. 1 ac., S2SE, SESW exc. 5 ac. off
W side 80 rods N&S and 10 rods wide, NESW
Sec. 12, SENW, W2NW, S2SW, NE, NENW, N2SW, W2SE

1016.81 Acres

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3, #5, and #10 apply to all lands

Lease Notice #4 applies to T. 14 N., R. 13 W., Sec. 7, NWNE

Lease Notice #6 applies to T. 14 N., R. 13 W., Sec. 6

Lease Stipulations #1, #2, or #3 (i.e., No Surface Occupancy)

apply to T. 14 N., R. 13 W., Sec. 6, N2SESW; Sec. 7, Pt.

N2NWNE; T. 14 N., R. 14 W., Sec. 1, S2SENE, W2NESE,

NENESE, SWSE, E2SESE; Sec. 3, all lands; Sec. 11, all lands

except Pt. E2N2SENE exc. 1 ac.; Sec. 12, W2, W2W2SE, All

NE except W2SENE, E2SWNE

FS Parcel #14
EOI-861 (14)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 14 N., R. 12 W., Michigan Meridian
Sec. 6, NWNE
Sec. 7, All
Sec. 18, NWNE, NENW

T. 14 N., R. 13 W., Michigan Meridian
Sec. 1, Part of entire section exc. 100' wide Pere Marquette RR
R/W containing 9.4 ac.
Sec. 2, Part of NE exc. 4.6875 ac. in NW corner of SWNE.
Also exc. 100' wide Pere Marquette RR R/W containing 4.27
ac.
Sec. 12, NE, E4NW exc. Pere Marquette RR R/W, Pt. SE lying
E of PMRR, W3/4NW

1891.16 Acres

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3, and #10 apply to all lands

Lease Notices #4 and #5 apply to T. 14 N., R. 13 W., Sec. 1, Pt.
W2, Sec. 2, all lands

Lease Notice #7 applies to T. 14 N., R. 13 W., Sec. 1, Pt. W2

Lease Stipulations #1 or #2 (i.e., No Surface Occupancy) apply
to T. 14 N., R. 12 W., Sec. 7, Pt. W2SE, Pt. SESE, Pt. SENW;

T. 14 N., R. 13 W., Sec. 1, NW, W2NE

Lease Stipulation #23 (i.e., No Surface Occupancy) applies to
T. 14 N., R. 13 W., Sec. 2, Pt. NE (Loda Lake Wildflower
Sanctuary)

FS Parcel #15
EOI-861 (15)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 15 N., R. 12 W., Michigan Meridian
Sec. 30, E2NE
Sec. 31, NE
Sec. 32, N2NW exc. NWNENW, SW, S2SESE

T. 15 N., R. 13 W., Michigan Meridian
Sec. 25, N2NE
Sec. 26, E2NW, NWNE, N 30 ac. SE, N2S2S2SE

739.73 Acres

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3, #5, and #10 apply to all lands

Lease Notice #6 applies to T. 15 N., R. 13 W., Sec. 25

Lease Stipulation #2 (i.e., No Surface Occupancy) applies to T.
15 N., R. 12 W., Sec. 30, E2NE, Sec. 32, S2SESE

Lease Stipulation #17 (i.e., No Surface Occupancy) applies to
T. 15 N., R. 12 W., Sec. 31, NE (Loon Lake Candidate
Research Natural Area)

Lease Stipulation #21 (i.e., No Surface Occupancy) applies to
T. 15 N., R. 13 W., Sec. 26, all lands (occupied Karner blue
butterfly habitat)

FS Parcel #16
EOI-861 (16)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 15 N., R. 12 W., Michigan Meridian
Sec. 4, S2SW
Sec. 8, S2NE
Sec. 16, N2NW, E3/4SENE, E2SW, SESE
Sec. 17, E2SW
Sec. 20, SENE, NESE
Sec. 21, NWSW, SWNW, NENW, SWNE

710.00 Acres

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3, #5, and #10 apply to all lands

Lease Notice #6 applies to Sec. 21

Lease Stipulations #1, #2, or #3 (i.e., No Surface Occupancy)
apply to Sec. 4, S2SW, Sec. 8, S2NE, Sec. 16, Pt. NWNW

Lease Stipulation #21 (i.e., No Surface Occupancy) applies to
Sec. 8, W2S2NE (occupied Karner blue butterfly habitat)

PUBLIC DOMAIN – Manistee NF

FS Parcel #17
EOI-861 (17)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 16 N., R. 14 W., Michigan Meridian
Sec. 10, SENE

35.31 Acres

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3, #4, #5, #6, and #10 apply to all lands

FS Parcel #18
EOI-861 (18)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 14 N., R. 13 W., Michigan Meridian
Sec. 6, NWNW

39.30 Acres

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3, #5, #6, and #10 apply to all lands

Lease Stipulations #1, #2, or #3 (i.e., No Surface Occupancy)

apply to Sec. 6, NWNWNW, Pt. SWNWNW, and Pt.

NENWNW

ACQUIRED PARTIAL MINERAL INTEREST – Manistee NF

FS Parcel #19
EOI-861 (19)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 16 N., R. 13 W., Michigan Meridian
Sec. 18, N2, E2SW, SE
Sec. 19, NWNW, E2NW, E2SW, W2SE, SESE
Sec. 30, E2NE, E2NW, W2E2

1157.30 Acres

Note: 75% Federal mineral interest.

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3, #6, and #10 apply to Sec. 30, Pt. E2NE

Lease Stipulations #1, #2, #3, or #11 (i.e., No Surface Occupancy) apply to all lands except Sec. 30, Pt. E2NE

Lease Stipulations #4, #5, #6, #7, and/or #22 (i.e., Occupancy only along existing roads, etc. at a specified surface development density) apply to Sec. 30, Pt. E2NE

FS Parcel #20
EOI-861 (20)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 16 N., R. 13 W., Michigan Meridian
Sec. 17, SENE, NESE
Sec. 20, SE, E2SW
Sec. 29, NENW, S2NW, NE, W2SE, NESE

720.00 Acres

Note: 75% Federal mineral interest.

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3, and #10 apply to all lands

Lease Notice #6 applies to Sec. 17 and 20

Lease Stipulation #1, #2 or #3 (i.e., No Surface Occupancy) apply to Sec. 17, SENE, Sec. 20, NESE, SESW, Pt. NWSE, Sec. 29, Pt. NENE, Pt. W2SE, Pt. NESENE, Pt. SWNE, Pt. S2NW, Pt. W2NENW, Pt. NESE

Lease Stipulation #4 and #22 (i.e., Occupancy only along existing roads, etc. at a specified surface development density) apply to Sec. 17, NESE, Sec. 20, NESW, Pt. NWSE, Pt. S2SE

Lease Stipulation #22 (i.e., surface well density of 1 per 160 acres) applies to Sec. 29, E2NENW, NWNE, Pt. SWNE, Pt. SENE, Pt. NESE

FS Parcel #21
EOI-861 (21)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 16 N., R. 13 W., Michigan Meridian
Sec. 19, NE

158.09 Acres

Note: 91.67% Federal mineral interest.

Subject to:

Lease Stipulations #1, #2, #3, or #12 (i.e., No Surface
Occupancy) apply to all lands

FS Parcel #22
EOI-861 (22)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 16 N., R. 14 W., Michigan Meridian
Sec. 13, SESE
Sec. 24, NENW, NESE
Sec. 25, NWSW

160.00 Acres

Note: 87.5% Federal mineral interest.

Subject to:

Lease Stipulations #1, #2, or #3 (i.e., No Surface Occupancy)
apply to all lands

FS Parcel #23
EOI-861 (23)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 15 N., R. 14 W., Michigan Meridian
Sec. 23, W3/4NW

120.00 Acres

Note: 50% Federal mineral interest.

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3, #5, and #10

Lease Stipulation #2 (i.e., No Surface Occupancy) applies to
entire tract except Pt. S2W3/4NW

FS Parcel #24
EOI-861 (24)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 15 N., R. 14 W., Michigan Meridian
Sec. 35, NWNE

40.00 Acres

Note: 1/8 Federal mineral interest.

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3, #5, #6, and #10 apply to entire parcel

FS Parcel #25
EOI-861 (25)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 15 N., R. 12 W., Michigan Meridian
Sec. 32, E3/4N3/4S2NE

45.00 Acres

Note: 1/3 Federal mineral interest.

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3, #5, and #10

Lease Stipulation #2 (i.e., No Surface Occupancy) applies to Pt.
E3/4N3/4S2NE

FS Parcel #26
EOI-861 (26)
ES-000-
MIES

Michigan, Newaygo County, Manistee NF
T. 15 N., R. 12 W., Michigan Meridian
Sec. 5, Pt. N2 lying W of Little S. Branch PM River exc. parcel
beg. at SE corner of SWNE, thence W 10 rods; thence N to said
river; then SE'ly along river to beg., Pt. N2 lying E of Little S.
Branch PM River exc. S 330' of SWNE lying E of said river,
also exc. SENE and NENE

T. 16 N., R. 12 W., Michigan Meridian
Sec. 32, SWSW

279.00 Acres

Note: 50% Federal mineral interest.

Subject to:

Lease Stipulations #1, #2, #3, or #21 (i.e., No Surface
Occupancy) apply to entire parcel

EOI 892

EOI-626/892(10)

Michigan, Lake County, Manistee NF

T20N, R11W, Michigan Meridian

Sec. 8, E2SW

Sec. 16, N2NW, N2NE, SENE, E2SE, SWSE

Sec. 23, S2NE

480.00 Acres

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3

Lease Notice #5 applies to Sec. 23, S2NE

Lease Notice #7 applies to Sec. 23

Lease Stipulation #1 (i.e., no surface occupancy) applies to Sec. 16, NENE, NESE, SWSE

EOI 1605

Manistee National Forest

	Acres
Total Acres Available	110.64
Acquired Lands 125008 218	110.64

ACQUIRED – Manistee NF

FS Parcel #1
EOI-1605
ES-000-
MIES

Michigan, Lake County, Manistee NF
T. 19 N., R. 13 W., Michigan Meridian
Sec. 17, W2NENWNW, Pt. N2SWNW N. of RR, Pt.
N2SWNW S. of RR exc. strip 2 rods wide on W boundary and
strip 30' wide on E boundary, SWSEW
Sec. 18, N2NE

110.64 Acres

Subject to:

Forest Service Standard Lease Stipulations

Lease Notices #1, #2, #3, #4, #5 and #6

9 APPENDIX C – ESA Section 7 Consultation Letter from U.S. Fish and Wildlife Service



United States Department of the Interior

FISH AND WILDLIFE SERVICE
East Lansing Field Office (ES)
2651 Coolidge Road, Suite 101
East Lansing, Michigan 48823-6316

IN REPLY REFER TO:

March 2, 2015

Mr. Kyle A. Schumacher
Bureau of Land Management
Northeastern States Field Office
626 E. Wisconsin Avenue
Suite 200
Milwaukee, Wisconsin 53202-4617

RE: Endangered Species Act Section 7 Consultation for the Expression of Interests to Lease Land for Oil and Gas Development within the Huron Manistee National Forests (HMNF), Newaygo and Lake Counties, Michigan

Dear Mr. Schumacher:

Thank you for your biological assessment (BA) of January 5, 2015, including the amendment, dated February 11, 2015, and corresponding emails and conference call, for informal consultation pursuant to section 7 of the Endangered Species Act of 1973, as amended (Act) for the proposed oil and gas lease project. The Bureau of Land Management (BLM) has received four expressions of interests (EOI) to lease 16,700 acres for oil and gas development within the boundary of the Manistee Ranger District of the HMNF. The proposed actions include processing of leases by the BLM and processing of each application for permits to drill by both the BLM and the U.S. Forest Service (USFS).

Your BA addresses potential effects from the proposed project on the endangered Karner blue butterfly (*Lycaeides melissa samuelis*), proposed as endangered northern long-eared bat (*Myotis septentrionalis*; NLEB), and candidate eastern massasauga rattlesnake (*Sistrurus catenatus*). You have determined that this project may affect, but is not likely to adversely affect these species. According to the amended BA, the BLM has coordinated with the USFS to apply lease notices and stipulations, including best management practices (BMPs), for each application to drill to avoid adversely affecting Karner blue butterfly and massasauga. The USFS established the notices and stipulations and BMPs in their 2006 HMNF Land and Resource Management Plan (LMRP). Coordination between the agencies also occurred to design BMPs to avoid adverse effects to NLEB.

Although 16,700 acres are proposed for oil and gas leasing, the BLM anticipates only nine wells may be drilled, resulting in approximately 36 acres of surface disturbance (approximately 0.2% of the project area may potentially be impacted by surface disturbance). In addition, if any wells

are drilled and placed into production, the well pad and any associated access route or utility corridor would be placed into a state of interim reclamation. Further, any subsequent Application for Permit to Drill that results from these leases, the USFS would apply more site-specific conditions of approval, which could include moving the proposed well pad or changes to operations including time/season of operations to better mitigate each project within the lease.

The NLEB is currently proposed for listing under the Act. Critical habitat has not been proposed at this time. Pursuant to section 7(a)(4) of the Act, Federal action agencies must confer with the U.S. Fish and Wildlife Service (Service) if their proposed action is likely to jeopardize the continued existence of a species proposed for listing [50 CFR 402.10(a)]. Action agencies may also voluntarily confer with the Service if the proposed action may affect a proposed species. Species proposed for listing are not afforded protections under the Act; however as soon as a listing becomes effective, the prohibitions against “take” and jeopardizing the species’ continued existence apply, regardless of an action’s stage of completion. The final listing decision for the NLEB is expected in April 2015.

Karner blue butterfly

You determined that this project is *not likely to adversely affect* Karner blue butterfly. We concur with this determination for the following reasons:

- BLM will utilize notices and stipulations and BMPs, as well as management guidelines established in the Karner blue butterfly recovery plan.
- According to Stipulation #21 in the BA, BLM will not permit surface occupancy for oil and gas development in areas designated for this species.
- The BA also states that prescribed or controlled fire is not a proposed action related to this project.

Based on this information, we expect any potential effects from this project on Karner blue butterfly to be discountable or insignificant.

Northern Long-eared Bat

You determined that this project is *not likely to adversely affect* NLEB. We concur with this determination for the following reasons:

- Only a small proportion of the planning area is anticipated to have any surface disturbance (i.e., 36 acres out of the 16,700 acres leased)
- Trees larger than 5 inches dbh will not be cut during the period of April 1 through September 30 while the bats are present on the landscape.
- BLM will utilize BMPs and maintain continued coordination with the USFS to avoid adverse effects.

Based on this information, we expect any potential effects from this project on northern long-eared bat to be insignificant. Should the NLEB become listed and construction of the proposed project occur after the final listing decision, this concurrence can be used to complete section 7 consultation for this species, provided the project scope and anticipated impacts have not changed and all measures to avoid take of the NLEB were incorporated into the project.

Eastern massasauga rattlesnake

The eastern massasauga rattlesnake occurs in a variety of wetland systems with adjacent upland habitat. Populations in southern Michigan typically use shallow, sedge- or grass-dominated wetlands, while those in northern Michigan prefer lowland coniferous forests, such as cedar swamps. This species requires open, sunny areas with scattered shade to assist with thermoregulation, but avoids heavily wooded or closed-canopy areas.

Eastern massasaugas hibernate singly or in small groups in wetlands, frequently in crayfish burrows, close to the groundwater below the frost line, and individuals tend to return to the same hibernaculum each year. The snakes continue to occupy wetlands in the spring and fall, but some move to drier sites in summer. Females give birth in August and early September and often utilize upland habitats for bearing their young. The home range size for individual snakes varies widely and is dependent on habitat quality.

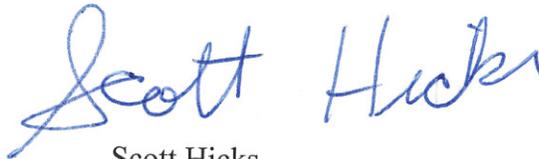
Although the Act does not extend protection to candidate species, BLM has considered this species during project planning.

Conclusion

This precludes the need for further action on this project as required by section 7 of the Act. If the project is modified or new information about the project becomes available that indicates listed species or critical habitat may be affected in a manner or to an extent not previously considered, you should reinitiate consultation with this office.

We appreciate the opportunity to cooperate with the BLM in conserving endangered species. If you have any questions regarding these comments, please contact Tameka Dandridge of this office, at 517-351-8315 or tameka_dandridge@fws.gov.

Sincerely,



Scott Hicks
Field Supervisor

cc: Dan Kennedy, MDNR, Wildlife Division, Lansing, MI