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**FINDING OF NO SIGNIFICANT IMPACT** BUREAU OF LAND MANAGEMENT  
**Environmental Assessment for Expression of Interest #020** ES-NSFO  
**DOI-BLM-ES-030-2012-0006-EA**

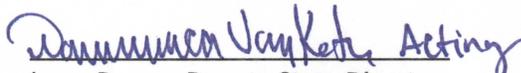
**Finding of No Significant Impact**

The proposed action is for the BLM to offer the Federally-owned oil and gas resources in Higgins Township, Roscommon County, Michigan (T. 23 N., R. 2 W., Section 15, SE ¼; and Section 22, N½; N½SW¼, containing 560 acres) on the next available Eastern States competitive oil and gas lease sale.

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

Based on the analysis of potential environmental impacts contained in the Expression of Interest #020 EA, and considering the significance criteria in 40 CFR 1508.27, I have determined that the proposed action will not have significant impacts on the human environment. Therefore, preparation of an environmental impact statement is not required prior to approving and implementing the proposed action.

Approving Official:

  
~~Larry Denny~~, Deputy State Director  
Division of Natural Resources  
BLM Eastern States Office

  
Date

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

Environmental Assessment  
*DOI-BLM-ES-0030-2012-0006-EA*  
*Expression of Interest #020*

It is my decision to allow the Proposed Action to be implemented as described in the EA of Expression of Interest #020, T. 23 N., R. 2 W., Section 15, SE ¼; and Section 22, N½; N½SW¼, Roscommon County, Michigan, for a total of 560 acres. The EA and FONSI analyzed the selected alternative and found no significant impacts. Implementation of this decision will grant exclusive rights to the lessee to develop Federally-owned oil and gas resources, but does not authorize any drilling and associated activities or obligate the company to drill a well on the lease.

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

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

**Terms / Conditions / Stipulations:** Lease stipulations are contained in Appendix B of the Expression of Interest #020 EA. Additionally, any purchaser of a Federal oil and gas lease is required to comply with all applicable Federal, State, and local laws and regulations including obtaining all necessary permits required prior to the commencement of project activities.

### **PLAN CONFORMANCE AND CONSISTENCY:**

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

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

**Rationale for Decision:** The proposed action alternative was selected because the policy of the BLM is to promote oil and gas development if it meets the guidelines and regulations set forth by the National Environmental Policy Act of 1969 and other subsequent laws and policies passed by the U.S. Congress and to make Federal minerals available for economically feasible development in an environmentally sound manner.

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

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

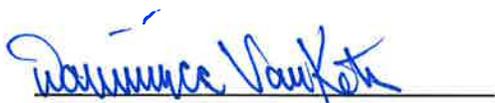
The appeal and any petition for stay must be filed at the office of the authorized officer: Authorized Officer, BLM Eastern States Office, 7450 Boston Blvd., Springfield, VA 22153. **At this time, the BLM will not accept protests or appeals sent by electronic mail.** Within 15 days of filing the appeal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

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

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

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

Authorized Officer:



Dominica VanKoten, Acting Deputy State Director  
Division of Natural Resources  
BLM Eastern States Office

July 1, 2013  
Date

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

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## Environmental Assessment

NEPA #: DOI-BLM-ES-030-2012-0006-EA

### Expression of Interest #020

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**Date:** September 2012

**Type of Action:** Oil and Gas

**Serial Number:** MIES-50996

**Location:** Michigan Meridian, Higgins Township, Roscommon County, Michigan  
T. 23 N., R. 2 W., Sec. 15, SE¼; Sec. 22, N½; N½SW¼.

**Project Acreage:** 560 acres

**Proponent Address:** Richard B. Patterson  
P.O. Box 610  
Haslett, Michigan 48840

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Bureau of Land Management  
Northeastern States Field Office  
626 E. Wisconsin Ave., Suite 200  
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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.

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## CHAPTER 1 – PURPOSE OF AND NEED FOR ACTION

### Purpose of the Proposed Action

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

### Need for the Proposed Action

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

On March 14, 2002, the BLM Northeastern States Field Office (NSFO) received a request from the BLM Eastern States Office (ESO) for a National Environmental Policy Act (NEPA) analysis report on 560 acres of land with the following legal description: Michigan Meridian, Higgins Township, Roscommon County, Michigan, T. 23 N., R. 2 W., sec. 15, SE¼, sec. 22, N½; N½SW¼. This nomination is located on State-owned land.

### Management Objectives of the Action

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

### Conformance with BLM Land Use Plan(s)

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

### Relationship to Statutes, Regulations and Other Plans

This EA was prepared in accordance with the NEPA of 1969 and in compliance with all applicable laws and regulations, including Council on Environmental Quality (CEQ) regulations (40 C.F.R., Parts 1500-1508), U.S. Department of the Interior (DOI) requirements (Department Manual 516, Environmental Quality), the National Historic Preservation Act, the American Indian Religious Freedom Act, the Native American Graves Protection and Repatriation Act, Executive Order 13007 (Indian Sacred Sites),

guidelines listed in BLM's NEPA Handbook, H-1790-1 , and/or other Federal statutes and executive orders.

Additionally, any purchaser of a Federal oil and gas lease is required to comply with all applicable Federal, State, and local laws and regulations including obtaining all necessary permits required prior to the commencement of project activities.

## Decision to Be Made

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

## Scoping and Issues

### Rationale for conducting external scoping

The BLM elected to conduct limited external scoping due to the presence of recreational trails through the EOI. To this end, the BLM and the Michigan Department of Natural Resources (MDNR) have signed a Memorandum of Understanding (MOU) in 2011 to facilitate cooperative NEPA analysis of oil and gas leasing on State of Michigan lands. The BLM has limited knowledge of the recreational use, forestry, and other activities permitted in the state forest. The managers of the Roscommon State Forest Unit have a thorough understanding of the forest's conditions, uses, and management objectives and can provide valuable information on those issues.

### Process for conducting external scoping

External scoping was conducted via e-mail correspondence and a teleconference call with MDNR staff of the Roscommon State Forest Unit. The names of the participants are listed in **Chapter 5 - Persons, Organizations, and Agencies Consulted**.

### Issues identified through internal and external scoping

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

1. Hydraulic fracturing requires large amounts of water, and delivering large amounts of water to well pads may create large amounts of dust and other traffic-related impacts to natural resources.
2. The proposed lease and surrounding areas have abundant wetlands.
3. Construction on the steep slopes may cause unacceptable amounts of soil erosion.
4. The Decision Area contains a recreational trail that may be blocked, rerouted, damaged, or otherwise impacted by oil and gas development.

## CHAPTER 2 – ALTERNATIVES, INCLUDING THE PROPOSED ACTION

### Introduction

The NSFO has received an Expression of Interest (EOI) to lease 560 acres of Federal mineral estate for oil and gas development in Higgins Township, Roscommon County, Michigan. This competitive lease provides the lessee exclusive rights to explore and develop Federal oil and gas minerals on the lease but does not authorize surface-disturbing activities or obligate the company to drill a well on the lease. The lease can be used to consolidate acreage to meet well spacing requirements, or the mineral estate may be acquired for speculative value. The BLM will require applicants to adhere to lease stipulations, which have been formulated while conducting this EA and are made part of the proposed action.

### Location

The site, shown in Figure 1, is located on State-owned land in the northern portion of Michigan's Lower Peninsula. A legal description of the requested parcel is found in **Chapter 1 - Need for the Proposed Action** above.

### Proposed Action

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

### Connected Action – Drilling and Production

#### Site-Specific Applications for Permit to Drill (APDs)

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

The State of Michigan has stipulated well spacing by target formations. Spacing for wells targeting the Glenwood or lower formations is 640 acres. The most likely target formation, the Collingwood shale, falls into this category. Since the entire proposed lease is only 560 acres, the only way a well could be drilled under this lease would be for the operator to form a communitization agreement by pooling together other tracts of leased land in the surrounding area. Wells tapping the Antrim shale are spaced at 80 acres, meaning at least four wells could possibly be drilled within the 320 upland acres of the

requested minerals. All other formations have 40-acre spacing, and a maximum of eight wells could be drilled within the requested lease. This EA will analyze impacts to natural resources based on three scenarios: low-intensity (one vertical well), medium-intensity (three horizontal wells on one pad), and high-intensity (eight horizontal wells, three pads). *These scenarios are provided strictly for the purpose of analysis and do not represent the BLM's decision or prediction as to a number of wells that may be permitted under the proposed lease.*

The area's geology and the costs of drilling make it likely that wells that would be proposed to tap the minerals at hand would be on or near the area proposed for leasing. Most of the surrounding, state-owned land is classified as non-development<sup>1</sup> for oil and gas.

### Hydrocarbon Drilling Methods

Oil and gas (hydrocarbon) wells are built in two phases – drilling the borehole and completing the well. Wells may be drilled vertically if the end of the well, or *bottom hole location*, is directly below the well pad, or directionally, if the well pad is not directly above the bottom hole location. For example, federal minerals under a state park, where drilling is not permitted, can be accessed by directional drilling. The same method may be used to drill horizontally, with a wellbore extending for up to several thousand feet through the hydrocarbon-producing rock formation. In this case, the purpose of non-vertical drilling is not necessarily to provide access to the hydrocarbons but to increase the well's production.

Typically, after approval of an APD, the petroleum industry follows a general plan and process for all proposed drill sites, as follows:

### Vertical Drilling

Preparation for the drilling process includes construction of a road, drilling pad, and reserve pit. Constructed access roads normally have a running surface width of approximately 25-30 feet, the length depending upon the well site location in relation to existing roads or highways. The average length of road construction would be expected to fall between 0.25 and 0.5 miles. Therefore, between one and two acres would be affected by road construction. Typically, 2.5 acres of land is cleared and graded for pad construction. If the well is productive, another 0.5 acres may be affected by pipeline construction. **The total disturbed area for drilling a productive vertical well would be approximately five acres.**

Drilling operations continue around the clock. Wells in this area are generally drilled within 30 days. An excavation reserve pit is usually constructed about 5-10 feet deep and is lined with bentonite clay to retain drilling fluids, circulated mud, and cuttings. Plastic or butyl (or equivalent) liners that meet applicable thickness and quality standards are required for holding pit fluids.

Once drilling is completed, excess fluids are pumped out of the pit and disposed of in a state-authorized disposal site and the cuttings buried. Wells would be drilled by rotary drilling using mud as the circulating medium. Mud pumps would be used to force mud down the drill pipe and up through the

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<sup>1</sup> County maps of mineral lease information and MDNR ownership are at [http://www.michigan.gov/dnr/1,1607,7-153-10371\\_14793-30992--00.html](http://www.michigan.gov/dnr/1,1607,7-153-10371_14793-30992--00.html).

annulus, circulating the rock cuttings out the wellbore. Most conventional wells require less than 500,000 gallons of water for completion. Water would normally be from a well drilled on the site, but, if permitted, water could be pumped to the site from a local pond, stream, or lake through a pipe laid on the surface. If a tract is adjacent to a producing field and water production is expected during the life of the field, then separation, dehydration, and other production processing may be necessary. Construction of facilities off the Federal lease may be necessary to handle this processing. Some processing or temporary storage may be necessary on site.

During well pad construction, topsoil is stockpiled for use during restoration activities. If the well is successful, the drill pad would be reduced to about 100 square feet with the remaining surface area, including the reserve pit, re-graded and restored as per the BLM and the surface management agency's requirements. The remaining pad is maintained for the life of the well. The life of a productive well is typically on the order of 25 years. Following abandonment, the pad is reclaimed.

### Horizontal Drilling

Wells drilled horizontally with multiple-stage hydrofracture operations require somewhat larger well pads and reserve pits than conventional vertical or directional wells. A typical 3-4-acre well pad in the eastern Ohio Utica shale play is designed to accommodate one to three horizontal wells; similar pad sizes are likely in Michigan. The larger pads are required to store the larger amounts of equipment and supplies used in drilling horizontal wells.

Horizontal wells also require far more water for completion than conventional vertical wells. Conventional vertical wells are drilled to and slightly below the depth of the target formation(s), but a horizontal well is drilled to and then into the target formation, with the length of the horizontal portion of the well, known as a lateral, often exceeding the vertical depth of the well. Lateral lengths exceeding one mile can occur, and the number of fracture stages used to complete a horizontal well are far greater than the number used for a conventional vertical well. A horizontal shale well typically requires several million gallons of water, and some require more than 5 million gallons. The first Collingwood (Utica) shale well drilled horizontally in Michigan, the State Pioneer 1-3 HD1, conducted 15 staged fractures, had a lateral length of 6,351 feet, and used almost 6 million gallons of water for completion. Because the area proposed for leasing would likely hold no more than one or two wells, we will assume that the well pad will be no more than three acres in size. **For the purpose of this analysis, the total disturbance associated with horizontal drilling is 5.5 acres (3 acre pad, 2 acre road, 0.5 acre pipeline).**

The State of Michigan regulates and monitors all proposed water usage. Typically, a water well is drilled within the well pad to provide water for drilling and completion. In some areas, surface water may be used depending on state requirements. Water users must apply for state approval for use of any water sources. When a well is completed, the produced water, including both the hydrofracture fluids and formation fluids, must be collected in tanks for injection into State-approved disposal wells.

### Well Completion

Horizontal drilling using hydraulic fracturing methods is commonly used for mineral extraction in Antrim shale formations. Hydraulic fracturing (hydrofracture or "fracking") has been widely used in the oil and

gas industry since the late 1940s. The process has allowed hydrocarbon production from tight sandstones, shales and carbonates. Fracturing is not used in all well completions. The use of hydrofracture is dependent on the type of reservoir rock encountered in the subsurface. Virtually all wells in shale reservoirs are completed using hydrofracture.

In the hydraulic fracturing process, water, sand and small amounts of chemical additives are pumped down the wellbore. Holes in the production tubing direct the mixture to the reservoir rock under high pressure, breaking the rock. The water-induced fractures allow the oil and gas to flow into the wellbore. Additives may be added depending upon the type of reservoir rock and fluids encountered at depth to help maintain the fractures. Most conventional wells require less than 500,000 gallons of water for completion.

The subsurface pressure forces the hydrocarbons, reservoir fluids and used fracture fluids to the surface. The hydrocarbons naturally separate from the other fluids. The used fracture and reservoir fluids are stored in large tanks for disposal in deep injection wells or other approved disposal methods. In areas where large quantities of water are needed to fracture the rocks, the fluids are recycled and used in other completion operations.

### **Production, Abandonment, and Site Reclamation**

Formation water production, along with the oil and/or gas, will be expected during the life of each well, and separation, dehydration and other production processing may be necessary. Construction of temporary on-site and additional off-site facilities may be needed to handle this processing.

During well pad construction, the topsoil is stockpiled to be used during restoration activities. If the well is successful, the drill pad would be reduced to about 100 feet square with the remaining surface area, including the reserve pit, re-graded and restored per BLM and surface owner requirements. A lease notice in these proposed leases encourages the use of non-invasive cover plants during all restoration and stabilization activities. Final seed mixtures and plantings are determined with recommendations from BLM with approval of the land owner. The remaining pad is maintained for the life of the well. The life of a productive well may be 25 years. Following abandonment, the pad is subject to the same restoration parameters.

### **No-Action Alternative**

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

## **CHAPTER 3 – DESCRIPTION OF THE AFFECTED ENVIRONMENT**

### **Introduction**

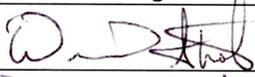
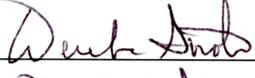
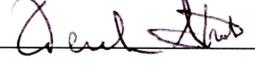
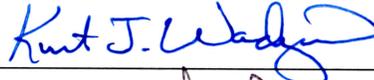
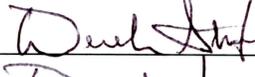
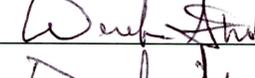
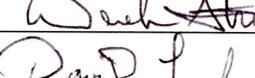
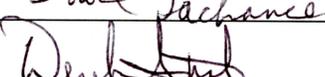
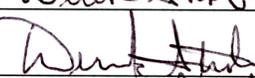
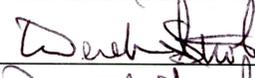
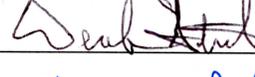
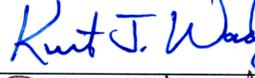
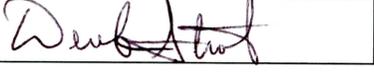
The Decision Area includes a two-mile buffer around the EOI, a total area of 13,900 acres, and a one-mile buffer that includes 5,300 acres (Appendix A, Figure 1). These areas represent the distances from which directional (one mile) and horizontal drilling (two miles) are economically viable in typical cases.

The Decision Area is within the Northern Lakes and Forests Level-III ecoregion. It straddles the divide between the Lake Michigan and Lake Huron basins, forming the headwaters of the Au Sable River subbasin, which drains to Lake Huron, and the Muskegon River subbasin, which drains to Lake Michigan. The Decision Area is within the Roscommon Forest Management Unit and is managed by the MDNR for forestry, recreation, and conservation purposes. Many portions of the Decision Area are accessible via Russell Lake Road and several unimproved roads, two of which run directly into the proposed lease. Interstate 75 runs for 3.5 miles through the western extent of the Decision Area.

Most of the Roscommon Unit lands were previously farmed and reverted to the State of Michigan. Forest fires swept over much of what is now the Roscommon Unit in the early 1900s, and much of these lands were replanted by the Civilian Conservation Corps (CCC) in the 1930s. A 1,000-acre portion of the Backus Creek State Game Area overlaps the southwestern edge of the Decision Area.

The Decision Area contains two gravel quarries that are in state-owned lands leased to a private operator (Figure 3, Appendix A).

**Table 1. Technical Review.**

Program	Reviewer	Signature	Date
Air Quality	Derek Strohl Natural Resources Specialist		9/25/12
Climate Change	Derek Strohl Natural Resources Specialist		9/25/12
Cultural/Paleontology	Derek Strohl Natural Resources Specialist		9/25/12
Environmental Justice	Kurt Wadzinski Planning & Environmental Coordinator		9/25/12
Farmlands (Prime & Unique)	Derek Strohl Natural Resources Specialist		9/25/12
Fish and Wildlife	Derek Strohl Natural Resources Specialist		9/25/12
Floodplains	Derek Strohl Natural Resources Specialist		9/25/12
Geology/Mineral Resources/Energy Production	Dave Lachance Geologist		9/25/12
Hazardous Wastes	Derek Strohl Natural Resources Specialist		9/25/12
Invasive Species/Noxious Weeds	Derek Strohl Natural Resources Specialist		9/25/12
Native American Religious Concerns	Derek Strohl Natural Resources Specialist		9/25/12
Recreation	Derek Strohl Natural Resources Specialist		9/25/12
Socioeconomics	Kurt Wadzinski Planning & Environmental Coordinator		9/25/12
Soils	Derek Strohl Natural Resources Specialist		9/25/12

**Table 1. Technical Review.**

Program	Reviewer	Signature	Date
Threatened, Endangered or Candidate Animal Species/Migratory Birds	Derek Strohl Natural Resources Specialist		9/25/12
Vegetation	Derek Strohl Natural Resources Specialist		9/25/12
Visual Resources	Derek Strohl Natural Resources Specialist		9/25/12
Water Resources/Quality (Drinking, Surface & Ground)	Derek Strohl Natural Resources Specialist		9/25/12
Wetlands/Riparian Zones	Derek Strohl Natural Resources Specialist		9/25/12
Wild & Scenic Rivers	Derek Strohl Natural Resources Specialist		9/25/12
Wilderness	Derek Strohl Natural Resources Specialist		9/25/12

Based on a review of the resource values listed above on the NSFO Technical Review Form and in consideration of the Purpose and Need statement prepared for this EA, the following will be addressed:

- Air Quality
- Climate Change
- Cultural/Paleontology
- Environmental Justice
- Prime and Unique Farmlands
- Fish and Wildlife
- Floodplains
- Geology/Mineral Resources/Energy Production
- Hazardous Wastes
- Invasive Species/Noxious Weeds
- Native American Religious Concerns
- Recreation
- Socioeconomics
- Soils
- Threatened, Endangered, or Candidate Animal Species/Migratory Birds
- Vegetation
- Visual Resources
- Water Resources/Quality (Drinking/Surface/Ground)
- Wetland/Riparian Zones
- Wild and Scenic Rivers
- Wilderness

### Air Quality

Roscommon County meets the National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), sulfur dioxide (SO<sub>2</sub>), particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>), and lead (Pb). These are the primary pollutants that the U.S. Environmental Protection Agency (EPA) tracks nationwide. The proposed action is not expected to produce emissions in excess of *de minimis* amounts, which are defined by the U.S. EPA<sup>2</sup> as maximum amounts that will not threaten a state's efforts to attain or maintain conformity with the National Ambient Air Quality Standards (NAAQS).

<sup>2</sup> *De minimis* levels for each priority pollutant are listed at <http://www.epa.gov/air/genconform/deminimis.html>.

## Climate Change

The primary indicators of interest regarding climate change are emissions of greenhouse gases (GHG), primarily water vapor, carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), and a few other gasses of lesser importance. These gasses tend to trap heat from the sun in the Earth's atmosphere, leading to global warming. The various GHGs trap different amounts of heat and persist in the atmosphere for different amounts of time. Therefore, the various GHGs have different levels of potency in causing global warming per unit volume in the atmosphere. These potencies are normalized with respect to the potency of CO<sub>2</sub> and expressed in terms of CO<sub>2</sub>e (carbon dioxide equivalent). For example, one metric ton of methane, which is 21 times as potent as carbon dioxide, represents 21 metric tons of CO<sub>2</sub>e. Carbon dioxide and CH<sub>4</sub> are the most abundant GHGs in terms of CO<sub>2</sub>e.

Because these gases circulate freely throughout Earth's atmosphere, the appropriate Analysis Area for this resource is the entire globe. The largest component of global anthropogenic greenhouse gas emissions is carbon dioxide. Global anthropogenic carbon emissions reached about 7,000,000,000 metric tons per year in 2000 and about 9,000,000,000 metric tons per year in 2004.<sup>3</sup> Oil and gas production is a major contributor of greenhouse gases. In 2006, natural gas production accounted for eight percent of global methane emissions, and oil production accounted for 0.5% of global methane emissions.<sup>4</sup> The impact of the proposed action on climate change will be discussed further in Chapter 4.

## Cultural/Paleontology

Native Americans inhabited Roscommon County prior to the arrival of European settlers, and several villages, burial grounds, mounds, and important trails, were located throughout the county.<sup>5</sup> Reviews of State forest lands conducted by the MDNR<sup>6</sup> state that there are no cultural or archeological resources present. The BLM would consider potential cultural resources with each APD that is submitted under any lease(s) that would be approved pursuant to this EOI. No further analysis is warranted.

## Environmental Justice

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

The Decision Area is located in a rural area. There are no adverse human health and environmental effects anticipated from potential development on minority and low-income populations or individuals near the Decision Area. No further analysis is warranted.

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<sup>3</sup> Marland, G., T.A. Boden, and R. J. Andres. 2007. *Global, Regional, and National CO<sub>2</sub> Emissions. Outside Trends: A Compendium of Data on Global Change.*

<sup>4</sup> URS Corporation. 2010. *Climate Change Supplementary Information Report, Montana, North Dakota and South Dakota Bureau of Land Management.*

<sup>5</sup> Roscommon County, Michigan Planning Commission. July 19, 2010. *Roscommon County Master Plan for Land Use*, p. 3.

<sup>6</sup> Available online at [http://www.michigan.gov/dnr/0,1607,7-153-30301\\_30505---,00.html](http://www.michigan.gov/dnr/0,1607,7-153-30301_30505---,00.html) and at the Northeastern States Field Office.

## Farmlands (Prime and Unique)

There are no prime and unique farmlands in the Decision Area.

## Fish and Wildlife

The Decision Area is mostly undeveloped forest and wetland habitat (See **Vegetation** section below). The Decision Area harbors populations of diverse types of wildlife, including deer, grouse, rabbit, turkey, beaver, nesting birds, reptiles and amphibians, and insects. The state forest is managed, in part, to support deer, and ponds in the Decision Area are known walleye spawning areas. Wetlands support ospreys and great blue heron rookeries. The Backus Creek State Game Area is managed for mallard, scaup, and wood duck. The Decision Area contains a large portion of Ninemile Hill Swamp (see Figure 2), also known as the Long Crossway Swamp, which includes habitat for various large and small game, amphibians and reptiles, migratory birds, raptors, and other wildlife taxa. Lake St. Helen has a maximum depth of 25 feet, and all of the lakes in the Decision Area have largely undeveloped, vegetated shorelines.

## Floodplains, Wetlands, and Riparian Zones

The western half of the Decision Area is part of the large, contiguous wetland complex known as Ninemile Hill Swamp or Long Crossway Swamp, composed primarily of lowland conifers and lowland shrub habitat. The eastern edge of the Decision Area consists of lowland conifer habitat that includes Russell Lake, a portion of Lake St. Helen, and adjacent marshes. The only floodplains are associated with Cameron Creek, which flows into the southwestern end of Lake St. Helen, and Russell Creek, which connects Russell Lake to Lake St. Helen. There may be small wetlands interspersed throughout other portions of the Decision Area. Operators proposing to drill will be required to verify the absence of wetlands or to take steps to avoid impacting them, in compliance with Executive Order 11990, the Clean Water Act, and State law.

## Geology/Mineral Resources/Energy Production

Michigan's Southern Peninsula is entirely underlain by the Michigan Basin, a structural depression within the Earth's crust that is filled with sedimentary rocks of various ages. The exploration and development of oil and gas resources within the Michigan Basin has occurred continuously since 1925. Currently recognized oil and gas plays within the Michigan Basin are the Mid-Michigan Rift-Related Structures, Mid-Michigan Rift Reactivation-Related Structures, Niagaran Pinnacle Reefs, Shallow Salt-Related Structures, the Antrim Shale, and the Collingwood Shale. Horizontal drilling using hydraulic fracturing methods is commonly used to extract the minerals in Antrim shale formations. The BLM has not identified specific exploration targets underlying the lands being evaluated in this EA. However, based upon the available data and exploration and development activity, the Collingwood Shale would be the most likely play to be explored and developed on the lands being evaluated in this EA. The Collingwood Shale underlies all of Roscommon County at depths greater than 9500 feet and thicknesses greater than 200 feet.

Possible secondary targets in the immediate area of the lands being evaluated in this EA would be Mid-Michigan Rift-Related Structures and Mid-Michigan Rift Reactivation-Related Structures. These structures are commonly identified using seismic, magnetic and gravitational data.

## Hazardous Wastes

The Michigan Department of Environmental Quality's Environmental Mapper<sup>7</sup> shows no sites of environmental contamination or underground storage tanks in the Decision Area.

## Invasive Species/Noxious Weeds

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

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. Since the Decision Area has a low density of roads, many invasive species that are present in other parts of Michigan are likely not present in the Decision Area. However, the surrounding area is known to contain invasive species, such as reed canary grass (*Phalaris arundinacea*), Asian honeysuckles (*Lonicera* spp.), garlic mustard (*Alliaria petiolata*), Canada thistle (*Cirsium arvense*) and purple loosestrife (*Lythrum salicaria*). The most likely locations for most of these species are in and around areas disturbed by road construction and land clearing, and some of these species were observed along the edges of the gravel pit in Section 22.

Lake St. Helen is infested by Eurasian watermilfoil (*Myriophyllum spicatum*), and the infestation has been controlled by the introduction of milfoil weevils between 1998 and 2001, and a 2007 survey of the lake revealed only sparse populations.

## Native American Religious Concerns

The BLM sent letters on March 6, 2012, to twelve Indian tribes that have a known connection to the Decision Area, asking whether they can identify any concerns that would need special consideration with respect to the proposed action. The BLM did not receive a response that indicated any concerns. 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.

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<sup>7</sup> Available online at <http://www.mcgi.state.mi.us/environmentalmapper/>

## Recreation

The Decision Area includes 11,600 acres of state-owned land that is open to recreational use, offering various recreational opportunities:

- Off-Road Vehicle (ORV) use – the Geels South Trail (Figure 2, Appendix A) is a 28-mile ORV trail that runs mostly within Township 28 North, Range 2 West. A 13.6-mile loop of the trail crosses the Decision Area. The trail is about 50 inches wide, has tight turns, and includes several scenic overlooks. Trail descriptions and a map are available at <http://vvmapping.com/trails/geels.html>.
- Hunting – most of the upland portions of the Decision Area are within a few hundred feet of a road or ORV trail, making the area highly accessible for hunting. The wetland areas in the state forest are not as easily accessible as the upland area. The wetlands in the Backus Creek State Game Area are interspersed with open water, which probably draws more waterfowl hunters than the wetlands in the state forest.
- Boating – Lake St. Helen is open to motorized boating and has at least one public boat launch. The other small lakes are likely non-motorized, given their small size and lack of drive-in access.
- Fishing – Lake St. Helen contains black crappie, black bullhead, bluegill, largemouth bass, smallmouth bass, rock bass, muskellunge, northern pike, walleye, and yellow perch, and the small lakes in the Decision Area likely have game fish populations.

## Socioeconomics<sup>8</sup>

Roscommon County is located in the north central part of Lower Michigan and is 519.63 square miles, with a population density of approximately 47 persons per square mile. Its population as of the 2010 U.S. Census was 24,449, a 4% decrease from the 2000 census.

The vast majority of the population in Roscommon County is White (97.3%); 83.9% of Roscommon County residents are 18 years of age or older and 28% are 65 years or older, a significantly older population than Michigan as a whole (13.8%). Median household income in 2009 was \$33,273 for Roscommon County. Approximately 22.6% of persons lived below the poverty level, well above the 16.1% Statewide that live below the poverty level (U.S. Census Bureau, 2010). Demographically, Roscommon County is poorer, less educated, more homogenous and older than most counties in Michigan.

The unemployment rate for Roscommon County was 10.8% in June 2012, a 1.6% decrease from the 12.4% rate in June 2011.<sup>9</sup> In 2008, the retail trade provided the greatest number of employers, followed by accommodation, food services and drinking establishments, and construction.<sup>10</sup>

Although mining employment accounted for less than one percent of total employment for the county in 2011, the average annual wages for those employed in the Natural Resources and Mining industry in

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<sup>8</sup> Much of the information in this section is taken from the 2010 United States Census Quickfacts website available online at <http://quickfacts.census.gov/qfd/states/26/26143.html>.

<sup>9</sup> Bureau of Labor Statistics. 2011. *Local area unemployment statistics*. Available online at <http://www.bls.gov/lau/>.

<sup>10</sup> United States Census Bureau. 2010. *2008 county business patterns*. Available online at [http://factfinder.census.gov/servlet/IBQTable?\\_bm=y&-geo\\_id=05000US26143&-skip=0&-ds\\_name=CB0800A1&-lang=en](http://factfinder.census.gov/servlet/IBQTable?_bm=y&-geo_id=05000US26143&-skip=0&-ds_name=CB0800A1&-lang=en).

Roscommon County is over \$69,000, an amount that is 135% above the average annual wage for the county and over \$10,000 higher than the average annual wage of employees in the State of Michigan.

## Soils

Most of the Decision Area is dominated by slopes between 4% and 8%. Approximately 2,900 acres is mapped in soil types that are potentially highly erodible (Figure 4, Appendix A). These types include the following:

- Gerrish-Grayling sands, 6% to 18% slopes
- Gerrish sand, 6% to 18% slopes
- Graycalm-Klacking sands, 6% to 18% slopes
- Graycalm sand, 6% to 18% slopes

Approximately 2,100 feet of unimproved road and 4 miles of the Geels South ORV Trail currently run across this area of potentially highly erodible soils, accounting for approximately three acres. An area of approximately 50 acres on the eastern edge of the EOI boundary has slopes greater than 10%, which is the recommended maximum slope for forestry roads in Michigan’s forestry best management practices guide.<sup>11</sup> Approximately 1,700 feet of OHV trail and 900 feet of unimproved road are already constructed on steep slopes in this area.

## Sensitive Species and Migratory Birds

One species, Kirtland’s warbler (*Dendroica kirtlandii*) is listed on the USFWS list of endangered species known to occur in Roscommon County, Michigan<sup>12</sup>, as of May 22, 2012. Kirtland’s warbler requires young stands of Jack pine (*Pinus banksiana*). A 40-acre stand of Jack pine is present in the southern end of the Decision Area but is not identified by the State of Michigan as Kirtland’s warbler habitat, possibly because the stand is too old. The highest density of nesting Kirtland’s warblers is located in eastern Roscommon County and portions of Ogemaw County, and it is possible that Kirtland’s warblers are using Jack pine stands in the Decision Area.

There are also several State-listed species that have been reported in Roscommon County and that may be present in the EOI. Of the 29 species that are known to occur in Roscommon County, only 13 species have habitats that may be present or are known to be present in the Decision Area. Ten of these 13 species dwell primarily in wetland habitats. In Table 2, the species that are not shaded are possible or likely to occur in areas that may be impacted by land-disturbing activities.

**Table 2. Threatened, endangered, and candidate species present in Roscommon County, Michigan.**

Scientific name	Common name	Status	Habitat	Habitat present
<b>Animals</b>				

<sup>11</sup> Michigan DNR and Michigan DEQ, *Sustainable Soil and Water Quality Practices on Forest Land*, IC4011, available online at [http://michigan.gov/dnr/0,1607,7-153-30301\\_31154\\_31261---,00.html](http://michigan.gov/dnr/0,1607,7-153-30301_31154_31261---,00.html).

<sup>12</sup> Available online at <http://www.fws.gov/midwest/Endangered/lists/pdf/MichiganCtyListFeb2012.pdf>.

**Table 2. Threatened, endangered, and candidate species present in Roscommon County, Michigan.**

Scientific name	Common name	Status	Habitat	Habitat present
<i>Alasmidonta marginata</i>	Elktoe	SC	Streams and rivers	N
<i>Alasmidonta viridis</i>	Slippershell	T	Creeks and headwaters	N
<i>Appalachia arcana</i>	Secretive locust	SC	Various open, shrubby habitats and open, young aspen stands	L
<i>Brachionycha borealis</i>	Boreal brachionyncha	SC	Various dry to mesic forest types	L
<i>Buteo lineatus</i>	Red-shouldered hawk	T	Mature forests in or adjacent to wet meadows and swamps	L
<i>Chlidonias niger</i>	Black tern	SC	Marshes	P
<i>Clemmys guttata</i>	Spotted turtle	T	Shallow waters with mucky bottoms	P
<i>Coregonus artedi</i>	Lake herring or Cisco	T	Deep inland lakes	N
<i>Coturnicops noveboracensis</i>	Yellow rail	T	Wet meadows with <i>Carex lasiocarpa</i>	P
<i>Dendroica kirtlandii</i>	Kirtland's warbler	END, E	Young jack pine stands	N
<i>Emydoidea blandingii</i>	Blanding's turtle	SC	Shallow waters with mucky bottoms	P
<i>Gallinula chloropus</i>	Common moorhen	T	Variety of emergent marsh types	P
<i>Gavia immer</i>	Common loon	T	Lakeshores	N
<i>Glyptemys insculpta</i>	Wood turtle	SC	Riparian habitats	N
<i>Haliaeetus leucocephalus</i>	Bald eagle	SC	Tall trees near open water	N
<i>Ixobrychus exilis</i>	Least bittern	T	Emergent vegetation	P
<i>Ligumia recta</i>	Black sandshell	E	Streams with gravelly substrate	N
<i>Merolonche doli</i>	Doll's merolonche	SC	Acid-soil areas, barrens, bogs, and jack pine stands	P
<i>Notropis dorsalis</i>	Bigmouth shiner	SC	Streams	N
<i>Pandion haliaetus</i>	Osprey	SC	Tall structures above or near water	N
<i>Rallus elegans</i>	King rail	E	Marshes adjacent to uplands	N
<i>Sistrurus catenatus catenatus</i>	Eastern massasauga	CAN, SC	Variety of wetland habitats, primarily open	L
<i>Stagnicola contracta</i>	Deepwater pondsnail	E	Lakes	N
<i>Villosa iris</i>	Rainbow	SC	Streams	N
<b>Plants</b>				
<i>Calypso bulbosa</i>	Calypso or fairy-slipper	T	Conifer swamps and moist coniferous forests with cool soils.	L
<i>Cirsium hillii</i>	Hill's thistle	SC	Barrens	N

**Table 2. Threatened, endangered, and candidate species present in Roscommon County, Michigan.**

Scientific name	Common name	Status	Habitat	Habitat present
<i>Cypripedium arietinum</i>	Ram's head lady's-slipper	SC	Mature, deeply-shaded, extensive cedar swamps	L
<i>Festuca scabrella</i>	Rough fescue	T	Pine barrens	N
<i>Prunus alleghaniensis var. davisii</i>	Alleghany or Sloe plum	SC	Pine barrens and savanna	N

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

## Vegetation

The Roscommon State Forest consists of approximately 275,000 acres of land in Roscommon and Ogemaw Counties under State ownership. Most of the Roscommon State Forest lands were burned by widespread wildfires around 1900, and much of the Roscommon State Forest was planted during the 1930s by the Civilian Conservation Corps. The Decision Area has 3,800 acres of aspen, mostly in the 30-39-year and 40-49-year age classes,<sup>13</sup> and about 2,000 acres of other upland forest types. There are also small stands of upland conifers and hardwoods in the uplands and lowland conifers in the wetlands. The Decision Area contains approximately 2,000 acres of wooded wetlands and 2,500 acres of open or shrubby wetlands.

The Decision Area contains 200 acres of Special Conservation Areas, which are DNR-owned lands that have at least one identified special conservation objective, interest, or element. These consist of ten separate stands. These areas will be off limits to surface disturbance unless the MDNR agrees in writing that the proposed disturbance would be consistent with the area's applicable management guidelines.

## Visual Resources

Most of the Decision Area is undeveloped. The roads and recreational trails penetrating the Decision Area are unimproved and narrow. The major exceptions to the undeveloped state of the Decision Area are the two sand and gravel quarries, both of which are leased to Rieth-Riley Construction Company, Inc., of Prudenville, Michigan. The SENE of Section 22, a 40-acre parcel, is under lease until August 1, 2013. The northern half of the quarry appears to be in an early stage of reclamation. A second quarry, in the NW of Section 17, called the Carter pit, also includes areas in various stages of production and reclamation. The lease was initiated in 1999 and was extended in 2012 until 2015. The leased areas may contain permissible well locations. Both of these quarries are located on hilltops and surrounded by woodlands and are expected to be visible from short distances only because they are surrounded by dense forest. The quarry that is inside the EOI has an estimated viewshed of 50 acres, and the Carter

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<sup>13</sup> Michigan DNRE, Roscommon Forest Management Unit Compartment Review Presentations, Compartment #'s 59 and 87, revision dates July 12, 2010, and March 11, 2009, respectively.

quarry, located in the northwestern portion of the Decision Area, has an estimated viewshed of 250 acres.

### **Water Resources and Water Quality**

Most of the Decision Area falls within the Lake Huron basin, and the southwestern corner of the Decision Area is in the Lake Michigan basin. Wetlands are described in the **Floodplains, Wetlands, and Riparian Zones** section above. The Decision Area contains all of the 90-acre Russell Lake, 200 acres of 2,390-acre Lake St. Helen, 30 acres of open water in the state game area, and two areas of open water, totaling 150 acres, within the Ninemile Hill Swamp. Streams in the Decision Area include Cameron Creek and Russell Creek. The water table is near or at the surface in the wetlands and is up to several dozen feet below the surface in the uplands. There are no wells in the Decision Area.

### **Wild and Scenic Rivers and Wilderness**

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

## **CHAPTER 4 – ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES**

### **Introduction**

This chapter assesses potential consequences associated with direct, indirect, and cumulative effects of the Proposed Action. As discussed in Chapter 2, most of the surrounding, state-owned land is off-limits to oil and gas development. Due to this restriction, the local geology, and the costs of directional drilling, the most likely locations for proposed wells would be on or near the proposed lease area. The No-Action Alternative, which would be to withhold the Federal minerals from leasing, would have no impacts on resources.

### **Air Quality**

The primary air quality impact of the proposed action is likely to be a temporary increase in dust from the intensive truck traffic on unimproved roads. Traffic would include construction vehicles and heavy equipment during the drilling and completion phases. Traffic for hauling water would be greatly intensified if horizontal drilling and hydrofracture are used unless water is supplied by on-site wells. This impact would persist through the period of well construction.

### **Climate Change**

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

- Fossil fuel combustion for construction and operation of oil and gas facilities – vehicles driving to and from production sites, engines that drive drill rigs, etc. These produce CO<sub>2</sub> in quantities that vary depending on the age, types, and conditions of the equipment as well as the targeted formation, locations of wells with respect to processing facilities and pipelines, and other site-specific factors.

- Fugitive methane – methane that escapes from wells (both gas and oil), oil storage, and various types of processing equipment. This is a major source of global methane emissions. These emissions have been estimated for various aspects of the energy sector, and starting in 2011, producers are required under 40 CFR 98, to estimate and report their methane emissions to the EPA.<sup>14</sup>
- Combustion of produced oil and gas – it is expected that drilling will produce marketable quantities of oil and/or gas. Most of these products will be used for energy, and the combustion of the oil and/or gas would release CO<sub>2</sub> into the atmosphere. Fossil fuel combustion is the largest source of global CO<sub>2</sub>.

In recent years, many states and other organizations have initiated GHG inventories, tallying GHG emissions by economic sector. Links to statewide GHG emissions inventories can be found at <http://www.epa.gov/statelocalclimate/state/state-examples/ghg-inventory.html>. Guidelines for estimating project-specific GHG emissions are available,<sup>15</sup> but some necessary data, such as quantities of oil produced and number of wells, are not available for such an estimate for the proposed action. The uncertainties regarding numbers of wells and other factors make it very impractical to attempt to project amounts of GHG that the proposed action would emit. At the APD stage, more site-specific information on GHG impacts and mitigation measures would be described in greater detail.

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

## Fish and Wildlife

The proposed action could potentially result in the clearing of between five to 15 acres of forest, based on the low-, medium-, and high-intensity scenarios described in Chapter 2. Impacted areas would be reclaimed at the end of their use as well pads or construction areas. This figure is likely far higher than actual areas that would be disturbed, for two reasons. First, access to much of the Decision Area is good and minimizes the need for additional road construction. Second, any potential wells located in the footprint of the sand and gravel quarry would result in no additional clearing of mature forest.

## Cumulative Effects to Fish and Wildlife

Cumulative impacts include actions that have been done in the past, are being done presently, or are planned for the future and which have an impact on a resource under consideration. A 40-acre parcel in the southeast corner of the EOI is being leased for use as a gravel pit and represents the conversion of forest habitat to a quarry for the duration of quarry activity. The current lease began in 2007 and will expire in 2013, and the MDNR expects that the same company will request to lease an additional 40 acres at that time. The northern half of the existing quarry is covered in young aspens, suggesting that

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<sup>14</sup> More information on this requirement is available at <http://www.epa.gov/climatechange/emissions/subpart/w.html>.

<sup>15</sup> *Climate Change Supplementary Information Report, Montana, North Dakota and South Dakota Bureau of Land Management*, page 5-2.

reclamation has begun on that portion and that the habitat is being restored as an aspen forest type. Another quarry near the northwest edge of the Decision Area has cleared 200 acres of land.

A 311-acre timber harvest, partially overlapping the Decision Area, began in 2011 and is expected to last for two years. Aspen comprises the majority of the harvest, and maple, Jack pine, and black cherry comprise minor elements. The management goals of the timber sale are to regenerate the aspen stands, diversify the age distribution, and thin overstocked hardwood stands.

### **Floodplains, Wetlands, and Riparian Zones**

A lease stipulation (see Appendix B) will prohibit surface occupancy in wetlands. This will prevent direct filling of wetlands. Because wells could potentially be directionally drilled from outside the EOI, prohibiting surface occupancy in wetlands would not necessarily prevent accessing the minerals under the wetlands. The BLM will closely analyze areas proposed for drilling in APDs, since regional wetland inventories often do not capture small wetlands.

### **Geology/Mineral Resources/Energy Production**

Whether or not commercial quantities of oil and gas are present beneath the lands that are being evaluated in this EA cannot be known without further exploration. However, it is certain that any oil and gas produced from these lands is a nonrenewable resource that will not be available in the future.

### **Hazardous Wastes**

Drilling introduces various chemicals into the environment that become waste products after use. These include drilling and completion fluids, which may contain heavy metals, hydrochloric acid, hydrocarbons, and brine. These materials are typically stored temporarily on-site. Michigan regulations require that field fluid wastes be injected into underground formations that are isolated from freshwater by impervious strata. These wastes are exempt from the Federal definition of hazardous waste and are referred to as *special wastes* by the EPA. Under certain circumstances, wastes may be disposed of in the annular spaces between strings of casing. Also, brines that are rich in calcium and that contain minimal concentrations of hydrogen sulfide and a few aromatic hydrocarbons may be used for ice and dust control and road stabilization<sup>16</sup>. Environmental impacts to the Decision Area may occur under several circumstances. Chemicals may be spilled or leaked from a temporary storage facility or container used for transportation. Chemicals may contaminate groundwater resources in the event of improper design, construction, or use of an injection well intended for disposal of wastes. Surface introduction of restricted amounts of hydrogen sulfide and hydrocarbons may occur in the event that the State of Michigan permits the surface spreading of brines, as provided for in the State of Michigan's regulations.

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<sup>16</sup> Michigan's Oil and Gas Regulations, available online at [http://michigan.gov/deg/0,1607,7-135-3311\\_4111\\_4231-9245--,00.html](http://michigan.gov/deg/0,1607,7-135-3311_4111_4231-9245--,00.html).

## Invasive Species/Noxious Weeds

Construction of roads, well pads, pipelines, and other structures associated with oil and gas development can be expected to spread invasive species and/or noxious weeds in two general ways. First, increased vehicle traffic may carry seeds, plant parts, or other live organisms that may become established within the Decision Area. This could introduce new species from outside the Decision Area or from one part of the Decision Area to another. The risk of such propagation may be estimated in terms of the area disturbed (calculated in Chapter 2 at five to 5.5 acres per well pad), the volume of vehicle traffic, and the presence of invasive species in locations along the routes that traffic uses on the way to and within the Decision Area. While the last two variables would be unreasonable to attempt to quantify without site-specific analysis, we may consider various scenarios of infestation. The land areas described in the low-, medium-, and high-intensity development scenarios in Chapter 2 would be susceptible to direct infestation by non-native, invasive plant species that thrive in disturbed conditions. However, many of these species are able to propagate into undisturbed areas, and large areas of otherwise intact habitat could be infested by plant parts that are introduced into the Decision Area on equipment and vehicles. Therefore, it is possible that far more than the directly-disturbed area of land could be infested in non-native, invasive plant species as a result of the disturbance.

The second way that oil and gas development may result in the propagation of invasive species is by creating open corridors and forest edges that are highly susceptible to edge-loving species. Where the forest canopy is broken, invasive species that thrive in sunny conditions may thrive. The 0.25-0.5-mile estimation of new roadway provided in Chapter 2 is likely high, since the eastern half of the Decision Area, which has more buildable, upland habitat, also has abundant roads and cleared rights-of-way, leaving little need for clearing new ones.

The Wisconsin Council on Forestry has developed a set of best management practices (BMPs) designed to prevent the spread of invasive species in forests due to urban and production forestry practices, transportation and utility rights-of-way, and recreation<sup>17</sup>. Several of the BMPs are directly applicable to the proposed lease, since it would incorporate rights-of-way and vegetation management on dedicated forest land. The BLM would incorporate appropriate BMPs as conditions of approval into permits to drill in order to prevent the introduction or spread of invasive species into affected areas.

## Recreation

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

Noise that is generated by construction or operation is naturally damped as it travels through an environment, and the nature of the environment through which it travels, such as open air, buildings, or woods, determines the rate at which noise is damped. Finally, the time during which the woods are

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<sup>17</sup> These are available at <http://council.wisconsinforestry.org/invasives/>.

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),<sup>18</sup> and a forest may damp noise by five to 20 dB per 100 feet. Hunters or game animals are unlikely to tolerate noise above 40 dB. Using these figures, the affected radius with respect to hunting around construction operation would range from 150 feet to 1500 feet (0.28 mile). The damping effect of the woods would be at its highest during summer, when leaves aid in damping the sound, or in winter under thick snow cover. The areas to be affected by these minimum and maximum radii are, respectively, 1.6 acres and 160 acres per point source of the described construction noises.

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

### **Cumulative Effects to Recreation**

Heavy equipment operation associated with the two sand and gravel operations generates noises over 100 dB during operation hours. Likewise, the ongoing timber harvest (see **Fish and Wildlife** section above) will produce noises exceeding 100 dB in scattered locations in much of the Decision Area on an intermittent basis for two years.

### **Mitigation of Effects**

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

### **Socioeconomics**

The proposed action would likely bring revenues to the region in the form of wages and salaries to employees and contractors who are employed in drilling wells and sales to area hotels, restaurants, and other businesses that serve drillers for the duration of drilling and similar construction-related benefits later as wells are abandoned and sites restored. During production, producers would be earning income from the produced oil and/or gas, some of which would provide salaries and wages to maintenance staff and contractors.

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<sup>18</sup> Bureau of Land Management, Milwaukee District Office, *Mosquito Creek Lake Draft Planning Analysis/Environmental Assessment*, April 1998, available for review at the NSFO.

## Soils

Because permitted well pads could be scattered at various locations throughout the Decision Area, it is impossible to determine how much disturbance would take place on steep slopes and potentially highly erodible soils. The BLM would not permit well pad construction on slopes steeper than 10% (Appendix A), and the BLM would incorporate soil-conserving BMPs into drilling permits. If a well pad were to be constructed on the ridge in the eastern portion of the proposed lease area, then at least 2.5 acres (the area required for roads and pipelines) of potentially highly erodible soils would likely be disturbed. The Michigan DNR has compiled a guide to using BMPs to prevent erosion.<sup>19</sup> The Michigan water quality BMPs address several activities that are common in oil and gas drilling, such as building temporary roads and clearing land. The BLM would require the use of appropriate BMPs, through consultation with the MDNR, as conditions of approval for APDs.

## Bureau-Sensitive Species and Migratory Birds

Since stipulations will prohibit surface occupancy in wetlands, most habitat-related impacts to species that dwell in wetlands are not expected to result from the proposed action. Lessees would be required to conduct surveys of areas that may contain endangered species and to adhere to the recommendations provided by the Fish and Wildlife Service for avoiding and minimizing impacts to species. Depending on locations of proposed wells and the timing of drilling, migratory birds could be impacted by the removal or degradation of stopover and/or nesting habitat. The amounts of habitat that could be impacted are described in Chapter 2. As with endangered species, these site- and time-specific factors would be considered in appropriate detail as APDs are submitted to the BLM.

## Vegetation and Visual Resources

Impacts for vegetation and visual resources are combined because the primary visual quality of the Decision Area is defined by the vegetation or the industrial activities that replace the vegetation. Since surface occupancy will be prohibited in wetlands, any drilling that takes place will be in uplands. The state-owned areas that are open for oil and gas development are dominated by aspen, and construction would be expected to have most of its forestry-related impact on aspen stands. Using the low-, medium-, and high-intensity scenarios in Chapter 2, between five and 15 acres of timber could be removed, although far less clearing may occur if one or more wells were to be located on the existing disturbed leased quarry property. These areas would be cleared and maintained for various durations and restored after their uses as roads, staging areas, or well pads, and then restored as described in Chapter 2.

## Cumulative Impacts to Vegetation and Visual Resources

As described above, the earliest action that is considered in the cumulative impacts to the Decision Area is the planting in the 1930s of much of the Roscommon State Forest Unit, and ongoing timber management, with its emphasis on wildlife, has defined the visual quality of the Decision Area.

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<sup>19</sup> *Sustainable Soil and Water Quality Practices on Forest Land.*

Most of the aspen stands in the Decision Area are prescribed to be clearcut with hardwoods and pine left for mast production, release of young trees, and other purposes, and the MDNR will likely continue to offer timber sales on other portions of the Decision Area as they mature. If drilling were to coincide with prescribed timber harvests, then the *additional* impacts of drilling in upland stands would be as follows:

- Complete vegetation removal – while prescribed forestry practices leave trees of selected species and ages as well as shrubs and herbaceous vegetation, well pad construction would result in total vegetation clearing.
- Retention of cleared areas – while clearcut areas would be allowed, under normal forestry use, to regenerate or would be actively planted, well pads would be maintained in a cleared state for the duration of construction or up to approximately 25 years, until the wells were abandoned.

For the six years that the sand and gravel quarries been in operation, 200 acres of land have been converted to industrial use and visually impacted about 300 acres. An additional 40 acres will likely be converted to industrial use for a similar duration beginning in 2013. The impacts of past and current timber sales are not as fundamental as that of the sand and gravel operation, since they do not remove all vegetation and convert the land to an industrial use. Rather, the timber sales open up the canopy and create more open conditions for a few years, after which aspen regeneration creates dense stands of young trees. Over a period of a few decades, these stands yield mature stands with high, dense canopies.

## Water Resources and Water Quality

Lakes, streams, and wetlands will be protected by lease stipulations, and the same Best Management Practices that are applied to protect potentially highly erodible soils will be used to protect surface waters from runoff.

As described in Chapter 2, drilling and completion phases consume quantities of water that are regulated by the State of Michigan. Anyone wishing to withdraw water at a rate of more than 70 gallons per minute must use the online Water Withdrawal Assessment Tool (<http://www.miwat.org/>) 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.

The relative absence of streams and lakes in the Decision Area and the stipulations protecting surface water resources limit the likelihood of contamination of surface water resources.

Any approved drilling operation must adhere to BLM Onshore Order No. 2, which requires that casing and cementing programs be conducted as approved to protect and/or isolate all usable water zones, potentially productive zones, lost circulation zones, abnormally pressured zones, and any prospectively valuable deposits of minerals. Hydraulic fracturing does not have any effect on surface or near-surface water supplies, nor does it impact other surface resources. Surface impacts can be limited with properly

constructed wells, including adequate casing and cementing design and equipment testing. Recovery and treatment or disposal of flowback fluids are required by both BLM and the State of Michigan DEQ.

## PERSONS, GROUPS, AND AGENCIES CONSULTED

### Consultation and Coordination

#### List of Persons, Agencies and Organizations Consulted

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
Steve Anderson, Unit Manager, Roscommon Management Unit, Michigan Department of Natural Resources	General information regarding the Roscommon State Forest Management Unit	Provided information regarding timber sales and the gravel lease in the Decision Area.
Brian D. Conway, State Historic Preservation Officer	Antiquities Act, Section 106	Letter to BLM dated February 16, 2012, concurring with BLM's consultation requirement conditions prior to drilling activities.
Kurt Perron, Chairman Bay Mills Indian Community 12140 West Lakeshore Drive Brimley, MI 49715	The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response, assumes no concerns or issues at this time.
Alan Shively, Chairman Lac Vieux Desert Band of Lake Superior Chippewa Indians P.O. Box 249 Watersmeet, MI 49969	The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response, assumes no concerns or issues at this time.
Joseph Eitrem, Chairman Sault Ste. Marie Tribe of Chippewa Indians 523 Ashmun St. Sault Ste. Marie, MI 49783	The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response, assumes no concerns or issues at this time.
Dexter McNamara, Chairman Little Traverse Bay Bands of Odawa Indians 7500 Odawa Circle Harbor Springs, MI 49740	The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response, assumes no concerns or issues at this time.

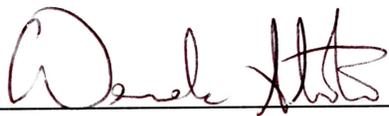
<b>Name</b>	<b>Purpose &amp; Authorities for Consultation or Coordination</b>	<b>Findings &amp; Conclusions</b>
Derek Bailey, Chairman Grand Traverse Band of Ottawa & Chippewa Indians 2605 N. West Bay Shore Dr. Peshawbestown MI 49682- 9275	The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response, assumes no concerns or issues at this time.
Kenneth Meshigaud, Chairman Hannahville Indian Community N14911 Hannahville B-1 Rd. Wilson MI 49896	The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response, assumes no concerns or issues at this time.
Homer Mandoka, Tribal Council Chairperson Nottawaseppi Huron Band of Potawatomi 2221 1-½ Mile Road Fulton, MI 49052	The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response, assumes no concerns or issues at this time.
David Sprague, Chairman Match-E-Be-Nash-She-Wish Band of Pottawatomi Indians PO Box 218 Dorr, MI 49323	The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response, assumes no concerns or issues at this time.
Matthew Wesaw, Mekko Pokagon Band of Potawatomi Indians 58620 Sink Road, Box 180 Dowagiac, MI 49047	The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response, assumes no concerns or issues at this time.
Warren Swartz, Jr., President Keweenaw Bay Indian Community 16429 Beartown Rd. Baraga, MI 49908	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.	Letter to BLM dated March 22, 2012, indicating “no areas of archaeological, cultural, historical, or religious interests documented within the Area of Potential Effect.”
Julius Peters, Chief Saginaw Chippewa Indian Tribe 7070 East Broadway Road Mt. Pleasant, MI 48858	The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other	No response, assumes no concerns or issues at this time.

Name	Purpose & Authorities for Consultation or Coordination	Findings & Conclusions
	statutes and executive orders.	
Larry Romanelli, Tribal Ogema Little River Band of Ottawa Indians 375 River Street Manistee, MI 49660	The National Historic Preservation Act, The American Indian Religious Freedom Act, The Native American Graves Protection and Repatriation Act, E.O. 13007, and/or other statutes and executive orders.	No response, assumes no concerns or issues at this time.

## List of Preparers

### BLM Preparers

Name	Title	Responsible for the Following Section(s) of this Document
Derek Strohl	Natural Resources Specialist	Air Quality, Climate Change, Cultural Resources, Native American Religious Concerns, Prime and Unique Farmlands, Fish and Wildlife, Floodplains, Hazardous Wastes, Invasive Species/Noxious Weeds, Recreation, Soils, Threatened, Endangered, or Candidate Animal Species/Migratory Birds, Vegetation, Visual Resources, Water Resources/Quality (Drinking/Surface/Ground), Wetland/Riparian Zones, Wild and Scenic Rivers, and Wilderness; Preparer
Kurt Wadzinski	Planning and Environmental Coordinator	Environmental Justice, Socioeconomics; Editor
Dave Lachance, Jeff Nolder	Geologists	Geology/Mineral Resources/Energy Production

  
Preparer

Sept. 19, 2012  
Date

  
Planning & Environmental Coordinator

Sept. 24, 2012  
Date

  
Assistant Field Manager, Natural Resources

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Date

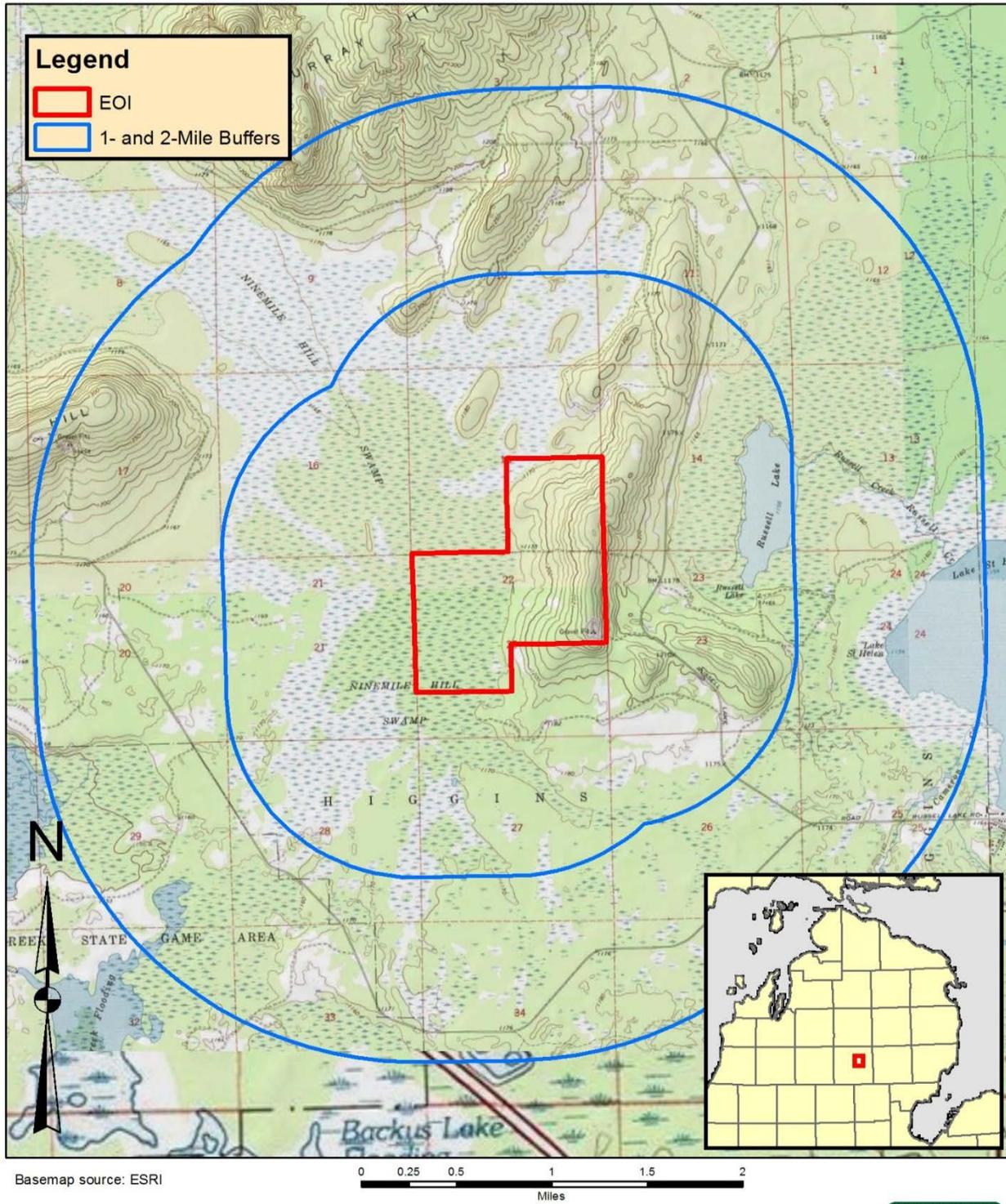
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# APPENDIX A – Figures

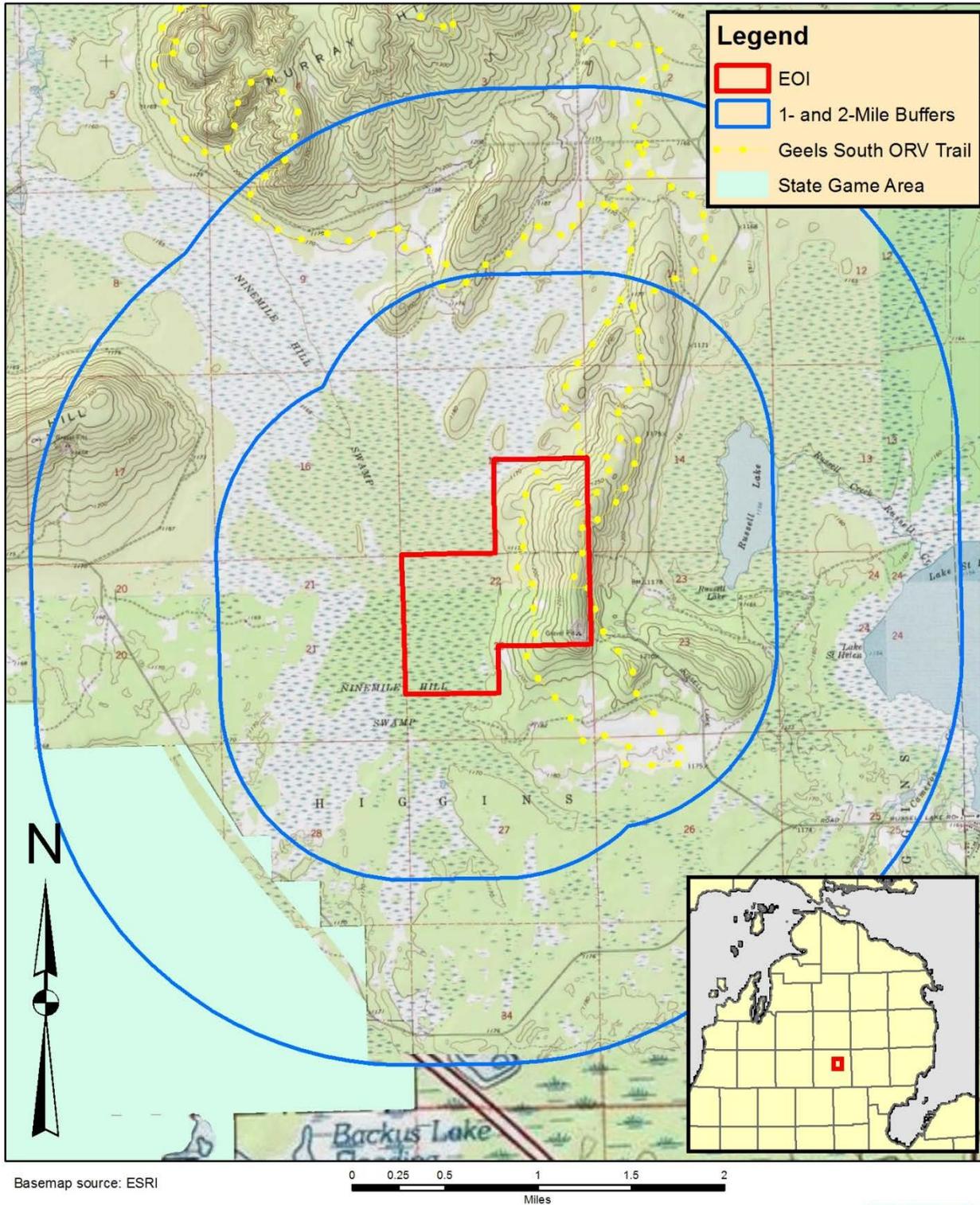
Figure 1. EOI and 1- and 2-Mile Distances from EOI



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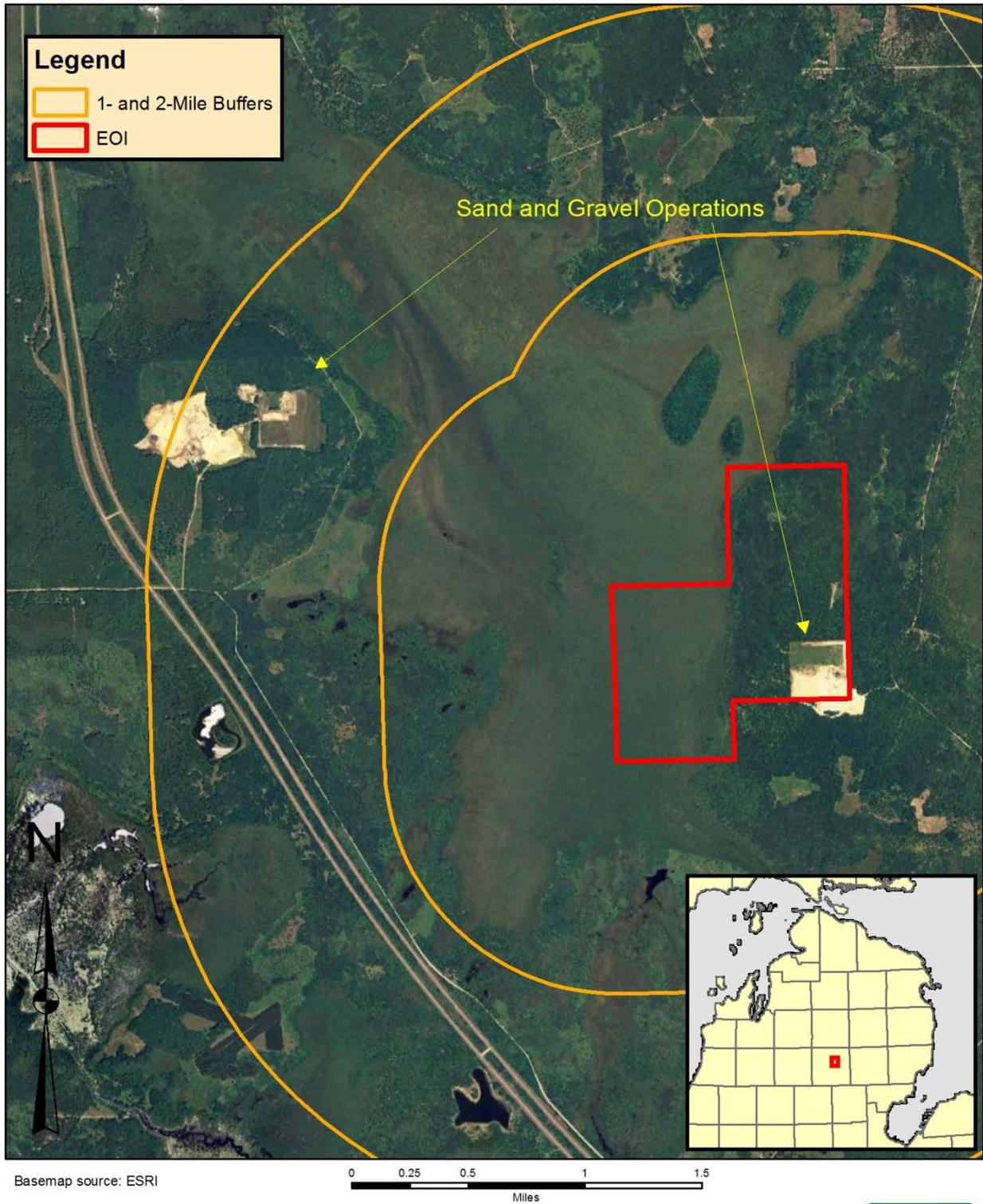
Figure 2. Recreational Trails and State Game Area



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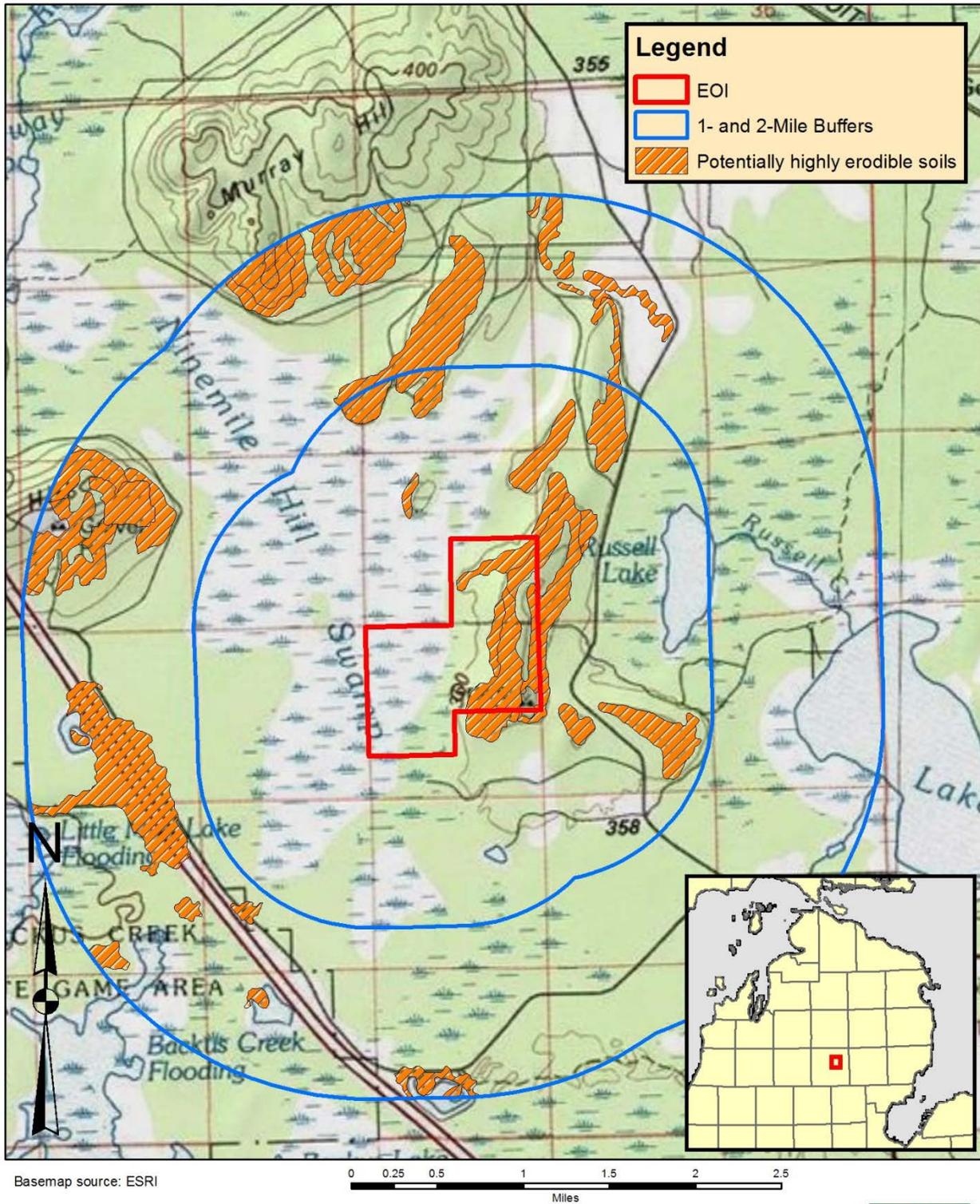
Figure 3. Sand and Gravel Quarries



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Figure 4. Highly/Potentially Highly Erodible Soils.



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## **APPENDIX B – Stipulations**

1. No surface occupancy shall be permitted in areas that are identified on the Roscommon County Mineral Lease Information and DNR Ownership map as “Non-Development.” Exceptions to this stipulation may be made with the written approval of the Michigan Department of Natural Resources.
2. No surface occupancy shall be permitted in the Backus Creek State Game Area.
3. No surface occupancy shall be permitted in the Special Conservation Areas. Exceptions to this stipulation may be made with the written approval of the Michigan Department of Natural Resources.
4. No surface occupancy shall be permitted in wetlands. Exceptions to this stipulation may be granted in writing by the BLM and the MDNR.
5. No surface occupancy will be permitted within 200 feet from any navigable waterway. Exceptions may be made in writing by the BLM for improvements made to existing stream crossings; exceptions made will incorporate best management practices to minimize impacts to water resources.