

Arche Solar Project

Case No. 20-0979-EL-BGN



Exhibit F

Ecological Assessment

Ecological Assessment

7X Energy, Inc.

Arche Energy Project, LLC

July 2020

E319302601



Document Information

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Acronyms

AC	Alternating Current
Arche Solar	Arche Energy Project, LLC
AWS	Agricultural Water Supplies
BGEPA	Bald and Golden Eagle Protection Act
BMPs	Best Management Practices
BW	Bathing Waters
CECPN	Certificate of Environmental Compatibility and Public Need
CFR	Code of Federal Regulations
CGP	Construction General Permit
CWA	Clean Water Act
CHW	Cold Water Habitat
DC	Direct Current
DOW	Division of Wildlife
ESA	Endangered Species Act
EWH	Possible Exceptional Warm Water Habitat
FSA	Farm Service Agency
FWS	U.S. Fish and Wildlife Service
GIS	Geographic Information Systems
GPS	Global Positioning System
HDD	Horizontal Directional Drilling
HHEI	Headwater Habitat Evaluation Index
HUC	Hydrologic Unit Code
IBA	Important Bird Areas
IPaC	Information for Planning and Conservation
IWS	Industrial Water Supplies
JD	Jurisdictional Determination
kV	kilovolt
lf	linear feet
Lf	Lenawee Series
LRW	Limited Resource Water
MBTA	Migratory Bird Treaty Act
Mf	Mermill Loam
Mo	Millgrove Loam
MRLC	Multi-Resolution Land Characteristics Consortium
MW	Megawatt

MWH	Modified Warm Water Habitat
NHD	National Hydrography Dataset
NHPA	National Historic Preservation Act
NLCD	National Land Cover Database
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
NWP	Nationwide Permit
OAC	Ohio Administrative Code
ODNR	Ohio Division of Natural Resources
OEPA	Ohio Environmental Protection Agency
OHWM	Ordinary High Water Mark
ONHD	Ohio Natural Heritage Database
OPSB	Ohio Power Siting Board
ORAM	Ohio Rapid Assessment Methodology
ORC	Ohio Revised Code
OSHPO	Ohio State Historic Preservation Office
OWI	Ohio Wetland Inventory
PCR	Primary Contract Recreation
PEM	Palustrine Emergent Wetland
PFO	Palustrine Forested Wetland
PHWH	Primary Headwater Habitat Stream
Project	Arche Solar
PV	Photovoltaic
PWS	Public Water Supply
QHEI	Qualitative Habitat Evaluation Index
RTE	Rare, Threatened or Endangered species
s.f.	Square Foot
SCR	Secondary Contact Recreation
SESC	Soil erosion and sediment control
SMS	Solar meteorological station
SRW	State Resource Water
SSH	Seasonal Salmonid Habitat
SWPPP	Storm Water Pollution Prevention Plan
TNW	Traditional Navigable Water
UNT	Unnamed Tributary
USACE	U.S. Army Corps of Engineers

USEPA	U.S. Environmental Protection Agency
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WOTUS	Waters of the United States
WQC	Water Quality Certificate
WWH	Warm Water Habitat

Executive Summary

Arche Energy Project, LLC, an affiliate of 7X Energy, Inc., is proposing to construct Arche Solar (Project) near Fayette, Ohio, which is located approximately 40 miles west of Toledo. The proposed photovoltaic (PV) solar energy facility will have a generation capacity of 107 megawatts (MW). The Project is proposed to be constructed within an area of roughly 1,010 acres of private leased land and easements (Project Area). The Project Area is entirely contained within Gorham Township Fulton County, Ohio.

Proposed Project infrastructure will consist of the fenceline, photovoltaic (PV) panel arrays, below-ground and overhead electrical collection lines, inverters, access roads, a substation, an operations and maintenance (O&M) building, weather stations, and laydown yards. The Project is anticipated to temporarily impact up to 39 acres during construction and permanently impact up to 21 acres during operation. Permanent impacts will be limited to approximately 1.3 acres associated with solar piles, 16.19 acres of access roads, 1 acre for a permanent laydown yard, 1.8 acres to accommodate the substation, 1 acre for the Project O&M facility and approximately 0.2 acres to accommodate inverters. Temporary impacts are associated with workspaces to accommodate the installation of Project infrastructure in addition to laydown yards that will be utilized to stage equipment and materials during construction.

As part of the Ecological Assessment, a desktop review of environmental resources was completed for the Project Area. This included a review of land use, bedrock geology, glacial drift, wetlands, water quality/floodplain, and major species habitat.

Cardno also conducted field studies within the approximately 1,010-acre Project Area. A habitat assessment was completed for the Project Area, in addition to a visual habitat assessment on a ¼-mile buffer surrounding the Project Area. Cardno also conducted a wetland delineation field survey to identify wetland or potential waterbodies of the United States, in accordance with Sections 401/404 of the Clean Water Act (CWA). Cardno's field efforts focused on accessible parcels across a broad area of leased parcels and easements

Based on preliminary survey data and habitat evaluations, the Project will be constructed primarily on land that is agricultural with some scattered woodlots. Upon construction of the proposed Project, most of the Project Area land will no longer be available for agricultural use, resulting in a conversion to vegetated open land in the form of a commercial solar field. The construction of the Project infrastructure may require tree clearing of smaller woodlots and woodlot edges to reduce shading and provide contiguous acreage for the Project. All of the proposed tree clearing is located in upland areas; no forested wetlands will be cleared. Habitat evaluations also found that the proposed Project is unlikely to have a significant impact on local or migratory bird populations, due to limited habitat provided by agricultural fields. The Project will observe seasonal restrictions on tree clearing to protect listed bat species (e.g., cutting trees only between October and March), or as conditions specify. Additionally, recommendations provided via consultation with the Fish and Wildlife Service and Ohio DNR will be followed. Thus, it was determined that the Project is not likely to have significant or adverse impacts to wildlife or sensitive species utilizing the Project Area.

Energy projects commonly include pre-construction and post-construction monitoring of the Project Area. Surveys include (but are not limited to) researching the biological resources within the Project Area (wetlands, waterbodies, etc.), migration patterns of birds/bats passing through the Project Area, and the protective status of migratory and nesting/resident species in an area where Project infrastructure is being considered. At this time, no species-specific surveys have been conducted for the Project, and due to the low probability of impact to sensitive species, none are recommended.

As part of the assessment, Cardno conducted a wetland delineation field survey to identify wetlands and potential waterbodies (Waters of the United States [WOTUS]), in accordance with Section 401/404 of the CWA. Potentially jurisdictional WOTUS, including Traditional Navigable Waters (TNW), their tributaries, and non-isolated wetlands, which are regulated under the jurisdiction of the State of Ohio and the U.S. Army Corps of Engineers (USACE) in accordance with Sections 401/404 of the CWA, were identified. In addition, isolated waterbodies and wetlands that do not have a significant nexus to TNW, which are considered waters of Ohio (as defined under Ohio Administrative Code [OAC] Rule 3745-1-02 (b)(77)¹) and are regulated by the Ohio Environmental Protection Agency (OEPA)'s Isolated Wetlands Permitting Program, were also identified. Cardno's wetland delineation surveyed approximately 1,162 acres, including the Project Area and additional properties.

Based on the field survey, four wetlands were identified totaling 1.24 acres. Two wetlands were identified as palustrine emergent (PEM) and two wetlands were identified as palustrine forested (PFO). Based on the preliminary Project layout provided by Arche, no delineated wetlands will be impacted by the construction, operation, or maintenance of this Project.

Seven waterbodies (streams, ponds, and ditches) were delineated within the Project Area, totaling 19,318 linear feet (lf) of waterway. The most significant waterbody is Spring Creek, which runs through the entire middle portion of the Project Area. The waterbodies observed were mostly National Hydrography Dataset (NHD) stream features (i.e., unnamed tributaries of Spring and Deer Creek) and one man-made pond. Three (3) of the delineated streams were scored as Class II features. Many of the streams delineated within the Project Area ran through narrow windrows or woodlots; five (5) of the streams were categorized as perennial the other two (2) streams were categorized as ephemeral features. Current Project designs avoid direct impacts to all delineated streams, horizontal directional drilling technology (HDD) will be utilized to avoid impacts to stream 001-A at three (3) collection line crossings. Due to the modification and disturbance present in the surrounding land use, and lack of flowing water, the waterbodies identified in the Project Area are unlikely to support significant aquatic communities.

¹ OEPA 2017.

1 Introduction

Arche Solar is proposing to construct and operate a 107-megawatt (MW) photovoltaic (PV) solar project in Gorham Township, Fulton County, Ohio. The Project is located within an area of approximately 1,010 acres of private land (Project Area). Figure 1.1 shows an aerial overview of the proposed Project Area, and Figure 1.2 shows the proposed Project Boundary.

In coordination with Arche, Cardno prepared this ecological assessment for the Project. Cardno reviewed environmental features and conducted a habitat assessment within the approximately 1,010-acre Project Area in addition to a ¼ mile visual habitat assessment. Cardno also conducted a wetland delineation field survey to identify wetlands and waterbodies of the United States, in accordance with Sections 401/404 of the Clean Water Act (CWA). Cardno's field efforts focused on accessible parcels across a broad area of leased parcels and easements (Survey Area). Interior areas of larger woodlots were not delineated unless there was infrastructure planned to run through these areas, as they most likely will be avoided for Project construction, operation, and maintenance.

This ecological assessment included a desktop review of the Project Area plus a ¼-mile buffer for:

- > Land Use – categories to classify the predominant land use (e.g., agriculture, recreational, water), including vegetative communities;
- > Bedrock Geology – underlying formation and morphology;
- > Glacial Drift – thickness of sediment material over bedrock formations;
- > Wetlands – areas with hydric soils that support hydrology and hydrophytic vegetation;
- > Water Quality/Floodplain – Ohio stream classifications and designations;
- > Habitat characterization; and
- > Major species, including Federal and State-listed threatened and endangered species.

Field studies were conducted on the Project Area during Fall of 2019, and included:

- > Wetland and surface water delineations; and
- > Habitat observations and sensitive species assessment, in the Project Area and visually within ¼ mile of the Project Area.

Appendix A includes the following Project Area Figures:

- > Land Use Map Overview
- > Bedrock Geology
- > Glacial Drift
- > Regional Wildlife Areas
- > Field-Delineated Surface Waters
- > Watersheds
- > 401 Water Quality Certification Map

Figure 1.1 Aerial Overview

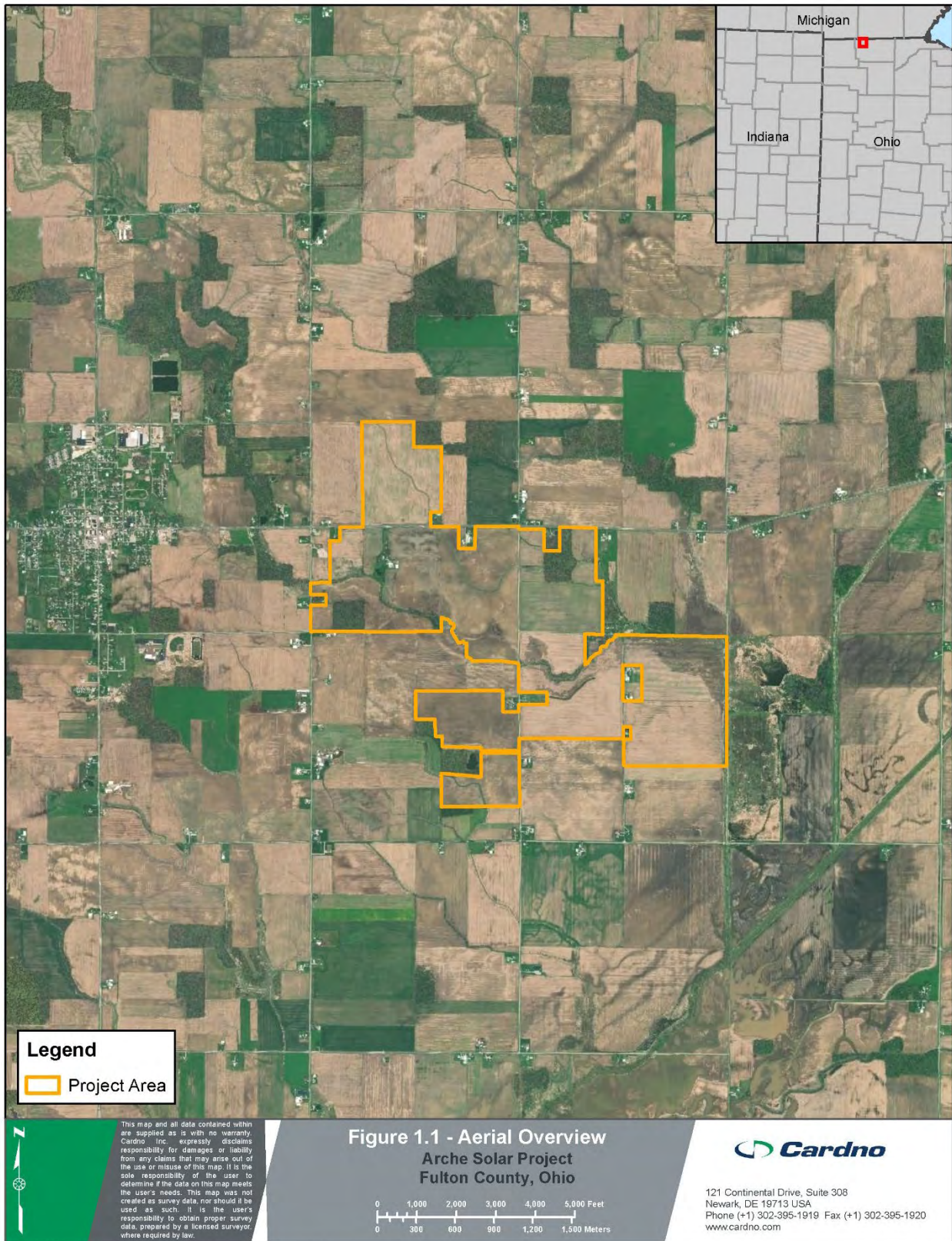
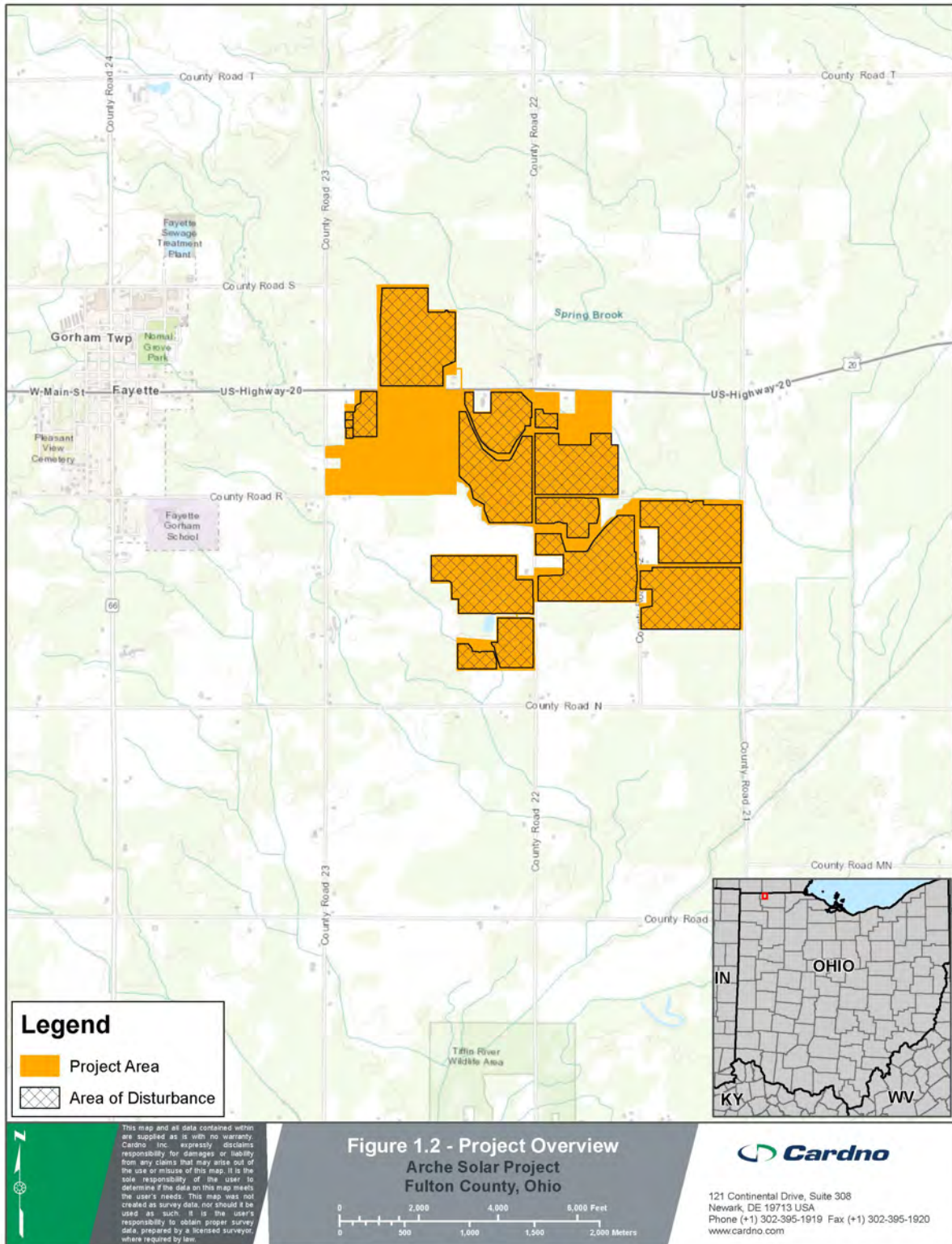


Figure 1.2 Project Overview



1.1 Project Description

Assumptions for the ecological assessment are as follows. These assumptions are based on the preliminary Facility layout developed by Arche. These components are further described in Arche's application for a Certificate of Environmental Compatibility and Public Need (Certificate Application), and the preliminary Facility layout is provided in Figure 03-2 of the Certificate Application:

1.1.1 Site Preparation

The primary steps for Facility construction include the following: (1) installation of storm-water, erosion control, and vegetation protection measures, (2) securing the perimeter of the construction area, (3) vegetation clearing, (4) minor earthwork and grading as necessary, (5) construction of access roads, and (6) installation of equipment such as pilings, racking, panels, inverters, weather stations, the substation, and fencing to secure the site. For a full list of facility components installed on the site, and anticipated impacts associated with those components, refer to Section 1.1.2 below.

For additional details regarding site preparation, refer to sections 4906-03(B) and (C) of the Certificate Application.

1.1.2 Solar Project Infrastructure

The Project will contain the following components. Standard overland construction techniques are anticipated for the installation of these components. For a more thorough description of these Project components, refer to section 4906-4-03(B) of the Certificate Application.

Of the approximately 1,010-acre Project Area, The fence line encompasses approximately 684 acres, while approximately 593 acres will remain as permanent impacts for Project infrastructure (solar arrays, roads, substations, etc.) and no longer be available for current land use. The remaining 91 acres within the fence line will be revegetated and maintained. The total acres of permanent impact may be reduced with revised Project siting and micro-siting of facilities to further minimize or avoid potential impacts.

Arche Solar will likely consist of the following infrastructure:

- > Solar Panels:
 - Typical PV panel size 4-feet by 7-feet, up to 14 feet at highest point
 - Panels will be grouped into a series of circuits (strings or rows)
 - Panel support piles less than 1 s.f. each, directly driven 8 to 10 feet below ground surface (up to 54,295 piles, or up to 1.25 acre total spread across 572-acre array area)
 - 20 to 25 feet of open space between panel strings
 - Up to 572 acres of solar array blocks (5 to 10 acres per block)
- > Project Substation and Support Facilities:
 - Up to 1.8 acre Project Substation
 - Up to 1 acre O&M facility
 - Security fencing and access gates

- The Project will also contain up to five on-site solar meteorological stations (SMSs or pyranometer), which would consist of irradiance (solar energy) meters as well as air temperature and wind meters. These met stations would be mounted on columns with a footprint of up to approximately 1 s.f. each, 5 s.f. total.
- > Inverters:
 - Inverter pads are anticipated to be 265 s.f. permanent concrete slab or mounted on 8 driven support posts per inverter (up to 33 inverter pads total).
 - Permanent impacts are anticipated to be 0.20 acres.
- > Collection Lines:
 - Up to 8.4 miles of cable trench, 20-foot wide temporary work area (10 acres)
 - Buried 36 inches below grade (outside fence lines)
 - All jurisdictional perennial streams will be avoided using HDD technology
- > Overhead Collection Line
 - Up to 0.7 miles of overhead collection line
 - The collection line will be supported by 9 wooden poles; 40 ft tall each
 - Temporary impacts from the collection line is anticipated to be < 0.5 acres and permanent impacts are anticipated to be up to 0.01 acres.
- > Access Roads:
 - Up to 6.6 miles of access roads
 - Access roads will have an impact width of up to 50 feet during construction (22.23 acres) to accommodate locations requiring cut and fill or clearance for two delivery vehicles. Permanent impacts from access roads will consist of a maintained 20 feet wide access roads post-construction (16.13 acres)
- > Overhead Generation Interconnection (Gen-Tie) Line
 - The overhead line will be supported on up to 2 wood or steel poles. The Height of the poles will not exceed 100ft.
 - The pole(s) will be installed using typical installation techniques to carry 138kV electric lines.
 - Wooden poles would be directly driven; if steel poles are used a caisson foundation would likely be used. The temporary impacts for the construction will be up to 0.1 acres and permanent impacts are anticipated to be less than 0.05 acres.
- > Equipment Laydown Areas:

- Up to 6.15 acres will be used for laydown areas; for storage of construction equipment and supplies during construction
- Up to 5.15 acres will be temporary during the construction phase
- Up to 1 acre (of the 6.15-acre area) will be maintained as permanent gravel-covered parking / laydown area.

1.1.3 Operation and Maintenance

Once in operation, the Project will generate electricity during daylight hours. Operation and maintenance workers will monitor operations remotely and conduct periodic cleaning and on-site maintenance procedures as needed. It is anticipated that Project-related supplies will be stored on-site with the 1-acre permanent O&M/Parking/Laydown pad.

On-site activities will include periodic panel washing and facility maintenance. Only authorized personnel will be permitted on-site (e.g., employees monitoring and maintaining the Project). Project maintenance includes periodic maintenance of solar panels and solar components as well as the internal access road network. The level of vehicle activity entering and leaving the site during operation will be limited to scheduled and emergency maintenance visits. Manual solar panel washing will likely take place 2 to 3 times per year, depending on seasonal precipitation in the Project Area.

2 Regulatory Overview

Arche Energy Project, LLC is seeking a Certificate of Environmental Compatibility and Public Need (CECPN) from the Ohio Power Siting Board (OPSB). The OPSB CECPN process includes a rigorous review from agencies including the OPSB, Ohio State Historic Preservation Office (OSHPO), U.S. Fish and Wildlife Service (FWS), and Ohio Department of Natural Resources (ODNR), among other agencies. Additional information regarding FWS and OSHPO coordination is provided in Section 3.

Table 2-1 provides further detail of the primary agencies and their regulatory authorities that may apply to the proposed Project.

Table 2-1 Potential Permit Requirements for the Project

Lead Agency/ Address	Agency Permit/Approval	Key Permit/Approval Thresholds
Federal Approvals		
U.S. Army Corps of Engineers (USACE) Huntington District	Clean Water Act (CWA) Section 404	Discharge of dredged and fill materials into waters of the United States (WOTUS), including wetlands with a significant nexus to navigable waterways. Section 10 of the Rivers and Harbors Act (which applies to dredge and fill activities in navigable waters) is not applicable, as there are no navigable waterways in the Project Area.
U.S. Fish and Wildlife Service (FWS) Ohio Field Office	50 Code of Federal Regulations (CFR) 402; Section 7(a)(2) Clearance; Threatened and Endangered Species	The Endangered Species Act of 1973 (ESA) under Section 7(a)(2) directs all Federal agencies to ensure that any action they authorize, fund, or carry-out does not jeopardize the continued existence of an endangered or threatened species or designated or proposed critical habitat (collectively referred to as protected resources).
State Approvals		
Ohio Power Siting Board (OPSB)	Certificate of Environmental Compatibility and Public Need <i>(OAC Chapter 4906-4)</i>	The OPSB has the authority to approve solar electric generation and transmission facilities that will generate 50 or more MW.
Ohio Department of Natural Resources (ODNR)	State Rare, Threatened and Endangered Species. Ohio Code 1531.25	The chief of the division of wildlife, with the approval of the wildlife council, shall adopt and may modify and repeal rules, in accordance with Chapter 119 of the Revised Code, restricting the taking or possession of native wildlife, or any eggs or offspring thereof, that he or she finds to be threatened with statewide extinction.
Ohio Historic Preservation Office (OSHPO) Ohio Historical Society	Section 106 compliance (36 CFR 800.11) Ohio Revised Code (ORC) Sections 149:51 through 149:54	Section 106 of the National Historic Preservation Act (NHPA) applies to certain projects that involve construction, demolition, or earthmoving activities, as mandated by Section 106 of the NHPA and 36 CFR 800.
Ohio Environmental Protection Agency (OEPA)	CWA Section 401 Water Quality Certification <i>(ORC Chapter 6111)</i>	Discharge of dredge and fill materials into WOTUS, including wetlands with a significant nexus to navigable waterways.

Table 2-1 Potential Permit Requirements for the Project

Lead Agency/ Address	Agency Permit/Approval	Key Permit/Approval Thresholds
Ohio Environmental Protection Agency	Isolated Wetlands Permit (ORC Chapter 6111.02-.029)	Construction activities that disturb isolated wetlands.
Ohio Environmental Protection Agency Division of Surface Water	National Pollution Discharge Elimination System (NPDES) Construction General Permit (CGP) OEPA Permit No.: OHC000003	The NPDES CGP renewal authorizes NPDES permit coverage for those construction activities involving one or more acres of land disturbance.

2.1 Federal

In accordance with Section 404 of the CWA, the Project is located within the jurisdiction of the United States Army Corps of Engineers (USACE) Buffalo District in Fulton County, Ohio. The USACE holds jurisdiction over “Waters of the U.S.” (WOTUS) within the Project Area. At this time, we do not anticipate any impact to Water of the US. Arche Solar has completed detailed field assessment of wetlands and waters to inform Project design and ensure compliance with CWA requirements.

The FWS requires the protection of species that are listed as threatened or endangered under the Endangered Species Act (ESA). Projects that have the potential to result in “take” of individuals or impact Designated Critical Habitat for these species, require permit authorization from the FWS. In addition, the Bald and Golden Eagle Protection Act (BGEPA or Eagle Protection Act) and Migratory Bird Treaty Act (MBTA) establish provisions for the protection of eagles and migratory birds that are not necessarily threatened or endangered. The FWS will typically review project information and provide technical assistance in an effort to avoid or minimize risk of any potential take of a species.

2.2 Section 404 / Clean Water Act

Surface waters are regulated under the CWA, under jurisdiction of either the state or federal government. Cardno identified potentially jurisdictional WOTUS, including Traditionally Navigable Waters (TNW), their tributaries, and non-isolated wetlands, which are regulated under the jurisdiction of the State of Ohio and the USACE in accordance with Section 401/404 of the CWA. Cardno also identified waterbodies and isolated wetlands that do not have a significant nexus to a TNW, which are considered waters of Ohio (as defined under Ohio Administrative Code [OAC] Rule 3745-1-02(b)(77)²) and are regulated by the Ohio Environmental Protection Agency (OEPA’s) Isolated Wetlands Permitting Program. Based on the preliminary Project layout, with no permanent impacts anticipated to wetland or waterbodies, no USACE coordination or permit is required for the Project.

2.3 Section 401 / Clean Water Act / Water Quality Certification

In Ohio, the Section 401 Water Quality Certification (WQC), and Isolated Wetland Permitting Section of the OEPA reviews applications for projects that propose the placement of fill or dredged material into WOTUS, as well as isolated waterbodies and wetlands that do not have a significant nexus to TNW, which are considered waters of Ohio (as defined under OAC Rule 3745-1-02 (b)(77)³).

On March 17, 2017, OEPA finalized the *401 WQC and Response to Comments for the 2017 Nationwide Permits* published by the USACE. Based on those 2017 Nationwide Permit (NWP) requirements, projects

² OEPA 2017

³ [OAC 3745-1-02](#)

seeking a NWP (including #12), may review the OEPA's Stream Eligibility Map⁴ to help determine if an individual WQC is required or not. This map identifies areas where projects are 'Eligible', 'Ineligible', or 'Possibly Eligible' to use a NWP for 401 coverage. Based on the preliminary Project layout, it is not anticipated that an individual WQC is required for the Project.

2.3.1 2017 Nationwide Permit 12 Ohio 401 Certification Special Limitations and Conditions

If impacts to WOTUS from the Project cannot be fully avoided as anticipated, the Project may use USACE Nationwide Permit #12 (NWP 12) to authorize impacts from certain access roads and collection lines. Under NWP 12 the individual crossings would be single and complete, provided the activity does not result in the loss of greater than ½-acre of WOTUS. The following lists the 2017 NWP 12 Ohio Special Limitations and Conditions:

1. Ohio state certification general limitations and conditions apply to this NWP.
2. Except for maintenance activities authorized under this NWP, individual 401 WQC is required for use of this NWP when temporary or permanent impacts are proposed on or in any of the following waters:
 - a. Category 1 or 2 wetlands when impacts exceed 0.50 acre;
 - b. Streams located in '*Ineligible*' areas determined through the NWP Stream Eligibility guidance
 - c. Streams located in '*Possibly Eligible*' areas determined to be high quality through one of the NWP eligibility flowcharts;
 - d. State wild and scenic rivers;
 - e. National wild and scenic rivers; and
 - f. General high quality water bodies, which harbor Federal and State-listed threatened or endangered aquatic species.
3. Temporary or permanent impacts to Category 3 wetlands are limited to less than 0.10 acre for activities involving the repair, maintenance, replacement, or safety upgrades to existing infrastructure that meets the definition of public need. OEPA will make the determination if a project meets public need during the ODNR Ohio's Rapid Assessment Methodology (ORAM) verification process.
4. Temporary or permanent impacts, as a result of stream crossings, shall not exceed a total of three per stream mile per stream.
5. For an individual stream, while the repair or replacement of an existing culvert of any length is not limited by this certification, any culvert extension shall not exceed 300 linear feet (lf).
6. All hydric soils up to 12 inches in depth within wetlands shall be stockpiled and replaced as the topmost backfill layer. BMPs, such as silt fencing and soil stabilization, shall be implemented to reduce erosion and sediment runoff into adjacent wetlands.
7. Buried utility lines shall be installed at a 90-degree angle to the stream bank to the maximum extent practicable. When a 90-degree angle is not possible, the length of any buried utility line within any single water body shall not exceed twice the width of that water body at the location of the crossing.
8. The total width of any excavation, grading or mechanized clearing of vegetation and soil shall not exceed a maximum of 50 feet.

⁴ <https://oeпа.maps.arcgis.com/apps/webappviewer/index.html?id=e6b46d29a38f46229c1eb47deefe49b6>

Currently there are no anticipated impacts to wetlands and waterbodies therefore no USACE permits are anticipated to be needed.

The Project will require a National Pollution Discharge Elimination System (NPDES) Construction General Permit (CGP) based on the assessment that one or more acres of land disturbance will likely occur. A storm water pollution prevention plan (SWPPP) will also be prepared for the Project that will use sound engineering and/or conservation practices and implementation of standard SESC and storm water management practices addressing all phases of construction.

2.4 Jurisdictional Determination

Cardno made a recommendation on the potential jurisdictional status of each identified surface water feature based on USACE/U.S. Environmental Protection Agency (USEPA) guidance material. Guidance used for these determinations includes documentation from the USEPA "Current Implementation of Waters of the United States"⁵, which refers to the original 1986/1988 promulgation and subsequent Supreme Court cases which further defined the term. The guidance document developed after the rulings from USEPA and USACE identified several key points regarding jurisdiction and when it would be exercised.

Critical to the guidance was the definition of a *significant nexus*, which would be determined by assessing the flow characteristics of a tributary and functions performed by any adjacent wetlands. The function of a wetland or waterbody was the potential ability to alter the chemical, physical, or biological integrity of a down-stream TNW.

The Code of Federal Regulations (40 CFR 230.3), defines WOTUS as:

1. All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
2. All interstate waters including interstate wetlands;
3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
 - a. Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
 - b. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
 - c. Which are used or could be used for industrial purposes by industries in interstate commerce;
4. All impoundments of waters otherwise defined as WOTUS under this definition;
5. Tributaries of waters identified in paragraph (o)(3)(iii) of this section;
6. The territorial sea;
7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (s)(1) through (6) of this section; waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 423.11(m) which also meet the criteria of this definition) are not WOTUS.

⁵ 40 CFR 230.3

Final verification of WOTUS boundaries for regulatory purposes can only be completed through a Jurisdictional Determination (JD) review by the USACE or its duly appointed representative.

3 Agency Consultation

3.1 U.S. Fish and Wildlife Service

On behalf of Arche Solar, Cardno submitted an Environmental Review request to the FWS on March 4, 2020. The FWS responded on March 20, 2020. The FWS stated that there are no federal wildlife areas, wildlife refuges or critical species habitats located in or around the Project. FWS also mentions that throughout the entirety of Ohio, there is potential for the presence of the federally endangered Indiana Bat (*myotis sodalis*) and the federally threatened Northern Long-eared Bat (*myotis septentrionalis*). They recommend minimizing water quality impacts and tree clearing, but state that unavoidable tree clearing should occur between October 1 and March 31 to avoid impacts to these species. The Project will adhere to the tree clearing dates recommended by the Service.

Due to the project type, size and location, USFWS does not expect that additional surveys will be necessary. No other adverse effects to federally endangered, threatened, or sensitive species are anticipated by FWS. Arche Solar is committed to minimizing the tree clearing where possible, and adhering to seasonal restrictions on tree clearing to protect sensitive bat species or as conditions specify.

A desktop review of the FWS Information for Planning and Conservation (IPaC) database is discussed in Section 4.4.3.

3.2 Ohio Department of Natural Resources

On behalf of Arche Solar, Cardno submitted an Environmental Review request to the ODNR on February 28, 2020 and ODNR provided a response dated April 23, 2020. See appendix B for the response letter from the ODNR. ODNR's response was based on an inter-disciplinary review, including input from the Ohio Natural Heritage Database (ONHD), Division of Fish and Wildlife (DOW), and the Division of Water Resources.

ONHD records provided the following records at or within a 1-mile radius of the Project Area: the Northern Harrier (*Circus hudsonius*) a state endangered species and the Badger (*Taxidea taxus*) a state species of concern.

The DOW recommends that impacts to streams, wetlands and other water resources be avoided and minimized to the fullest extent possible, and that BMPs be utilized to minimize erosion and sedimentation.

The DOW along with the Ohio Pollinator Habitat Initiative also recommend the areas between and around the solar panels be planted with legumes and wildflowers that are beneficial to pollinators and other wildlife in the area. They provided a list of these suggested plants (included in Appendix B, Agency Correspondence) and noted that they are all low growing, will not cast shadows on the panels and only require minimal maintenance. In areas where vegetation does not need to be low growing, they suggest a more diverse array of flowering plants and perennial vegetation to promote foraging habitat to songbirds.

The DOW also commented that the Project is within range of the Indiana bat (*Myotis sodalis*). The DOW recommends that if suitable habitat is located in the Project Area, that Indiana bat roosting trees be conserved. If suitable habitat occurs within the Project Area and trees must be cut, the DOW recommends cutting occur between October 1 and March 31. If tree removal is to occur during the summer months, the DOW recommends net surveys be conducted prior to cutting.

The Project is within range of the rayed bean (*Villosa fabalis*), a state endangered and federally endangered mussel. The DOW understands that mussel reconnaissance surveys did not result in mussels in the area and that streams within a watershed of 10 square miles above the point of impact will be crossed by horizontal directional bore. Due to these circumstances, the DOW states that impacts to mussels are unlikely.

The Project is within the range of the northern harrier (*Circus cyaneus*), a state endangered bird. If common habitat to this species, such as large marshes and grasslands is to be impacted, construction should be avoided during the species' nesting period of May 15 to August 1. If their habitat is unlikely to be disturbed, the DOW states that impacts to this species are unlikely.

The Project is within the range of the lark sparrow (*Chondestes grammacus*), a state endangered bird. If common habitat to this species, such as grasslands, disturbed open areas and shrubby fields along sandy beach ridges are to be impacted, construction should be avoided in this habitat during the species' nesting period from May 1 to June 30. If their habitat is unlikely to be disturbed, the DOW states that impacts to this species are unlikely.

The Division of Water Resources recommended contacting the local floodplain administrator concerning the possible need for any floodplain permits or approvals for this Project.

3.3 Ohio State Historic Preservation Office

Arche Solar is coordinating with OSHPO on the Project; additional information is provided in separate documentation.

4 Desktop Ecological Assessment

Cardno performed a desktop habitat survey using GIS to screen for and classify potential environmental resources. Reference material includes, but is not limited to, the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Survey for Fulton County, historic aerial photographs or farmed wetland maps from the USDA Farm Service Agency (FSA), National Wetland Inventory (NWI) maps, Ohio Wetland Inventory (OWI) maps, U.S. Geological Survey (USGS) topographic maps, the USGS National Hydrography Dataset (NHD), and recent aerial photographs. If GIS data that did not contain data within the Project Area, or applicable buffer area, the layers were not studied further.

4.1 Land Use

The land use types within the Project Area are based on data provided by the Multi-Resolution Land Characteristics Consortium (MRLC), from the 2011 National Land Cover Database, amended 2014 (MRLC 2011). The land use categories within the Project Area are classified according to the predominant land use, as follows:

- > **Agricultural (Cultivated Crops)** – Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20% of total vegetation. This class also includes all land being actively tilled.
- > **Agricultural (Pasture/Hay)** – Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation.
- > **Forested (Deciduous)** – Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal change.
- > **Woody Wetlands** – areas where forest or shrubland vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
- > **Developed, Open Space** – Areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.
- > **Mixed Developed** – A combination of three NLCD classes:
 - Developed (Low Intensity)
 - Developed (Medium Intensity)
 - Developed (High Intensity)
- > **Emergent Herbaceous Wetlands** – areas where perennial herbaceous vegetation accounts for greater than 80% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Based on a review of available aerial imagery the Project Area appeared to generally occur in cultivated crop areas, with isolated wood lots or buffer strips between agricultural areas. Review of the 2011 NLCD (Homer et al. 2015) confirmed this assessment, which showed that Agricultural (Cultivated Crops) accounted for approximately 92% of the total Project Area acreage. The second most prominent land use within the Project Area was classified as Developed, open space (primarily residential space), which

accounted for approximately 3% of the acreage. The third most prominent land use was Deciduous Forest areas, occurring mostly as isolated woodlots or buffer strips between agricultural areas, which accounted for approximately 3% of the Project Area. All other land use categories accounted for 1% or less of the total acreage in the Project Area. A summary is provided in Table 4-1 below.

Land Use of the Project Area is illustrated in Figure A-1 of Appendix A, Project Area Figures.

Table 4-1 Land Use within the Project Area

Type	Project Area (acres)	Project Area (%)
Cultivated Crops	927.96	92%
Developed, Open Space	32.69	3%
Deciduous Forest	27.21	3%
Woody Wetlands	10.30	1%
Developed, Low Intensity	6.31	<1%
Pasture/Hay	1.73	<1%
Emergent Herbaceous Wetlands	1.61	<1%
Mixed Forest	1.56	<1%
Developed, Medium Intensity	0.98	<1%
Total	1,010.35*	100%

Compiled from USDI 2011, amended 2014.

*The total acreage used in these calculations differs slightly from the project area due to minor differences inherent to the level of precision of the National Land Cover Dataset.

4.1.1 Agricultural Conversion Considerations

As described above, the Project Area primarily exists as active agricultural lands (92%). Upon construction of the proposed Project, most of the Project Area land will be converted to solar panels and will no longer be available for agricultural use.

With respect to converting an agricultural field to solar panels, such a conversion is expected to have a negligible environmental impact. Agriculture fields provide minimal habitat for floral and faunal communities, and are disturbed on a seasonal and/or annual basis by farming activities such as plowing, planting, and harvesting. The Project would no longer be intensely disturbed by tilling and other agricultural activities on a regular basis. A conversion of land use could create different species mix within the Project Area. The solar area will be planted with native species. Faunal species tolerant of an agricultural field could likely be tolerant of a solar field, as both are managed land. Significant loss of vegetation is not anticipated as the solar fields will consist of low growing vegetation throughout the solar arrays. Generally, ground surface under the solar panels is managed to be stable and maintained to create ground cover, which will have less runoff and sedimentation to local waterbodies in comparison to an agricultural field. Solar fields are also managed to stabilize the surrounding area to reduce soiling of the solar PV panels, which can come from dust, snow, and other particles that can settle on the array.

4.2 Geology

The Project is located within the Central Lowland Huron-Erie Lake Plains of Ohio, and in particular, between the Central Ohio Clayey Till Plain and the Maumee Lake Plains Physiographic Regions of Ohio. The Central Ohio Clayey Till Plain has a surface of clayey till, well-defined moraines with intervening flat-lying ground moraine and intermorainal lake basins; no boulder belts; about a dozen silt-, clay- and till-filled lake basins range in area from a few to 200 square miles; few large streams; limited sand & gravel

outwash; elevation 700'-1150', moderate relief (100'). The Maumee Lake Plains is a flat-lying Ice-Age lake basin with beach ridges, bars, dunes, deltas, and clay flats; contained the former Black Swamp; slightly dissected by modern streams; elevation 570'-800', very low relief (5') (ODGS 1998).

The Project Area is overlain by two bedrock formations – primarily the Coldwater Shale with a strip of Sunbury Shale in the west-northwest corner of the Project Area. These Formations consist of sandstone and shale.

Bedrock geology of the Project Area is illustrated in Figure A-2 of Appendix A, Project Area Figures.

4.2.1 Glacial Drift

Glacial drift depths are considered during the engineering phase of the Project, for subsidence and foundation requirements. Glacial drift depth is defined as the thickness of glacially derived sediments (drift) and post-glacial stream sediments overlying the buried bedrock surface. Generally, the Project Area is located within an area of glacial drift deposits of 50 to 150 feet thick.

Glacial drift thickness of the Project Area is illustrated in Figure A-3 of Appendix A, Project Area Figures.

4.2.2 Karst Terrain

Karst is a type of landform that develops as a result of limestone, dolomite, or gypsum dissolution. Karst terrain is characterized by the presence of features such as sinkholes, caverns, and caves. Karst landforms host some of Ohio's rare fauna; however, they also can be a significant geologic hazard. Sudden collapse of an underground cavern or opening of a sinkhole can cause surface subsidence that can severely damage or destroy any overlying structure such as a building, bridge, or highway.

The Project Area is not located within karst geology and therefore, Project construction or operation would not be impacted by karst terrain.

4.3 Soils

Soils within the Project Area are outlined in Table 4-2 below. Project soil information was obtained from the Web Soil Survey, an application of the NRCS⁶, and from the Soil Survey⁷ of Fulton County, Ohio. The dominant soil types were Fulton silty clay loam, Haskins loam, and Sloan silty clay loams. These three soil types account for a combined 45% of the Project Area. The other remaining soils accounted for smaller portions of the Project Area. In general, the soils were considered prime farmland if drained properly, though poor to moderate drainage and permeability limits the use of subsurface drainage features (such as tiles). Soil series within the Project Area were identified as low slope, which matched topographic and aerial maps. A discussion of specific soil series is provided below for the soils comprising approximately 52% of the Project Area:

The Haskins series, approximately 16% of the total Project Area, consists of very deep, somewhat poorly drained soils that are moderately deep or deep to dense till. They formed in loamy water-sorted or glaciolacustrine material 51 to 102 cm (20 to 40 inches) thick and in the underlying till. These soils are on lake plains and till plains. Slope ranges from 0 to 6 percent. Haskins soils are primarily used to grow corn, soybeans, wheat, oats, and hay. Some areas are used for tomatoes and sugar beets. Native vegetation is deciduous, mixed hardwood forest.

The Fulton series, approximately 18% of the total Project Area, very deep, somewhat poorly drained soils on lake plains. They formed in clayey glaciolacustrine sediments. Slope ranges from 0 to 6 percent. Fulton soils are mostly used to grow corn, soybeans, oats, wheat, and hay. A small portion is in

⁶ <https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>

⁷ <https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/survey/>

permanent pasture or woodland. Native vegetation is deciduous hardwood forest; primarily swamp white oak, northern red oak, pin oak, red maple, and beech.

The Sloan series, approximately 10% of the total Project Area, consists of very deep, very poorly drained soils formed in loamy alluvium on flood plains. Slope ranges from 0 to 2 percent. Sloan soils are used to grow corn and soybeans. Other areas, especially on the flood plains of the smaller streams, are used for permanent pasture or woodland. Native vegetation is deciduous forest, chiefly elm, ash, sycamore, silver maple, and willow.

The Latty Series, approximately 7.5% of the Project Area, consists of very deep, very poorly drained soils formed in clayey glaciolacustrine sediments. These soils are on lake plains. Slope ranges from 0 to 2 percent. Latty soils are used to grow corn, soybeans, wheat, oats, alfalfa, and grass-legume mixtures are the principal crops. Some areas are used for special crops such as tomatoes and sugar beets. Native vegetation is deciduous swamp forest of swamp white oak, bur oak, pin oak, elm, silver maple, and occasionally sycamore and basswood. Much of the ground cover consisted of coarse swampgrass, sedges, and water-tolerant shrubs.

Table 4-2 Soils within the Project Area

Type	Map Unit Description	Hydric Rating	Acreage	Project Area (%)
HkA	Haskins loam, 0 to 3 percent slopes	5	163.51	16.2%
FtA	Fulton silty clay loam, 0 to 2 percent slopes	5	150.04	14.9%
FtB	Fulton silty clay loam, 2 to 6 percent slopes	4	32.68	3.2%
So	Sloan silty clay loam, frequently flooded	85	105.36	10.4%
Lc	Latty silty clay, till substratum, 0 to 1 percent slopes	87	75.85	7.5%
SgB2	Shinrock-Tuscola complex, 3 to 8 percent slopes, eroded	0	69.41	6.9%
Lf	Lenawee silty clay loam, 0 to 1 percent slopes	93	65.84	6.5%
SfB2	Shinrock silty clay loam, 2 to 6 percent slopes, eroded	5	59.08	5.9%
Blo2B1	Blount loam, 2 to 6 percent slopes	4	46.26	4.6%
Blo2A1	Blount loam, 0 to 2 percent slopes	6	38.35	3.8%
Mo	Millgrove loam	90	38.09	3.8%
Mf	Mermill loam	92	36.37	3.6%
TuB	Tuscola fine sandy loam, 3 to 8 percent slopes	0	25.75	2.5%
Pm	Pewamo clay loam	93	20.39	2.0%
RbB	Rawson sandy loam, 2 to 6 percent slopes	8	16.6	1.6%
DfA	Del Rey silt loam, 0 to 3 percent slopes	5	14.27	1.4%
DtA	Dixboro fine sandy loam, 0 to 3 percent slopes	10	14.08	1.4%
KfA	Kibbie loam, 0 to 3 percent slopes	10	12.24	1.2%
ByA	Brady sandy loam, 0 to 3 percent slopes	8	11.56	1.2%
SfC2	Shinrock silty clay loam, 6 to 12 percent slopes, eroded	0	8.15	0.8%
GnC2	Glynwood loam, 6 to 12 percent slopes, eroded	3	3.86	0.4%
RnA	Rimer loamy fine sand, 0 to 3 percent slopes	2	1.67	0.2%
GnB2	Glynwood loam, 2 to 6 percent slopes, eroded	4	0.89	0.1%

Table 4-2 Soils within the Project Area

Type	Map Unit Description	Hydric Rating	Acreage	Project Area (%)
Gf	Gilford fine sandy loam	95	0.07	0.0%
Total			1,010.35*	100%

Source: Compiled from MRLC 2011, amended 2014

4.3.1 Highly Erodible Soils / Steep Slopes

Based on a review of the NRCS Web Soil Survey, the Project Area soils are not classified as highly erodible soils, most with Wind Erodibility Group ratings between 5 and 7 (1 being highly erodible; 8 being least erodible).

4.3.2 Hydric Soils

The poor draining qualities of hydric soils combined with local flat or bowl-shaped topography make these locations predisposed to containing wetland areas. The Project Area is composed of five hydric soils – primarily the Lenawee series (Lf) (6.5% of the Project Area) with a hydric rating of 93. The Millgrove loam (Mo) and Merrimill loam (Mf) has a hydric rating of 90 and 92, respectively; but occurs in only 7% of the Project Area. The two remaining soil types with hydric ratings of 90 or greater each occur within less than 2% of the Project Area. The remaining soils found in the Project Area are either non-hydric or only partially hydric with all other soil series having a hydric rating of 87 or less.

4.4 Biological/Conservation

Information on the existing wildlife in the Project Area was obtained from a variety of sources, including publicly available data from Federal and State agencies. Wildlife within the Project Area could potentially use the area for foraging, migratory stopover, breeding and/or shelter. Based on the current land use, species present in the vicinity of the Project Area are primarily associated with agricultural fields, isolated wooded lots, and potential wetland areas. Major species, as defined by OAC Chapter 4906-17, are those species with recreational or commercial value, or are listed as Federal- or State-listed threatened or endangered species. A discussion of potential Rare, Threatened or Endangered (RTE) species is found below in Section 4.3. Common game species⁸ in northwestern Ohio include American woodcock (*Scolopax minor*), chukar (*Alectoris chukar*), gray partridge (*Perdix perdix*), northern bobwhite (*Colinus virginianus*), ring-necked pheasant (*Phasianus colchicus*), ruffed grouse (*Bonasa umbellus*), wild turkey (*Meleagris gallopavo*), mallard (*Anas platyrhynchos*) and other ducks, mourning dove (*Zenaidura macroura*), eastern cottontail rabbit (*Sylvilagus floridanus*), eastern gray (*Sciurus carolinensis*) and fox (*Sciurus niger*) squirrels, and white-tailed deer (*Odocoileus virginianus*). Other than the agricultural crops in the area, no commercially valuable species are anticipated to be present in the Project Area.

4.4.1 Vegetative Community

Vegetative communities within the Project Area were evaluated based on interpretation of aerial photography. Agricultural land is the dominant community type in the Project Area (92%), with areas of grasses or grass mixtures as developed open space (3%), with isolated wood lots or buffer strips between agricultural areas (3%) and potential wetland areas (1%). Successional communities (e.g., old fields and shrubland) do not occur to any significant extent.

The data obtained during the desktop review was found to be generally consistent with the results of the field survey. As identified in Table 1, the predominant land use in the Survey Area is agricultural (crops).

⁸ http://www.dnr.state.oh.us/Home/wild_resourcehomepage/ResearchandSurveys/WildlifePopulationStatusLandingPage/tabid/19230/Default.aspx

Brief descriptions are provided below for each of the ecological communities in the Project Area.

4.4.1.1 Agricultural Land

The agricultural fields were generally tilled corn, soybean, and winter wheat crops. It is likely that the type of crop changes seasonally, but the general extent of the cultivated area remains roughly the same. Many of the cultivated areas and roadsides have grassy swales, which help maintain drainage for proper growing conditions. These swales often had a mix of herbaceous species including reed canary grass (*Phalaris arundinacea*) and various other grasses (*Festuca* sp. and *Fescue* sp.). The swales appear to be mowed seasonally. Vegetation in the narrow woodlots was characterized by intrusion of weedy species from nearby crop edges including: Canada goldenrod (*Solidago canadensis*), pokeweed (*Phytolacca americana*), Queen Anne's lace (*Daucus carota*), common teasel (*Dipsacus fullonum*), and purple deadnettle (*Lamium purpureum*). Where limited woody vegetation and shrub growth was observed, species included willows (*Salix* sp.), black locust (*Robinia pseudoacacia*), and sycamores (*Platanus occidentalis*).

Pasture/hay areas consist of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle

4.4.1.2 Forestland

The wooded areas of the Project Area occur as isolated woodlots between cultivated fields and along roads. Aggressive weedy species such as pokeweed, blackberry (*Rubus* sp.), and poison ivy (*Toxicodendron radicans*) often occur along the woodlot edges, with the interiors of woodlots comprised predominately of: walnuts (*Juglans* sp.), oaks (*Quercus* sp.), cherry (*Prunus* sp.), pawpaw (*Asimina triloba*), American beech (*Fagus grandifolia*), Osage orange (*Maclura pomifera*) and a few shagbark hickories (*Carya ovata*).

4.4.1.3 Disturbed/Developed

Disturbed/developed lands appear in low densities throughout the Project Area. These areas are typically residences or farmsteads with lawns or landscaped areas, driveways, and unpaved roads.

4.4.2 Wildlife Resources

Wildlife resources such as, birds, bats, terrestrial, and aquatic organisms have the potential of being impacted during the construction and operation of the Project. Project construction activities such as earthmoving, vehicular movements, and construction equipment are likely to displace wildlife using the habitat for foraging, breeding, and nesting. However, the Project is located within a primarily active agricultural area, likely to have limited use by wildlife species. Discussions on birds, raptors, bald eagles, bats, and any other sensitive or listed species potentially existing in the Project Area are provided below.

4.4.2.1 Birds

The Audubon Society designates Important Bird Areas (IBAs) around the globe as sites that provide essential habitat for one or more species of bird. IBAs include sites for breeding, wintering, and/or migrating birds' passageways. IBAs range from a few acres to thousands of acres in size, but usually they are discrete sites that stand out from the surrounding landscape. There are no recognized IBA's in the vicinity of the Project Area and the surrounding 20-mile radius.

Cardno also reviewed eBird (<http://ebird.org>), which provides a real-time online checklist program that aggregates basic bird abundance and distribution data made by recreational and professional bird watchers. The program was launched in 2002 by the Cornell Lab of Ornithology and National Audubon Society. Six eBird 'hotspots' were identified within 20 miles of the Project Area.

- > Harrison Lake is located 5 miles southwest of the Project Boundary. Approximately 108 bird species have been identified in this wildlife area. No endangered or threatened species have

been identified there. Two species of concern were identified there: the Great egret and the Common nighthawk. Fourteen species of special interest were identified there: the Winter wren, Purple finch, Ruddy duck, Red-breasted nuthatch, Common merganser, Dark-eyed junco, Blackburnian warbler, Blue-headed vireo, Golden-crowned kinglet, Hermit thrush, Nashville warbler, Pine siskin, Long-eared owl and the Brown creeper. No other bird species are listed as federally or state-protected species were identified in this wildlife area.

- > Tiffin River Wildlife area is located 6 miles south of the Project Boundary. Approximately 107 bird species have been identified in this wildlife area. One endangered species was identified there: the Northern harrier. Two threatened species were identified there: the Trumpeter swan and the Sandhill crane. Five species of concern were identified there: the Marsh wren, Great egret, American coot, Black-billed cuckoo, and the Red-headed woodpecker. Eight species of special interest were identified there: the Blackburnian warbler, Wilson's snipe, Gadwall, Green-winged teal, Northern pintail, Northern shoveler, Hermit thrush and the Nashville warbler. No other bird species are listed as federally or state-protected species were identified in this wildlife area.
- > Riverside Natural Area is located 7 miles northeast of the Project Boundary. Approximately 67 bird species have been identified in this wildlife area. No endangered or threatened species have been identified there. One species of concern was identified there: the Red-headed woodpecker. Four species of special interest were identified there: the Winter wren, Brown creeper, Golden-crowned kinglet and the Dark-eyed junco. No other bird species are listed as federally or state-protected species were identified in this wildlife area.
- > Morenci Sewage Pond and Oak Grove Cemetery are located in close proximity to each other and approximately 8 miles northeast of the Project Boundary. A combined total of approximately 160 bird species have been identified in these wildlife areas. One endangered species was identified there: the Northern harrier. Two threatened species were identified there: the Trumpeter swan and the Sandhill crane. Six species of concern were identified there: the Great egret, American coot, Vesper sparrow, Grasshopper sparrow, Black-billed cuckoo, and the Red-headed woodpecker. Fifteen species of special interest were identified there: the Brown creeper, Purple finch, Golden-crowned kinglet, Wilson's snipe, Gadwall, Green-winged teal, Northern pintail, Northern shoveler, Redhead, Ruddy duck, American black duck, Dark-eyed junco, Nashville warbler, Common merganser and the Blue-headed vireo. No other bird species are listed as federally or state-protected species were identified in this wildlife area.
- > Goll Woods State Nature Preserve is located 12 miles south of the Project Boundary. Approximately 131 bird species have been identified in this wildlife area. One endangered species was identified there: the Northern harrier. Two threatened species were identified there: the Trumpeter swan and the Sandhill crane. Three species of concern were identified there: the Prothonotary warbler, Eastern whip-poor-will and the Red-headed woodpecker. Eighteen species of special interest were identified there: the Canada warbler, Magnolia warbler, Northern waterthrush, Winter wren, Black-throated blue warbler, Brown creeper, Red-breasted nuthatch, Short-eared owl, Golden-crowned kinglet, Blackburnian warbler, Northern pintail, Dark-eyed junco, Hermit thrush, Least flycatcher, Nashville warbler, Veery, Yellow-bellied sapsucker, and the Blue-headed vireo. No other bird species are listed as federally or state-protected species were identified in this wildlife area.

These areas are illustrated in relation to the Project Area in Figure A-4 of Appendix A, Project Area Figure.

Based on a review of the publically available data (i.e. ODNR, USFWS, USGS, Audubon Society, USDA-NRCS) the Project Area and ¼-mile buffer are not known to provide significant habitat for sensitive bird species. Due to this lack of adequate habitat in the immediate Project Area, it is likely many of the

individuals would opt for higher quality habitat nearby such as the wildlife areas described above for roosting, foraging, and breeding.

4.4.2.2 Bald Eagles and Raptors

The bald eagle is no longer listed as a federal or state-threatened species, however, it is still protected under the BGEPA. This Act was passed in 1940 to prevent the extinction of the bald eagle and was amended in 1962 to include protection of golden eagles. In addition, the MBTA establishes provisions for the protection of migratory birds that are not necessarily threatened or endangered.

Cardno reviewed publically available data (i.e. ODNR, USFWS, National Eagle Center, Park Service) and no public records were identified with known bald eagle or sensitive raptor nests in the Project Area or ¼-mile buffer. Cardno is planning to send consultation letters to ODNR and USFWS to solicit non-public data on potential RTE species within the Project Area.

4.4.2.3 Bats

No federal or state listed bats species are expected to occur in the Project Area based on ODNR's Fulton County listings.

Cardno also conducted a desktop evaluation for potentially available bat habitat and reviewed habitat-based variables including the amount of suitable foraging and roosting habitat, the number of natural areas, number of perennial streams, and number of human developments.

Cardno reviewed publically available data (i.e. ODNR, USFWS, USGS) and there is also no publicly available record of known hibernacula in the Project Area or ¼-mile buffer. Cardno is coordinating with the ODNR on the Project to gather additional data on potential RTE species in the area.

4.4.3 Rare, Threatened and Endangered Species

Cardno conducted the following activities to determine the federal and state listed species of interest that could occur within the Project Area including utilization of the FWS IPaC, and reviewing the ODNR DOW's Ohio's Listed Animal Species report, updated March 2020, and ODNR's State-Listed Plant Species by County, updated July 2016, for Fulton County, Ohio. Table 4-3 provides the federally and state listed species with the potential to occur within Fulton County, Ohio, and the likelihood of occurring within the Project Area. A complete listing of protected species, including those of special concern described by FWS and ODNR are provided as Appendix C (RTE Species Information).

Table 4-3 Federally and State Listed Species with the Potential to Occur in Fulton County, Ohio.

Common Name	Scientific Name	Listing Status		Habitat	Critical Habitat in Project Area	Occurrence in Project Area
		Federal	State			
Birds						
Lark Sparrow	<i>Chondestes grammacus</i>	--	SE	Lark Sparrows breed in open grassy habitats with scattered trees and shrubs including orchards, fallow fields, open woodlands, mesquite grasslands, savanna, sagebrush steppe, and grasslands.	No	Not likely to occur, as the open habitats are mostly active agriculture fields
Northern Harrier	<i>Circus hudsonius</i>	--	SE	Breeding Northern Harriers are most common in large, undisturbed tracts of wetlands and grasslands with low, thick vegetation. They breed in freshwater and brackish marshes, lightly grazed meadows, old fields, tundra, dry upland prairies, drained marshlands, high-desert shrubsteppe, and riverside woodlands	No	Not likely to occur, as there are no large wetland tracts within the Project Area
Trumpeter Swan	<i>Cygnus buccinator</i>	--	ST	Breeding sites include small ponds (including beaver and farm ponds), lakes, marshes, bogs, glacial potholes, and quiet stretches of river. They also need at least 100 yards of open water for their running take-offs, and muskrat or beaver dens or small islands on which to nest.	No	Not likely to occur, as open water habitat is not present
Fish						
Greater Redhorse	<i>Moxostoma valenciennesi</i>	--	ST	Species of freshwater fish found in clear, relatively fast-moving rivers and in both shallow and deep waters in some lakes. They are unable to survive in even the slightest polluted waters.	No	Not likely to occur, as stream reaches are slow, meandering, and do not provide appropriate habitat
Mammals						
Indiana Bat	<i>Myotis sodalis</i>	E	FE	Hibernates in caves and mines; Maternity and foraging habitat includes small stream corridors with well-developed riparian woods; upland forests	No	Not likely to occur, as well developed riparian and upland forests are not present
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	T	FT	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.	No	Not likely to occur, as developed upland forests are not present
Mollusk						
Rayed Bean	<i>Villosa fabalis</i>	E	FE	Habitat consists of small, headwater creeks and occasionally larger rivers	No	Potential to occur in streams within Project Area, but unlikely as sensitive to sedimentation and runoff pollutants found within the waters adjacent to the existing agricultural lands.
Moth						
Singed Pinion	<i>Lithophane semiusta</i>	--	SE	Appears to be most commonly associated with bogs and acid soil habitats, however, they have been observed from well-drained slopes and ridgetops, including one granitic outcrop.	No	Not likely to occur, as bog habitat is not present

Common Name	Scientific Name	Listing Status		Habitat	Critical Habitat in Project Area	Occurrence in Project Area
		Federal	State			
Folded Satyr	<i>Ufeus plicatus</i>	--	SE	Associated with large poplars, especially eastern cottonwood (<i>Populus deltoides</i>) growing in moist areas along rivers where there is abundant loose rotting strips of bark near the base of the tree.	No	Not likely to occur, as preferred tree habitat is not present
Reptiles						
Kirtland's Snake	<i>Clonophis kirtlandii</i>	--	ST	Fossorial species, spending much of the time underground. It requires moist-soil environments to survive and is always found in close proximity to a permanent or seasonal water source, including wetlands, streams, reservoirs, lakes, or ponds. above ground, it is almost always found under natural or artificial cover objects instead of basking or moving through open areas.	No	Potential to occur in area adjacent to streams or with areas of adequate cover.
Blanding's Turtle	<i>Emydoidea blandingii</i>	--	ST	Requires both wetland and upland habitats to complete all aspects of their life history. Wetland habitats include ponds, marshes and marshy shorelines, shrub swamps, wet meadows, and ditches and streams with slow-moving water. Wetlands with mud bottoms and abundant aquatic vegetation are preferred, and extensive marshes bordering lakes and/or rivers provide good habitat.	No	Potential to occur in areas adjacent to ditches and streams, and in wetlands with standing water
Plants						
Western Rock-Jasmine	<i>Androsace occidentalis</i>	--	SE	Habitats include gravel hill prairies, upland sand prairies, upland dolomite prairies, gravelly or sandy areas along railroads, roadsides, pastures, fallow fields, and waste ground.	No	Unlikely to occur, as majority of open habitat is active agriculture fields
Prairie Thimbleweed	<i>Anemone cylindrica</i>	--	ST	Habitats include dry upland areas of black soil prairies, loess hill prairies, scrubby barrens, limestone glades, sandy Black Oak savannas, open sandy woodlands, abandoned fields, and open areas along roadsides. This plant is usually found in less disturbed habitats.	No	Unlikely to occur, as majority of open habitat is active agriculture fields
Field Sedge	<i>Carex conoidea</i>	--	ST	Habitats include fields, pastures, utility rights-of-way, thickets and roadsides. Mostly found in mesic soils in open sites	No	Unlikely to occur, as majority of open habitat is active agriculture fields
Raven-foot sedge	<i>Carex crus-corvi</i>	--	ST	Habitats include wet prairies, swales and sloughs, open floodplain areas along major rivers, floodplain woodlands, edges of vernal pools in woodlands, swamps, low areas along lakes, and ditches.	No	Unlikely to occur, as majority of open habitat is active agriculture fields
Pipsissewa	<i>Chimaphila umbellata</i>	--	ST	Habitats include dry sandy forests, edges of forests, and roadsides with thin, sandy soils	No	Unlikely to occur, as majority of open habitat is active agriculture fields
Sweet Fern	<i>Comptonia peregrina</i>	--	ST	Habitats include barrens, rocky summits, woodlands, fields and clearings, open heathlands, roadsides, and utility rights-of-way. A plant of open dry thin acidic soils.	No	Unlikely to occur, as majority of open habitat is active agriculture fields

Common Name	Scientific Name	Listing Status		Habitat	Critical Habitat in Project Area	Occurrence in Project Area
		Federal	State			
Tansy Mustard	<i>Descurainia pinnata</i>	--	ST	Habitats include gravelly prairies, sandstone and limestone glades, rocky bluffs and cliffs, areas along roads and railroads (including the ballast), fields, and sterile waste areas. Disturbed areas are preferred, although this plant also occurs in higher quality natural habitats.	No	Unlikely to occur, as majority of open habitat is active agriculture fields
Sessile Tick-trefoil	<i>Desmodium sessilifolium</i>	--	ST	Habitats include dry sand prairies and typical prairies, railroad prairies, dry sandy savannas and typical savannas, rocky open woodlands, limestone glades, and roadside embankments.	No	Unlikely to occur, as majority of open habitat is active agriculture fields
Early Panic Grass	<i>Dichanthelium praecocius</i>	--	SE	Habitats include dry, open, sandy ground of prairies, open oak savannas, borders, and fields.	No	Unlikely to occur, as majority of open habitat is active agriculture fields
Porcupine Grass	<i>Hasperostipa sparta</i>	--	SE	Habitats include mesic to dry black soil prairies, sand prairies, gravel prairies, dolomite prairies, hill prairies, upland savannas and sandy savannas, pastures, roadsides, and areas along railroads.	No	Unlikely to occur, as majority of open habitat is active agriculture fields
Long-bearded Hawkweed	<i>Hieracium longipilum</i>	--	SE	Habitats include black soil prairies, clay prairies, sand prairies, prairie remnants along railroads, typical savannas and sandy savannas, upland rocky woodlands, and disturbed areas along railroads.	No	Unlikely to occur, as majority of open habitat is active agriculture fields
Greene's Rush	<i>Juncus greenei</i>	--	ST	Habitats include dry to sometimes seasonal wet fields predominately in very sandy soils. Occasionally in cracks in rock outcrops.	No	Unlikely to occur, as majority of open habitat is active agriculture fields
Virginia Dwarf-dandelion	<i>Krigia virginica</i>	--	ST	Habitats include mesic to dry sand prairies, sandy savannas, sand dunes, sandy fields, sandy areas along paths and roadsides, and rocky glades without limestone. Occasional wildfires and other kinds of disturbance are probably beneficial in maintaining populations of this plant.	No	Unlikely to occur, as majority of open habitat is active agriculture fields
Thyme-leaved Pinweed	<i>Lechea minor</i>	--	ST	Habitats include sand prairies, openings and edges of sandy oak woodlands, sandy oak savannas, rocky bluffs and cliffs, partially wooded sand dunes near Lake Michigan, and edges of sandy marshes.	No	Unlikely to occur, as majority of open habitat is active agriculture fields
Plains Puccoon	<i>Lithospermum carolinense</i>	--	ST	Habitats include open sandy woodlands, sandy savannas, upland sand prairies, sandy hill prairies, sand dunes along Lake Michigan, and sandy embankments along roads and railroads.	No	Unlikely to occur, as majority of open habitat is active agriculture fields
Dotted Noremint	<i>Monarda punctata</i>	--	SE	Habitats include sand prairies, hill prairies, sandy Black Oak savannas, stabilized sand dunes along Lake Michigan, and sandy fields.	No	Unlikely to occur, as majority of open habitat is active agriculture fields
Downy White Beard-tongue	<i>Penstemon pallidus</i>	--	ST	Habitats include dry rocky woodlands, hill prairies, dry-mesic railroad prairies, sandstone and limestone glades, upland savannas, thinly wooded bluffs, rocky cliffs, and abandoned fields.	No	Unlikely to occur, as majority of open habitat is active agriculture fields

Common Name	Scientific Name	Listing Status		Habitat	Critical Habitat in Project Area	Occurrence in Project Area
		Federal	State			
Mountain Phlox	<i>Phlox latifolia</i>	--	SE	Habitats include moist black soil prairies, moist sand prairies, cemetery prairies, prairie remnants along railroads, openings in bottomland woodlands, thickets, acidic gravelly seeps, and abandoned fields.	No	Unlikely to occur, as majority of open habitat is active agriculture fields
Racemed Milkwort	<i>Polygala polygama</i>	--	ST	Habitats include openings in forests, forest edges, pine barrens, and utility right-of-way in dry, sand soils.	No	Unlikely to occur, as majority of open habitat is active agriculture fields
Hairy Mountain-mint	<i>Pycnanthemum verticillatum var. pilosum</i>	--	ST	Habitats include black soil prairies, meadows in wooded areas, rocky upland forests, woodland edges, savannas, thickets, limestone glades, and abandoned fields. Hairy Mountain Mint is usually found in higher quality natural areas, although it may colonize adjacent disturbed areas.	No	Unlikely to occur, as majority of open habitat is active agriculture fields
Birdfoot Violet	<i>Viola pedata</i>	--	ST	Habitats include upland areas of black soil prairies, sand prairies, hill prairies, sandstone glades, cherty slopes, thinly wooded bluffs, openings in rocky or sandy forests, sandy Black Oak savannas, and sand dunes near Lake Michigan. This plant is largely restricted to high quality habitats.	No	Unlikely to occur, as majority of open habitat is active agriculture fields

(F) Federally Endangered, (T) Federally Threatened, (SE) State Endangered, (ST) State Threatened.

Endangered: The classification provided to an animal or plant in danger of extinction within the foreseeable future through all or a significant portion of its range.

Threatened: Any species which is likely to become an endangered species within the foreseeable future through all or a significant portion of its range.

4.4.3.1 Federally Listed Species

The Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*) are afforded protections under the ESA and have been listed by the FWS as federally endangered and federally threatened, respectively. Neither species of bat is expected to occur within the Project Area, as forested areas used for roosting are minimal, and the Project does not contain caves for hibernation.

The rayed bean (*Villosa fabalis*) is afforded protection under the ESA and has been as listed by the FWS as federally endangered. It occupies small, headwater creeks, and can sometimes be found in larger rivers and wave-washed areas of glacial lakes. Adults are highly sensitive to pollution and sedimentation, including runoff from cultivated field, farms, mines, and construction sites. Degradation of water quality decreases the survivability of individuals and the proliferation of rayed bean communities (USFWS 2012). As the streams traversing the Project Area run adjacent to active agriculture lands and experience water quality degradation, it is not anticipated that preferred habitat is found within the Project Area. The rayed bean has the potential to occur within the slower moving streams within the Project Area. A preliminary survey of the streams within the Project Area did not result in the identification of the rayed bean. Survey information for this species is further discussed in Section 6, Pre-Construction Surveys.

4.4.3.2 State Listed Species

In addition to the Federally listed species, state listed endangered animal species for Fulton County include the lark sparrow, northern harrier, signed pinion and folded satyr. State listed threatened species for Fulton County include the trumpeter swan, greater redhorse, Kirtland's snake and Blanding's turtle. The Kirtland's snake and Blanding's turtle have the potential to occur along the banks of the streams and areas frequently inundated with water. The remainder of the state listed species are not expected to occur within the Project Area, as preferred habitat is not present.

State listed species of concern for Fulton County include two amphibian species, nine bird species, one fish species, four mammal species, one mollusk species, one moth species and one reptile species. An additional seven bird species are listed as species of special interest. A complete list of sensitive animal and plant species protected by ODNR is provided in Appendix C, RTE Species information.

According to the ODNR State Listed Plant Species by County, for Fulton County, Fulton County lists six endangered plant species, fifteen threatened species and twenty potentially threatened species in this county.

Given the majority of the Project Area is located within active agricultural lands, significant populations of these species are unlikely to occur in the Project Area. Through Cardno, Arche Solar is coordinating with the ODNR, in part, to confirm potential impacts to sensitive plant species populations.

The Project will aim to minimize any potential impacts to the habitats that may support significant wildlife by avoiding the majority of woodlots, and all high quality streams. Where possible, micro-siting of the Project infrastructure will further reduce or avoid potential impacts.

4.5 Wetlands/Water/Floodplain

Prior to field surveys, Cardno conducted a desktop review of the Survey Area using publically available GIS data to identify and classify potential environmental resources and create field maps for use during survey. Reference material included, but was not limited to: the National Land Cover Database (NLCD); the U.S. Department of Agriculture (USDA) NRCS Soil Survey for Fulton County; historic aerial photographs; FWS NWI maps; U.S. Geologic Service (USGS) topographic maps; the USGS NHD; and the OWI.

Surveys were conducted in the Survey Area to determine the extent of wetlands and waterbodies in accordance with applicable Federal and State regulations and guidelines. A Trimble® Global Positioning

System (GPS) with sub-meter accuracy was used to collect data points for mapping. Additional details on Cardno's methodology is provided in Appendix D, Arche Solar Wetland and Stream Delineation Report and Forms.

Cardno conducted surveys within 19 parcels that totaled approximately 1,162 acres in October 2019.

An overview of field-delineated surface waters is included as Figure A-5 of Appendix A, Project Area Figures.

4.5.1 Navigable Waters

The Survey Area is located within the Deer Creek – Bean Creek and Stag Run – Bean Creek watersheds (Hydrologic Unit Code [HUC]-12), which are located within the larger Maumee River drainage basin, which ultimately drains northeast into Lake Erie. No navigable waterways are located within the Survey Area. Deer Creek and Spring Creek have a designated use, and are identified as warm water habitat (WWH) in the Water Quality Standards⁹

During field surveys, Cardno performed a Headwater Habitat Evaluation Index (HHEI) or a QHEI assessment for all field-verified streams to record and score a variety of aspects about the waterbody including substrates, pool depths, and ecological value or condition. The QHEI form is used to describe similar aspects of waterbodies, but is focused on larger (often higher quality) waterbodies. While delineating the waterbodies for the Project, Cardno will evaluate the features for suitability as habitat for RTE species.

A Watershed Map of the Project Area is illustrated in Figure A-6 of Appendix A, Project Area Figures.

4.5.2 Water Quality

Surface waters are regulated under the CWA, under jurisdiction of either the state or federal government. Cardno identified potentially jurisdictional WOTUS, their tributaries, and non-isolated wetlands, which are regulated under the jurisdiction of the State of Ohio and the USACE in accordance with Section 401/404 of the CWA. Waterbodies and isolated wetlands that do not have a significant nexus to a WOTUS, are considered waters of Ohio (as defined under OAC Rule 3745-1-02(b)(77)) (OEPA 2007) and are regulated by the OEPA Isolated Wetlands Permitting Program.

In Ohio, the 401 WQC and Isolated Wetland Permitting Section of the OEPA reviews applications for projects that propose the placement of fill or dredged material into WOTUS as well as isolated waterbodies and wetlands that do not have a significant nexus.

On March 17, 2017, OEPA finalized the 401 WQC and Response to Comments for the 2017 Nationwide Permits (NWP) published by the U.S. Army Corps of Engineers. Based on those 2017 NWP requirements, projects seeking a NWP, may review the OEPA's Stream Eligibility Map¹⁰ to help determine if an Individual WQC is required or not. This map identifies areas where projects are 'Eligible', 'Ineligible', or 'Possibly Eligible' to use a NWP for 401 coverage.

⁹ <http://epa.ohio.gov/Portals/35/rules/01-17.pdf>

¹⁰ <https://oeпа.maps.arcgis.com/apps/webappviewer/index.html?id=e6b46d29a38f46229c1eb47deefe49b6>

Using GIS, the Project Area was overlaid with the Stream Eligibility map (Figure A-7 in Appendix A, Project Area Figures):

- a. Eligible Areas: As long as a project meets the Ohio 401 Certification Special Limitation and Conditions, and stream impacts are within the eligible area, then no Individual WQC is needed, and impacts are covered under the 401 WQC for the Nationwide Permits.

No portion of Arche Solar falls within the 'eligible' area.

- b. Possibly Eligible Areas: If any stream proposed for impact within a project falls within a Possibly Eligible area, the applicant shall take pH values, when applicable, and perform a QHEI or HHEI assessment for the stream. Using the flow charts provided in the Review of 2017 NWP for Ohio, the applicant shall determine if impacts to that stream are eligible for coverage under the 401 WQC for the Nationwide Permits or if an individual 401 WQC is required.

All of the Project Area falls within the area designated as 'Possibly Eligible'.

- c. Ineligible Areas: If any stream proposed for impact within a project falls within this ineligible area, impacts to that stream are not eligible for coverage under the 401 WQC for the NWP, and the applicant shall apply for an individual 401 WQC.

No portion of Arche Solar falls within the 'ineligible' area.

4.5.3 Floodplains

Based on review of the Federal Emergency Management Agency Flood Insurance Maps, approximately 38.8 acres of 100-Year Floodplains are located within the Project Area. The 100-year floodplains are identified on Figure A-6 of Appendix A, Project Area Figures.

5 Other Studies

Arche Solar also is evaluating the Project with respect to a variety of other subjects, including cultural resources, noise, socioeconomic factors, and geotechnical matters. These topics are not part of this ecological assessment, and are provided under separate cover.

6 Pre-Construction Surveys

The following is a discussion of the results of field surveys of the Project Area conducted in October 2019. An overview of field-delineated surface waters is included as Figure A.5 of Appendix A, Project Area Figures. A Watershed Map of the Project Area is illustrated in Figure A-6 of Appendix A, Project Area Figures.

6.1 Habitat Assessment

A habitat assessment was completed for the 1,010 acre Project Area. A ¼-mile visual investigation was also conducted around the Project Area for sensitive habitats. The results of the field study were found to be generally consistent with the initial desktop review, as detailed below.

6.1.1 Vegetative Communities

Vegetative communities within the Project Area were evaluated based on desktop interpretation of aerial photography then verified during field surveys. Agricultural land dominated the total acreage of the vegetative community in the Project Area, with small areas developed/disturbed lands and clusters of deciduous forest. As identified in Table 4-1, the predominant land use in the Project Area was agricultural (crops), followed by developed/open space, smaller portions of agricultural land and cluster forests.

Brief descriptions are provided below for each of the ecological communities in the Project Area. All of the major plant communities found within the area are common to Ohio. Vegetative communities within the Project Area were dominated by agricultural monocultures, including soy beans and corn. Limited amounts of forestland remain, typically as isolated woodlots and windrows. Appendix D, Wetland and Stream Delineation Report and Forms also includes documentation of the vegetative communities associated with the surface water features that were delineated.

6.1.1.1 **Agricultural Land**

Much of the acreage within the Project Area is used for agricultural production, and is either currently active or recently fallowed. The agricultural fields were observed to be primarily a mix of remnants from the previous year's soybean and corn crops. Additionally, some crop areas were actively planted with winter wheat. It is likely that the type of crop changes seasonally, but the general extent of the cultivated area remains roughly the same. The type of crop may change seasonally, but the general extent of the crop area would remain consistent.

Many of the cultivated areas and roadsides have grassy swales, which helped maintain drainage for proper growing conditions. These swales often had a mix of herbaceous species including reed canary grass (*Phalaris arundinacea*) and various other grasses (*Festuca* sp. and *Fescue* sp.). The swales appear to be mowed seasonally. Vegetation in the narrow woodlots was characterized by intrusion of weedy species from nearby crop edges including: Canada goldenrod (*Solidago canadensis*), pokeweed (*Phytolacca americana*), Queen Anne's lace (*Daucus carota*), common teasel (*Dipsacus fullonum*), and purple deadnettle (*Lamium purpureum*). Where limited woody vegetation and shrub growth was observed, species included willows (*Salix* sp.), black locust (*Robinia pseudoacacia*), and sycamores (*Platanus occidentalis*).

6.1.1.2 **Forestland**

The deciduous forests were observed to occur as isolated woodlots between agricultural areas and along roads. Aggressive weedy species such as pokeweed, blackberry (*Rubus* sp.), and poison ivy (*Toxicodendron radicans*) often occur along the woodlot edges, with the interiors of woodlots comprised predominately of: walnuts (*Juglans* sp.), oaks (*Quercus* sp.), cherry (*Prunus* sp.), pawpaw (*Asimina*

triolba), American beech (*Fagus grandifolia*), Osage orange (*Maclura pomifera*) and a few shagbark hickories (*Carya ovata*).

6.1.1.3 Developed/Disturbed

Developed/disturbed lands are found in low densities throughout the Project Area, and are by a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses.

6.1.2 Wildlife Observations

The habitats surveyed during field efforts appear to lack significant or obvious evidence of RTE species. Visual reconnaissance surveys were conducted during the wetland and waterbody delineations and did not observe any RTE species. The modification of the majority of available habitat has likely degraded the quality and limited potential RTE habitat. Wooded areas in the Project Area were typically of moderate quality, with isolated occurrences of relatively large high quality trees surrounded by younger second growth forest and saplings. Many of the woodlots had vehicle paths through them, which were likely to allow farm equipment access to surrounding fields. The delineated waterbodies could potentially provide RTE species habitat, but at reduced quality due to the surrounding land use impacting the water chemistry (i.e., high sediment loading during storms and fertilizer in runoff). During the field surveys, Cardno staff observed minimal wildlife use in the Survey Area and observed no RTE species due to the Project Area being relatively low quality and highly disturbed.

6.2 Surface Water Delineations

6.2.1 Wetland Delineation Criteria and Methods

Cardno conducted surface water delineation surveys in the Project Area during October 2019 to determine the extent and jurisdiction of surface waters within the Project Area. A ¼-mile visual investigation was also conducted around the Project Area for sensitive habitats.

6.2.1.1 Wetland Delineation Methods

Wetland delineations were conducted according to the 1987 USACE *Corps of Engineers Wetlands Delineation Manual* (USACE 1987) and the applicable regional supplements; *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0)* (USACE 2010). Together, these documents are referred to as “The Manual.” The methodology outlined in the Manual requires that three wetland criteria be met in order for a wetland to be determined to be present; that is, the area being evaluated must have a dominance of hydrophytic vegetation, hydric soils, and sufficient hydrology to be identified as a wetland.

Dominant vegetation is assessed for hydrophytic preference. The hydrophytic vegetation criterion is met when more than 50 percent of the dominant plant community is hydrophytic, as determined by species dominance and the assigned species-specific indicator status of the identified species.

The hydric soils criterion is met when the soils identified are officially listed as hydric soils or the soils demonstrate characteristics representative of soils in reducing (hydric) conditions. The latter is determined in the field when the soils fall within the hydric ranges on the Munsell Color Chart, examining soil profiles for other evidence of reducing conditions, and/or observing other indicators of anaerobic activity per the Manual.

The hydrology criterion is met when sufficient hydrologic indicators are present. The indicators must be representative of sufficient saturation or inundation occurring over the growing season sufficient to support a hydrophytic plant-dominated vegetative community. Such indicators may include evidence of standing water, saturated soils, geomorphic position within the landscape, drainage patterns, water-stained leaves, and morphologic adaptation of vegetation.

Appendix D, Wetland and Stream Delineation Report and Forms provides a discussion of the wetland delineation methodologies in greater detail.

6.2.1.2 Ohio Rapid Assessment Method for Wetland Assessment

Field delineated wetlands were scored using the OEPA's ORAM. The ORAM wetland functional assessment was developed to determine the ecological "quality" and level of function of a particular wetland in order to meet requirements under Section 401 of the CWA. Wetlands were scored on the basis of hydrology, upland buffer, habitat alteration, special wetland communities, and vegetation communities. Each of these subject areas is further divided into sub-categories under ORAM v5.0 resulting in a score that describes the wetland using a range from 0 (low quality and high disturbance) to 100 (high quality and low disturbance). Wetlands scored from 0 to 29.9 are grouped into "Category 1," 30 to 59.9 are "Category 2," and 60 to 100 are "Category 3". Transitional zones exist between "Categories 1 and 2" from 30 to 34.9 and between "Categories 2 and 3" from 60 to 64.9. However, wetland scores that fall into the transitional range should be assigned to the higher Category unless scientific data has been collected that suggests the wetland should be placed in the lower category. Category 1 are wetlands that are often isolated emergent marshes dominated by cattails with little or no upland buffers located in active agricultural fields. Category 2 are wetlands that do not have RTE species or the habitat for such species. Category 2 wetlands constitute the broad middle category of "good" quality wetlands. A "Modified Category 2" wetland appears to have some signs of degradation but also has the potential to restore some of the lost functionality. Category 3 wetlands are typified by high levels of diversity, a high proportion of native species, and/or high functional values. Category 3 wetlands include wetlands which contain or provide potential habitat for RTE species, are high quality mature forested wetlands, vernal pools, bogs, fens, or which are scarce regionally and/or statewide.

Appendix D, Wetland and Stream Delineation Report and Forms discusses wetland assessment methodologies in greater detail.

6.2.1.3 Wetland Survey Results

Four wetlands were delineated during field surveys, for a total of 1.24 acres of wetland within the Survey Area. All of the delineated wetlands accounted for less than 1 acre. Two wetlands were classified as palustrine forested wetlands (PFO) and two were classified as palustrine emergent (PEM). All of the wetlands fell into the Category 2. None of the wetlands in the Survey Area were identified as Category 3.

Cardno anticipates that four wetlands could be jurisdictional, based on potential hydrologic connectivity to a potential WOTUS. Final verification of their boundaries for regulatory purposes can only be completed through a JD review by the USACE or its duly appointed representative. Table 6-1 provides a list of the delineated wetlands and associated characteristics. Wetland acreages reported in the summaries below are representative only of the portion of the wetland located within the Survey Area.

Additional detail on each feature can be found in Appendix D, Wetland and Stream Delineation Report and Forms.

Table 6-1 Wetlands Delineated in the Project Area

Wetland ID	Latitude of Center Point	Longitude of Center Point	Acres	Wetland Type	ORAM Score	Wetland Category	Anticipated Jurisdictional	Drainage Basin
W01	41.6678	-84.296	0.22	PFO	45	2	Yes	Deer Creek - Bean Creek
W02	41.6673	-84.2958	0.17	PFO	41	2	Yes	Deer Creek - Bean Creek
W03	41.6722	-84.2818	0.56	PEM	40	2	Yes	Deer Creek - Bean Creek
W04	41.6669	-84.2784	0.3	PEM	32	Modified 2	Yes	Deer Creek - Bean Creek
Total Acreage			1.24					

Notes:

PEM – Palustrine Emergent Wetland

PFO – Palustrine Forested Wetland

Source: Wetland types classified according to Cowardin et al. (1979):

PEM: Palustrine (freshwater) Emergent Wetland – characterized by erect, rooted herbaceous and grass-like plants suited to growing in wet conditions

PFO: Palustrine Forested Wetland - dominated by woody vegetation at least 20 feet tall with a tolerance to a seasonally high water table

ORAM: Ohio Rapid Assessment Method

6.2.2 Waterbody

6.2.2.1 *Waterbody Delineation Criteria and Methods*

Linear waterbodies, such as ditches and streams, were surveyed by locating the path (typically the centerline if water depth was shallow, or the top-of-bank if the centerline was not accessible) and documenting widths (both as Ordinary High Water Mark (OHWM) to OHWM and top-of-bank to top-of-bank) at each survey point. Physical flagging was hung along the waterbody features to identify their general course. Observational notes about the characteristics of each waterbody, such as flow regime and substrate, were recorded by the field team to enable the categorization of the types of waterbodies encountered. In order to be identified as a waterbody, each feature must have a defined bed and bank with indications of a channel flow – either perennial, intermittent, or ephemeral. Grassy swales were not identified as waterbodies.

Appendix D, Wetland and Stream Delineation Report and Forms provides a discussion of the wetland delineation methodologies in greater detail. Waterbody Qualitative Assessment Methods

All flowing waterbodies (streams and ditches, but not ponds) delineated in the Survey Area were assessed using the HHEI. The HHEI allows for uniform scoring of various waterbodies using a standard methodology that identifies pertinent information about the waterbody including substrates, pool depths, and ecological value or condition. HHEI forms typically are completed for waterbodies with a drainage area of less than one square mile. A summary of the HHEI Scoring is provided in Table 6-2 below.

Table 6-2 Headwater Habitat Evaluation Index (HHEI) Scoring

Final HHEI Score	Definition
<30	Class I PHWH (ephemeral streams, normally dry channel, little to no aquatic life)
30 - 50	Class II PHWH (intermittent flow, summery-dry, warm water streams)
>50	Class II or III PHWH (depending on conditions)
>75	Class III (perennial flow, cool-cold water streams)

Notes:

PHWH – Primary Headwater Habitat Stream

Larger features are evaluated using the QHEI. The QHEI form is used to describe similar aspects of waterbodies, but is focused on larger (often higher quality) waterbodies. Typically, QHEI forms are completed for those perennial features with drainage areas greater than one square mile and pools deeper than 40 centimeters (approximately 15 inches). In cases where a feature scored highly on the HHEI forms but failed to meet either of QHEI criteria, they were still evaluated with the QHEI to better record the conditions present. Table 6-3 provides an overview of the typical score ranges and waterbody classification under QHEI.

Table 6-3 Qualitative Habitat Evaluation Index (QHEI) Scoring

Final HHEI Score	Definition
<32	Limited Resource Water (LRW)
32 - 60	Modified Warm Water Habitat (MWH)
60 - 75	Warm Water Habitat (WWH)
>75	Possible Exceptional Warm Water Habitat (EWH)

6.2.2.2 Waterbody Survey Results

Six waterbodies were delineated during field surveys within the Project Area; five streams and one pond. The waterbody delineation results are summarized in Table 6-4. Using the QHEI scoring, one of the waterbodies was designated as Limited Resource Water (LRW) Stream Class I (Deer Creek, S02). Additionally, two waterbodies (Spring Creek, S01a/S01b) were designated as a modified warm water habitat0 (MWH). Three waterbodies were designated as PHWH Class II, which generally indicated intermittent flow regimes and moderate development of channel features that could provide ecological value. One pond was not assessed using the HHEI, as it was a non-flowing waterbody.

Ditches were identified as man-made or modified channels, which were manipulated by landowners or communities to improve drainage among farm fields. Modification to channels could include the mowing of bank vegetation, altering of channel morphology, or removal of debris to maintain flow conditions. Many ditches have ephemeral or intermittent flows and heavily vegetated channels. At the time of the survey, most were flowing though due to the recent rains and saturated soils. Most ditches also had trapezoidal cross sections, with a small bankfull width/channel at the bottom and a wider crossing distance at the top-of-bank. If a ditch crossed under a road, the deepest pools of water were normally located at the edges of the culvert, which occur as a result of eddies and currents of stormwater flow creating erosion.

Streams were more often considered natural channels that had indications of significant recovery since any historic modification had occurred. All streams were flowing at the time of the survey, with slightly elevated turbidity, which was attributed to runoff from nearby ditches and cultivated areas during recent rains. Streams were more likely to have vegetated riparian buffers along the banks and pools of water, which might support wildlife.

Ponds were features that appeared to hold water throughout the year. Many of the ponds observed in the vicinity of the Survey Area were man-made impoundments, which may be used for holding water for irrigation or recreational fishing and aesthetics.

The OEPA HHEI forms were completed for each stream and ditch and serve to record and score a variety of aspects about the feature. The HHEI forms score the types and percent composition of substrates, maximum pool depth, and average bank full width. Additional descriptive information is recorded in the forms regarding flow regime, riparian width and quality, morphology, and modification. Stream channel modification is referenced in many of the descriptions below, as either 'naturalized' or 'modified'. Naturalized features are those that have either never been modified or have historic signs of modification but appear to have recovered to a natural state. Modified features are those that appear to have recently been modified (such as through dredging or armoring of the banks) and may have little to no evidence of recovery. Scores are tallied for each feature, and result in a HHEI Category of Class I, II, or III as described in Section 6.2.2.2 above.

While delineating the waterbodies in the Survey Area, Cardno evaluated the features for suitability as habitat for RTE species. Due to the modification and disturbance present in the surrounding area, none of the ditches were identified as highly likely to serve as habitat for any RTE species. On average, the streams had a slightly higher potential for providing suitable habitat to RTE species (such as mussels and snakes), but none were observed during the field surveys. Frequently a waterbody may be able to provide physical habitat, but lack suitable water chemistry due to intensive land use in the upland areas.

Table 6-4 Waterbodies Delineated in the Project Parcels

Stream ID	Type	Linear Feet in Project Area	HHEI Score	QHEI Score	PHWH Class Designation	Flow Regime	Drainage Basin	Stream Name	Anticipated Jurisdictional?	Potential RTE Habitat	Mussels Observed	S R W	W H	E W H	M W H	S S H	C W H	L R W	P W S	A W S	I W S	B W	P C R	S C R
S01a	Stream	10524	N/A	46	N/A	Perennial	Deer Creek - Bean Creek	Spring Creek	Yes	Moderate	No				X					X	X		X	
S01b	Stream	1486	N/A	41	N/A	Perennial	Deer Creek - Bean Creek	Spring Creek	Yes	Low	No				X					X	X		X	
S02	Stream	3298	N/A	26	N/A	Perennial	Deer Creek - Bean Creek	Deer Creek	Yes	Low	No							X		X	X		X	
S03	Stream	2153	52	N/A	Class II	Perennial	Deer Creek - Bean Creek	Unnamed Tributary to Spring Creek	Yes	Moderate	No													
S04	Stream	1210	32	N/A	Class II	Ephemeral	Deer Creek - Bean Creek	Unnamed Tributary to Spring Creek	Yes	Low	No													
S05	Stream	647	47	N/A	Class II	Ephemeral	Deer Creek - Bean Creek	Unnamed Tributary to Spring Creek	Yes	Low	No													
P01	Pond	N/A	N/A	N/A	N/A	Perennial	Deer Creek - Bean Creek	Private Pond	No	Low	No													
Total Linear Feet		19,318																						

Notes:
n/a – No QHEI performed
RTE – rare, threatened or endangered species
TBD – To Be Determined once a field delineation is conducted

QHEI – Scoring

- < 32: Limited Resource Water (LRW)
- 32 to 60: Modified Warmwater Habitat (MWH)
- 60 to 75: Warmwater Habitat (WWH)
- > 75: Possible Exceptional Warmwater Habitat (EWH)

HHEI – Scoring

- < 30: Class I PHWH (typically ephemeral streams)
- 30 to 50 Class II PHWH (intermittent warm water streams)
- > 50: Class II or III PHWH (depending on conditions)
- > 75: Class III PHWH (perennial cool water streams)

Notes:

- PHWH – Primary Headwater Habitat Stream
- N/A – Not Applicable
- SRW - State Resource Water
- WWH – Warm Water Habitat
- EWH – Exceptional Warm Water Habitat
- MWH – Modified Warm Water Habitat
- SSH – Seasonal Salmonid Habitat
- SRW - State Resource Water
- CWH – Cold Water Habitat
- LRW – Limited Resource Water

- PWS - Public Water Supply
- AWS – Agricultural Water Supply
- IWS – Industrial Water Supply
- BW - Bathing Waters
- PCR – Primary Contact Recreations
- SCR – Secondary Contact Recreation
- UNT – Unnamed Tributary
- HHEI – Headwater Habitat Evaluation Index
- QHEI – Qualitative Habitat Evaluation Index

No water quality samples were taken during Cardno’s field surveys, though field observations indicate several significant stressors present in and around many of the streams. Streams located between agricultural fields lack any significant sources of shade since the stream banks are regularly mowed. The lack of cover will lead to higher temperatures in the summer, which is further compounded by the relative lack of depth in many of the streams. The surrounding land use also results in significant nutrient loading from fertilizer run off in the overland flow during rain events. The implementation of field tiling may also increase the sediment loading onto streams.

Appendix D, Wetland and Stream Delineation Report and Forms has additional descriptive information delineated waterbodies.

6.3 Ohio Mussel Survey

All native mussels in the State of Ohio are protected per Ohio Revised Code Section 1533.324, as are the 10 federally protected species, which may occur in the state. In order to protect these species, the ODNR DOW and FWS developed a series of survey protocols to identify the presence or absence of mussels in a waterbody.

The protocols identify five types of streams based on their size and potential for federally listed species, as shown in Table 6-5.

Table 6-5 Stream Classifications according to Mussel Survey Protocol, per ODNR and FWS

Group	Definition
Unlisted	Streams not listed in the Survey Protocol, having a watershed larger than 10 square miles with the potential for mussels, but no federally listed species are expected
Group 1	Small to mid-sized streams, federally listed species not expected
Group 2	Small to mid-sized streams, federally listed species expected
Group 3	Large rivers, federally listed species not expected
Group 4	Large rivers, federally listed species expected

Mussel surveys are required to be completed by trained and accredited individuals, with the group of stream determining exact scale of surveys required. The unlisted streams and Group 1 streams may have visual reconnaissance surveys completed, with the results being forwarded to ODNR who then determine need for any additional surveys. All Group 2, 3, and 4 streams will require a full survey prior to any planned impact.

Cardno field staff conducted only visual reconnaissance surveys as part of the typical delineation process. If any mussels are found during stream delineations and if the stream is to be impacted, Cardno identifies the stream for a follow-up survey. The survey protocol notes that use of horizontal directional drill (HDD) to cross a stream eliminates the need for surveys, and streams with a drainage area less than 10 square miles also do not require surveys. Based on these criteria, full mussel surveys are not required for the Project.

None of the delineated streams within the Survey Area meet the requirements for mussel survey; however, Spring Creek (S01) and Deer Creek (S02) have drainage areas greater than 10 square miles.

During the field surveys, Cardno observed no individuals or populations of freshwater mussel species.

7 Estimated Project Impacts

Compared to the environmental impact of traditional energy sources (i.e., fossil fuel and nuclear), the production of solar power does not affect air quality, groundwater or surface water through air emissions or water discharges. In order to build solar project infrastructure, materials must be mined, manufactured, processed, and transported as with all conventional power plants.

7.1 Project Infrastructure Summary

As previously noted, the proposed Project infrastructure will consist of the fence line, photovoltaic (PV) panel arrays, below-ground and above-ground electrical collection lines, inverters, access roads, a substation, an operations and maintenance (O&M) building, weather stations, and laydown yards. The Project is anticipated to temporarily impact up to 39 acres during construction and permanently impact up to 21 acres during operation. The total acres of permanent impact may be reduced with revised Project siting and micro-siting of facilities to further minimize or avoid potential impacts.

Arche Solar will likely consist of the following infrastructure:

- > Solar Panels:
 - Typical PV panel size 4-feet by 7-feet, up to 14 feet at highest point
 - Panels will be grouped into a series of circuits (strings or rows)
 - Panel support piles less than 1 s.f. each, directly driven 8 to 10 feet below ground surface (up to 54,295 piles, or up to 1.25 acre total spread across 572-acre array area)
 - 20 to 25 feet of open space between panel strings
 - Up to 572 acres of solar array blocks (5 to 10 acres per block)
- > Project Substation and Support Facilities:
 - Up to 1.8 acre Project Substation
 - Up to 1 acre O&M facility
 - Security fencing and access gates
 - The Project will also contain up to five on-site solar meteorological stations (SMSs or pyranometer), which would consist of irradiance (solar energy) meters as well as air temperature and wind meters. These met stations would be mounted on columns with a footprint of up to approximately 1 s.f. each, 5 s.f. total.
- > Inverters:
 - Inverter pads are anticipated to be 265 s.f. permanent concrete slab or mounted on 8 driven support posts per inverter (up to 33 inverter pads total).
 - Permanent impacts are anticipated to be 0.20 acres.

- > Collection Lines:
 - Up to 8.4 miles of buried cable, 20-foot wide temporary work area (10 acres)
 - Buried 36 inches below grade (outside fence lines)
 - All jurisdictional perennial streams will be avoided using HDD technology
- > Overhead Collection Line
 - Up to 0.7 miles of overhead collection line
 - The collection line will be supported by 9 wooden poles; 40 ft tall each
 - Temporary impacts from the collection line is anticipated to be < 0.5 acres and permanent impacts are anticipated to be up to 0.01 acres.
- > Access Roads:
 - Up to 6.6 miles of access roads
 - Access roads will have an impact width of up to 50 feet during construction (22.23 acres) to accommodate locations requiring cut and fill or clearance for two delivery vehicles. Permanent impacts from access roads will consist of a maintained 20 feet wide access roads post-construction (16.13 acres)
- > Overhead Generation Interconnection (Gen-Tie) Line
 - The overhead line will be supported on up to 2 wood or steel poles. The Height of the poles will not exceed 100ft.
 - The pole(s) will be installed using typical installation techniques to carry 138kV electric lines.
 - Wooden poles would be directly driven; if steel poles are used a caisson foundation would likely be used. The temporary impacts for the construction will be up to 0.1 acres and permanent impacts are anticipated to be less than 0.05 acres.
- > Equipment Laydown Areas:
 - These staging areas will be covered with timber matting, gravel with an under lay of geosynthetic fabric, or other suitable material to separate the native soil from the construction materials.
 - Up to 6.15 acres will be used for laydown areas; for storage of construction equipment and supplies during construction
 - Up to 5.15 acres will be temporary during the construction phase, and will be removed and allowed to revegetate after construction.
 - After construction up to 1 acre (of the 6-acre area) will be maintained as permanent gravel-covered parking / laydown area.

Table 7-1 provides a summary of the reviewed and proposed Project infrastructure.

Table 7-1 Summary of Proposed Arche Solar Permanent Infrastructure

Features	Maximum Values
Project Generation Capacity	107 MW
Project Area	1,010 acres
Potential Tree Clearing (access/shading)	< 4 acres
Solar Arrays	571.5 acres
Solar Array Piles	1.25 acres
Project Substation	1.8 acres
Gravel-covered Parking / Laydown Area	1 acre
Supporting Facilities (Pyranometer Stations, Inverter Pads)	<0.5 acres
Collection Lines (buried)	0 acre (all buried) (8.4 miles)
Permanent Access Roads (gravel-covered)	16.2 acres (6.6 miles)

7.2 Natural Resource Impacts Summary

Overall, Arche Solar would likely have limited environmental impacts. The Project would aim to minimize any potential impacts to the habitats that may support significant wildlife by avoiding the majority of woodlots. No high quality streams are anticipated to be impacted. The Project is proposed to be primarily built on land that has already been disturbed seasonally/annually for agriculture with limited identified habitat of significant value to RTE species and other wildlife. The Project's most significant impact will come from the conversion of agricultural land to land to be used for the solar panel arrays (up to 572 acres) and associated infrastructure. The Project would be designed to avoid and minimize impacts to wetlands, waterbodies, woodlots, and aquatic and terrestrial wildlife species where possible. If the proposed Project were decommissioned, the landscape could be returned to its previous condition.

A summary of potential impacts to existing environmental features within the Project Area are presented in Tables 7-2 and 7-3. These anticipated impacts, which are based on current up to 572-acre design layout. This design layout has minimized impacts to resources and has avoided all permanent impacts to wetlands and waterbodies within the Project Area, and minimized tree clearing.

Table 7-2 Summary of Proposed Arche Solar Temporary Impacts

Impact Type	Upland Soil (acres)	Wetland (acres)	Streams (acres)	Streams (linear feet)	Ditches (acres)	Ditches (linear feet)	Ponds (acres)
Access Roads	22.23	0	0	0	0	0	0
Collection Line (Buried)	10.04	0	0	0	0	0	0
Collection Line (Overhead)	0.5	0	0	0	0	0	0
Equipment Laydown Area	5.15	0	0	0	0	0	0
Substation	<0.5	0	0	0	0	0	0
Array Pilings / Panels	0	0	0	0	0	0	0
Gen-Tie Line	0.1	0	0	0	0	0	0
Inverter Pads	0	0	0	0	0	0	0
Pyranometer	0	0	0	0	0	0	0
Totals	38.52	0	0	0	0	0	0

Table 7-3 Summary of Proposed Arche Solar Permanent Impacts

Impact Type	Upland Soil (acres)	Forested Uplands (Tree Clearing) (acres)	Wetland (acres)	Streams (acres)	Streams (linear feet)	Ditches (acres)	Ditches (linear feet)	Ponds (acres)
Access Roads	16.13	0.04	0	0	0	0	0	0
Collection Line (Buried)	0	0.19	0	0	0	0	0	0
Collection Line (Overhead)	0.01	0	0	0	0	0	0	0
Equipment Laydown Area	1	0	0	0	0	0	0	0
Substation	1.8	0	0	0	0	0	0	0
Array Pilings / Panels	1.3	3	0	0	0	0	0	0
Gen-Tie Line	0.05	0	0	0	0	0	0	0
Inverter Pads	0.2	0	0	0	0	0	0	0
Pyranometer	<0.01	0	0	0	0	0	0	0
Totals	20.5	3.23	0	0	0	0	0	0

7.2.1 Land Use

The Project Area currently is primarily used as active agricultural lands (92%). The wooded areas of the Project Area occurred as isolated woodlots, windrows between crop areas and along roads (3%). The most significant impact will come from the conversion of agricultural land to accommodate solar panel arrays. The conversion from agricultural lands to solar project is expected to have a negligible environmental impact because agriculture fields provide minimal habitat for floral and faunal communities. Additionally, the

proposed row spacing, elevation of the solar panels above the ground, and low-impact pilings will allow for managed vegetation beneath the array for erosion control, simultaneously providing a habitat similar to agricultural fields.

7.2.2 Uplands

Solar projects require significant areas of land for the solar panel arrays and associated infrastructure. This Project will locate as much of the infrastructure as possible on uplands, minimizing impacts to surface waters. Impacts to upland soils and tree clearing are discussed below.

7.2.2.1 Soil

The majority of impacts to the Project Area will occur as a result of upland soil disturbance for construction of access roads, both temporary (22.23) and permanent (16.13 acres).

Solar panels are supported by permanent pilings in the ground. Each support will be directly driven 8 to 10 feet below the ground, with a footprint of less than 1 s.f. each. Approximately 54,295 pilings will total 1.25 acre, spread across the 572 acres of panel arrays. Support infrastructure, including five pyranometer stations (1 s.f. each, 5 s.f. total), inverter pads (33 total, 0.20 acre total), a permanent equipment storage area (1 acre), and a Project Substation (1.8 acre) are all included as maximum permanent upland soil impacts.

7.2.2.2 Forested Uplands/Tree Clearing

Forested areas within the Project Area will be preserved where possible, however, Arche Solar anticipates the need to clear select windrows and edges of woodlots in order to construct and operate the Project. Less than 4 acres of woody vegetation are anticipated to be cleared. The windrows within the Project Area provide minimal habitat and were used as historical property boundaries.

Arche Solar is committed to minimizing tree clearing and observing seasonal tree clearing restrictions designed to protect Indiana bat (e.g., cutting trees only between October and March), or as conditions specify. The tree clearing will be done primarily by hand, however a skid-steer stump grinder will be used to grind stumps to ground level or just below as required to install Project infrastructure. Timber and other vegetative debris may be chipped for use as erosion control, mulch or otherwise disposed of, in accordance with applicable local regulations and landowner preferences.

7.2.3 Wetlands and Waterbodies

Cardno delineated four wetlands during field surveys, for a total of 1.24 acres of wetland within the Project Area. The majority of wetlands were identified as emergent and scored as lower quality wetlands on the ORAM.

Six waterbodies were delineated within the Project Area, primarily stream reaches, agricultural ditches, and one pond. Based on desktop analysis, the waterbodies identified were not expected to be highly impacted by the surrounding land use. Although the waterbodies may provide habitat, the water quality does not support the development of rich faunal communities. Due to the modification and disturbance present in the surrounding land use, and lack of flowing water, the agricultural ditches identified in the Project Area are unlikely to support aquatic communities.

Through careful design and avoidance measures, Arche Solar anticipates no impacts to delineated wetlands or waterbodies within the Project Area. Current layout design has three (3) HDD collection line crossings. Detailed tables of anticipated wetland and waterbody impacts, and proposed construction methods are provided in Appendix E, Wetland and Waterbody Impact Tables. The detailed Inadvertent Release of Drilling Fluid Contingency Plan is provided as Appendix F, and will be implemented at all HDD stream crossings.

Final array and layout designs are not finalized, but based on preliminary work, up to 6.6 miles of new permanent gravel roads will be installed for construction, operation, and maintenance of the Project. Construction of the Project access roads will require no temporary or permanent impact to any stream reaches.

In addition to the above-mentioned measures, Arche Solar will cooperate with the state as part of the NPDES CGP, and prepare a SWPPP incorporating the most appropriate SESC measures and BMPs to ensure surface waters in proximity to Project disturbance areas are not impacted. Arche Solar plans to restore all disturbed waterbodies from construction to pre-construction conditions within one growing season.

Surface waters within the Project Area will not be used during or for construction of the Project; however, water may be brought to the Project Area or groundwater wells may be used if needed. To prevent adverse effects from construction-related stormwater runoff, Arche Solar will obtain an NPDES general permit for construction activities over 1 acre and implement an SESC plan that contains appropriate stormwater quality and quantity control measures. Additionally, Arche Solar will maintain needed controls for operations to prevent and minimize stormwater runoff.

There will be a small operations and/or maintenance facility (storage shed) as part of this Project. Staff operating out of the operations and maintenance building will use water at a rate comparable to a typical small business or office. Modern, efficient fixtures will be installed and will be maintained in proper working order. As a result, the Project will not necessitate any water withdrawals or wastewater discharges.

There are no impacts to other water users anticipated as a result of Project construction or operation.

Additional details on sequence of construction activities, construction methods, and SESCOs (including inspection protocols) will be provided in Arche Solar construction drawings (currently under development). The detailed Inadvertent Release of Drilling Fluid Contingency Plan is provided as Appendix F, and will be implemented at all HDD stream crossings.

7.2.4 Aquatic and Wildlife Resources

The Project would not significantly impact wildlife or wildlife habitat. Information on the existing wildlife in the Project Area was obtained from a variety of sources, including observations during site surveys, and publicly available data from Federal and State agencies. Wildlife within the Project Area could potentially utilize the site habitat for foraging, migratory stopover, breeding, and/or shelter. Based on the current land use, species present in the Project vicinity are primarily associated with agricultural fields, pasture grasslands, isolated wooded lots, and wetland areas. Typical wildlife species observed during the field delineations included evidence of white-tailed deer and common woodland and grassland songbirds.

Typical construction-related impacts to wildlife include incidental injury and mortality of juvenile and/or slow moving animals (e.g., salamanders, turtles, etc.) due to construction activity and vehicular movement; construction-related silt and sedimentation impacts on aquatic organisms; habitat disturbance/loss associated with clearing and earthmoving activities; and displacement of wildlife due to increased noise and human activities. However, the Project has been sited to avoid and/or minimize such impacts. The Project has been designed to locate the majority of infrastructure within active agricultural land, which only provides habitat for a limited number of wildlife species. The few birds and mammals that may forage within these fields should be able to vacate areas that are being disturbed by construction. On a landscape scale, there is abundant availability of similar agricultural fields within the Project Area and beyond.

Since impacts to wildlife are anticipated to be negligible or limited, no post-construction monitoring is proposed.

7.2.5 Threatened and Endangered Species

The Project Area and ¼-mile buffer are not known to provide permanent habitat for sensitive bird, bat, or freshwater mussel species.

Due to the lack of adequate habitat in the immediate Project Area, it is likely many of the individuals would opt for higher quality habitat nearby such as Wildlife Areas or State Parks for roosting, foraging and breeding. Arche Solar has prioritized avoidance measures for sensitive habitats, such as minimizing habitat fragmentation, siting infrastructure in uplands rather than wetlands, and minimizing perennial stream crossings. Based on current Project designs, significant impacts to these habitats are not anticipated; therefore, no post-construction wildlife monitoring is proposed at this time.

7.2.6 Disposal of Plant-Generated Wastes

The storage and use of fuel, lubricants, and other fluids could create a potential contamination hazard during Project construction. Any spills or leaks of hazardous fluids could potentially contaminate soil and groundwater. The impact of leaks and spills will be minimized or avoided by restricting the location of refueling activities and by requiring immediate cleanup of spills and leaks of hazardous materials. Construction equipment will be maintained regularly, and the source of any leaks will be identified and repaired immediately. Any soil contaminated by fuel or oil spills would be removed and disposed of at an approved disposal site.

Temporary portable sanitary facilities would be installed during construction and sanitary wastes would be disposed of by a contractor.

Project construction will generate some solid waste, primarily plastic, wood, cardboard and metal packing/packaging materials, construction scrap, and general refuse. Construction waste will be collected and disposed of in dumpsters located at the laydown areas. A private contractor will empty the dumpsters on an as needed basis and dispose materials at a licensed solid waste disposal facility. Waste volumes are expected to be minimal and will not affect local waste disposal facilities.

As indicated above, staff will monitor Project operations from an off-site location, and conduct periodic cleaning and on-site maintenance procedures, as needed. The minimal wastes generated from these activities will be removed from the Project site and disposed of in accordance with Federal, state, and local regulations.

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Arche Energy Project, LLC

APPENDIX

B

AGENCY CORRESPONDENCE

Megan McLaughlin

From: Boyer, Angela <angela_boyer@fws.gov>
Sent: Friday, March 20, 2020 11:26 AM
To: Megan McLaughlin
Cc: Ohio, FW3; nathan.reardon@dnr.state.oh.us; Kate Parsons
Subject: 7X Energy's Proposed Arche Solar Farm Project, Fulton County, Ohio



UNITED STATES DEPARTMENT OF THE INTERIOR
U.S. Fish and Wildlife Service
Ecological Services Office
4625 Morse Road, Suite 104
Columbus, Ohio 43230
(614) 416-8993 / Fax (614) 416-8994



TAILS# 03E15000-2020-1014

Dear Ms. McLaughlin:

We have received your recent correspondence requesting information about the subject proposal. There are no federal wilderness areas, wildlife refuges or designated critical habitat within the vicinity of the project area. The following comments and recommendations will assist you in fulfilling the requirements for consultation under section 7 of the Endangered Species Act of 1973, as amended (ESA).

The U.S. Fish and Wildlife Service (Service) recommends that proposed developments avoid and minimize water quality impacts and impacts to high quality fish and wildlife habitat (e.g., forests, streams, wetlands). Additionally, natural buffers around streams and wetlands should be preserved to enhance beneficial functions. If streams or wetlands will be impacted, the Corps of Engineers should be contacted to determine whether a Clean Water Act section 404 permit is required. Best management practices should be used to minimize erosion, especially on slopes. All disturbed areas should be mulched and revegetated with native plant species. Prevention of non-native, invasive plant establishment is critical in maintaining high quality habitats.

FEDERALLY LISTED SPECIES COMMENTS: All projects in the State of Ohio lie within the range of the federally endangered Indiana bat (*Myotis sodalis*) and the federally threatened northern long-eared bat (*Myotis septentrionalis*). In Ohio, presence of the Indiana bat and northern long-eared bat is assumed wherever suitable habitat occurs unless a presence/absence survey has been performed to document absence. Suitable summer habitat for Indiana bats and northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥ 3 inches diameter at breast height (dbh) that have any exfoliating bark, cracks, crevices, hollows and/or cavities), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit the characteristics of a potential roost tree and are located within 1,000 feet (305 meters) of other forested/wooded habitat. Northern long-eared bats have also been observed roosting in human-made structures, such as buildings, barns, bridges, and bat houses; therefore,

these structures should also be considered potential summer habitat. In the winter, Indiana bats and northern long-eared bats hibernate in caves and abandoned mines.

We recommend minimizing tree clearing to the maximum extent possible and avoiding clearing of any woodlots and we appreciate your commitment to preserving forested areas where possible and to clearing unavoidable trees only between October 1 and March 31. However, at this time we are unable to fully assess the potential impact of the project on federally listed bats. Therefore, we recommend additional coordination with this office regarding project siting in order for us to provide project-specific conservation recommendations for federally listed bats.

If there is a federal nexus for the project (e.g., federal funding provided, federal permits required to construct), no portion of the project should be initiated until consultation under section 7 of the ESA, between the Service and the federal action agency, is completed. We recommend that the federal action agency submit a determination of effects to this office, relative to the Indiana bat and northern long-eared bat, for our review and concurrence.

Due to the project type, size, and location, we do not anticipate adverse effects to any other federally endangered, threatened, proposed, or candidate species. Should the project design change, or during the term of this action, additional information on listed or proposed species or their critical habitat become available, or if new information reveals effects of the action that were not previously considered, consultation with the Service should be initiated to assess any potential impacts.

STREAM AND WETLAND AVOIDANCE: Over 90% of the wetlands in Ohio have been drained, filled, or modified by human activities, thus is it important to conserve the functions and values of the remaining wetlands in Ohio (https://epa.ohio.gov/portals/47/facts/ohio_wetlands.pdf). We recommend avoiding and minimizing project impacts to all wetland habitats (e.g., forests, streams, vernal pools) to the maximum extent possible in order to benefit water quality and fish and wildlife habitat. Additionally, natural buffers around streams and wetlands should be preserved to enhance beneficial functions. If streams or wetlands will be impacted, the U.S. Army Corps of Engineers should be contacted to determine whether a Clean Water Act section 404 permit is required. Best management practices should be used to minimize erosion, especially on slopes. Disturbed areas should be mulched and revegetated with native plant species. In addition, prevention of non-native, invasive plant establishment is critical in maintaining high quality habitats.

These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), the ESA, and are consistent with the intent of the National Environmental Policy Act of 1969 and the Service's Mitigation Policy. This letter provides technical assistance only and does not serve as a completed section 7 consultation document. We recommend that the project be coordinated with the Ohio Department of Natural Resources due to the potential for the project to affect state listed species and/or state lands. Contact John Kessler, Environmental Services Administrator, at (614) 265-6621 or at john.kessler@dnr.state.oh.us.

If you have questions, or if we can be of further assistance in this matter, please contact Angela Boyer at this office at (614) 416-8993, ext. 122 or angela_boyer@fws.gov.

Sincerely,



Patrice Ashfield
Field Office Supervisor



Ohio Department of Natural Resources

MIKE DEWINE, GOVERNOR

MARY MERTZ, DIRECTOR

Office of Real Estate
John Kessler, Chief
2045 Morse Road – Bldg. E-2
Columbus, OH 43229
Phone: (614) 265-6621
Fax: (614) 267-4764

April 23, 2020

Megan McLaughlin
Cardno
11121 Canal Road
Cincinnati, Ohio 45241

Re: 20-272; Archie Solar Farm

Project: The proposed project involves the construction of a 107-megawatt photovoltaic solar farm.

Location: The proposed project is located in Gorham Township, Fulton County, Ohio.

The Ohio Department of Natural Resources (ODNR) has completed a review of the above referenced project. These comments were generated by an inter-disciplinary review within the Department. These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), the National Environmental Policy Act, the Coastal Zone Management Act, Ohio Revised Code and other applicable laws and regulations. These comments are also based on ODNR's experience as the state natural resource management agency and do not supersede or replace the regulatory authority of any local, state or federal agency nor relieve the applicant of the obligation to comply with any local, state or federal laws or regulations.

Natural Heritage Database: The Natural Heritage Database has the following records at or within a one-mile radius of the project area:

Northern harrier (*Circus hudsonius*), E
Badger (*Taxidea taxus*), SC

The review was performed on the project area you specified in your request as well as an additional one-mile radius. Records searched date from 1980. This information is provided to inform you of features present within your project area and vicinity.

Please note that Ohio has not been completely surveyed and we rely on receiving information from many sources. Therefore, a lack of records for any particular area is not a statement that rare species or unique features are absent from that area. Although all types of plant communities have been surveyed, we only maintain records on the highest quality areas.

Statuses are defined as: E = state endangered; T = state threatened; P = state potentially threatened; SC = state species of concern; SI = state special interest; A = species recently added to state inventory, status not yet determined; X = presumed extirpated in Ohio; FE = federal endangered, FT = federal threatened, FSC = federal species of concern, FC = federal candidate species.

Fish and Wildlife: The Division of Wildlife (DOW) has the following comments.

The DOW recommends that impacts to streams, wetlands and other water resources be avoided and minimized to the fullest extent possible, and that best management practices be utilized to minimize erosion and sedimentation.

The Division of Wildlife is working closely with our partners at Ohio Pollinator Habitat Initiative (OPHI) to create and enhance pollinator habitat at solar power installations. Attached for your use is the Ohio Solar Site Pollinator Habitat Planning and Assessment Form. This form was developed by the OPHI Solar Pollinator Program Advisory Team. We recommend that the areas between and around the solar panels be planted with legumes and wildflowers (i.e. forbs) that are beneficial to pollinators and other wildlife and reduce use of non-native grass and gravel. The recommended legumes and forbs listed below are low-growing so as not to cast shadows on the solar panels and would only require one to two mowings a year for maintenance, which should minimize maintenance costs. For other areas of the installation where vegetation does not have to be low-growing, alternative pollinator mixes are available with a more diverse array of flowering plants. This perennial vegetation will provide beneficial foraging habitat to songbirds and pollinators while reducing storm water runoff, standing water, and erosion. Please contact the Ohio Pollinator Habitat Initiative <http://www.ophi.info/>, and specifically Mike Retterer mretterer@pheasantsforever.org for further information on solar power facility pollinator plantings.

Recommended low-growing grasses and forbs may include:

Little Bluestem	<i>Schizachyrium scoparium</i>
Sideoats Grama	<i>Bouteloua curtipendula</i>
Alfalfa	<i>Medicago spp.</i>
Alsike Clover	<i>Trifolium hybridum</i>
Brown-eyed Susan	<i>Rudbeckia triloba</i>
Butterfly Milkweed	<i>Asclepias tuberosa</i>
Lanceleaf Coreopsis	<i>Coreopsis lanceolata</i>
Partridge Pea	<i>Chamaecrista fasciculata</i>
Timothy	<i>Phleum pratense</i>
Orchardgrass	<i>Dactylis glomerata</i>
Crimson Clover	<i>Trifolium incarnatum</i>
Ladino or White Clover	<i>Trifolium repens</i>

The project is within the range of the Indiana bat (*Myotis sodalis*), a state endangered and federally endangered species. The following species of trees have relatively high value as potential Indiana bat roost trees to include: shagbark hickory (*Carya ovata*), shellbark hickory (*Carya laciniosa*), bitternut hickory (*Carya cordiformis*), black ash (*Fraxinus nigra*), green ash (*Fraxinus pennsylvanica*), white ash (*Fraxinus americana*), shingle oak (*Quercus imbricaria*), northern red oak (*Quercus rubra*), slippery elm (*Ulmus rubra*), American elm (*Ulmus americana*), eastern cottonwood (*Populus deltoides*), silver maple (*Acer saccharinum*), sassafras (*Sassafras albidum*), post oak (*Quercus stellata*), and white oak (*Quercus alba*). Indiana bat roost trees consists of trees that include dead and dying trees with exfoliating bark, crevices, or cavities in upland areas or riparian corridors and living trees with exfoliating bark, cavities, or

hollow areas formed from broken branches or tops. However, Indiana bats are also dependent on the forest structure surrounding roost trees. If suitable habitat occurs within the project area, the DOW recommends trees be conserved. If suitable habitat occurs within the project area and trees must be cut, the DOW recommends cutting occur between October 1 and March 31. If suitable trees must be cut during the summer months, the DOW recommends a net survey be conducted between June 1 and August 15, prior to any cutting. Net surveys should incorporate either nine net nights per square 0.5 kilometer of project area, or four net nights per kilometer for linear projects. If no tree removal is proposed, this project is not likely to impact this species.

The project is within the range of the rayed bean (*Villosa fabalis*), a state endangered and federally endangered mussel. The DOW understands that a mussel reconnaissance survey did not result in the presence of mussels. In addition, streams with a watershed of 10 square miles above the point of impact will be crossed by horizontal directional bore. Therefore, impacts to mussels are not likely.

The project is within the range of the greater redhorse (*Moxostoma valenciennesi*), a state threatened fish. The DOW recommends no in-water work in perennial streams from April 15 to June 30 to reduce impacts to indigenous aquatic species and their habitat. If no in-water work is proposed in a perennial stream, this project is not likely to impact these or other aquatic species.

The project is within the range of the Blanding's turtle (*Emydoidea blandingii*), a state threatened species. This species inhabits marshes, ponds, lakes, streams, wet meadows, and swampy forests. Although essentially aquatic, the Blanding's turtle will travel over land as it moves from one wetland to the next. Due to the location, and the type of habitat present at the project site and within the vicinity of the project area, this project is not likely to impact this species.

The project is within the range of the northern harrier (*Circus cyaneus*), a state endangered bird. This is a common migrant and winter species. Nesters are much rarer, although they occasionally breed in large marshes and grasslands. Harriers often nest in loose colonies. The female builds a nest out of sticks on the ground, often on top of a mound. Harriers hunt over grasslands. If this type of habitat will be impacted, construction should be avoided in this habitat during the species' nesting period of May 15 to August 1. If this habitat will not be impacted, this project is not likely to impact this species.

The project is within the range of the lark sparrow (*Chondestes grammacus*), a state endangered bird. This sparrow nests in grassland habitats with scattered shrub layers, disturbed open areas, as well as patches of bare soil. In the Oak Openings area west of Toledo, lark sparrows occupy open grass and shrubby fields along sandy beach ridges. These summer residents normally migrate out of Ohio shortly after their young fledge or leave the nest. If this type of habitat will be impacted, construction should be avoided in this habitat during the species' nesting period of May 1 to June 30. If this type of habitat will not be impacted, this project is not likely to impact this species.

Due to the potential of impacts to federally listed species, as well as to state listed species, we recommend that this project be coordinated with the U.S. Fish & Wildlife Service.

Water Resources: The Division of Water Resources has the following comment.

The local floodplain administrator should be contacted concerning the possible need for any floodplain permits or approvals for this project. Your local floodplain administrator contact information can be found at the website below.

http://water.ohiodnr.gov/portals/soilwater/pdf/floodplain/Floodplain%20Manager%20Community%20Contact%20List_8_16.pdf

ODNR appreciates the opportunity to provide these comments. Please contact Sarah Tebbe, Environmental Specialist, at (614) 265-6397 or Sarah.Tebbe@dnr.state.oh.us if you have questions about these comments or need additional information.

Mike Pettegrew
Environmental Services Administrator (Acting)

Arche Enrgy Project, LLC

APPENDIX

C

RTE SPECIES INFORMATION

IPaC**U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Fulton County, Ohio



Local office

Ohio Ecological Services Field Office

☎ (614) 416-8993

📠 (614) 416-8994

4625 Morse Road, Suite 104

Columbus, OH 43230-8355

NOT FOR CONSULTATION

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species

¹ and their critical habitats are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries²).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact [NOAA Fisheries](#) for [species under their jurisdiction](#).

-
1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information.

2. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Indiana Bat <i>Myotis sodalis</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat <i>Myotis septentrionalis</i> This species only needs to be considered if the following condition applies: <ul style="list-style-type: none"> Incidental take of the northern long-eared bat is not prohibited at this location. Federal action agencies may conclude consultation using the streamlined process described at https://www.fws.gov/midwest/endangered/mammals/nleb/s7.html No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Threatened

Clams

NAME	STATUS
Rayed Bean <i>Villosa fabalis</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5862	Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act

[1](#) and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described [below](#).

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern <http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>
- Measures for avoiding and minimizing impacts to birds <http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>
- Nationwide conservation measures for birds <http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf>

THERE ARE NO MIGRATORY BIRDS OF CONSERVATION CONCERN EXPECTED TO OCCUR AT THIS LOCATION.

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) and/or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [AKN Phenology Tool](#).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go to the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: [The Cornell Lab of Ornithology All About Birds Bird Guide](#), or (if you are unsuccessful in locating the bird of interest there), the [Cornell Lab of Ornithology Neotropical Birds guide](#). If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and

3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the [Eagle Act](#) requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the [Diving Bird Study](#) and the [nanotag studies](#) or contact [Caleb Spiegel](#) or [Pam Loring](#).

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to [obtain a permit](#) to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score

can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

[PEM1A](#)[PEM1C](#)

FRESHWATER FORESTED/SHRUB WETLAND

[PFO1A](#)

FRESHWATER POND

[PUBK](#)[PUBGx](#)[PUBGh](#)

RIVERINE

[R5UBH](#)[R4SBC](#)

A full description for each wetland code can be found at the [National Wetlands Inventory website](#)

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm

reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

NOT FOR CONSULTATION

Ohio

County Distribution of Federally-Listed Threatened, Endangered, Proposed, and Candidate Species

January 29, 2018

County	Species	Status	Habitat
Adams	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Fanshell (<i>Cyprogenia stegaria</i>) (= <i>C. irrorata</i>)	Endangered	Found in areas of packed sand and gravel at locations in a good current
	Pink mucket pearlymussel (<i>Lampsilis abrupta</i>)	Endangered	The lower Ohio River and its larger tributaries
	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
	Sheepnose (<i>Plethobasus cyphus</i>)	Endangered	Shallow areas in larger rivers and streams
	Snuffbox (<i>Epioblasma triquetra</i>)	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
	Running buffalo clover (<i>Trifolium stoloniferum</i>)	Endangered	Disturbed bottomland meadows; disturbed sites that have shade during part of each day
Allen	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Ashland	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Ashtabula	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.

	Kirtland's warbler (<i>Dendroica kirtlandii</i>)	Endangered	Kirtland's warblers are known to migrate along the Lake Erie shoreline counties (Ashtabula, Cuyahoga, Erie, Lake, Lorain, Lucas, Ottawa, Sandusky counties) through Ohio in late April-May and late August-early October.
	Piping plover (<i>Charadrius melodus</i>)	Endangered	Beaches along shorelines of the Great Lakes
	Red Knot (Rufa) <i>Calidris canutus rufa</i>	Threatened	Present in Ohio during spring and fall migration
	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands
	Clubshell (<i>Pleurobema clava</i>)	Endangered	Found in coarse sand and gravel areas of runs and riffles within streams and small rivers
	Snuffbox (<i>Epioblasma triquetra</i>)	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
Athens	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	American burying beetle (<i>Nicrophorus americanus</i>)	Endangered	
	Fanshell (<i>Cyprogenia stegaria</i>) (= <i>C. irrorata</i>)	Endangered	Found in areas of packed sand and gravel at locations in a good current
	Pink mucket (<i>Lampsilis abrupta</i>)	Endangered	The lower Ohio River and its larger tributaries
	Sheepnose (<i>Plethobasus cyphus</i>)	Endangered	Shallow areas in larger rivers and streams
	Snuffbox (<i>Epioblasma triquetra</i>)	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
Auglaize	Indiana bat	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Belmont	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Brown	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests

	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Fanshell (<i>Cyprogenia stegaria</i>) (= <i>C. irrorata</i>)	Endangered	Found in areas of packed sand and gravel at locations in a good current
	Pink mucket pearlymussel (<i>Lampsilis abrupta</i>)	Endangered	The lower Ohio River and its larger tributaries
	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
	Sheepnose (<i>Plethobasus cyphus</i>)	Endangered	Shallow areas in larger rivers and streams
	Snuffbox (<i>Epioblasma triquetra</i>)	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
	Running buffalo clover (<i>Trifolium stoloniferum</i>)	Endangered	Disturbed bottomland meadows; disturbed sites that have shade during part of each day
Butler	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands
	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
Carroll	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Champaign	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands
Clark	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests

	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Clubshell <i>(Pleurobema clava)</i>	Endangered	Found in coarse sand and gravel areas of runs and riffles within streams and small rivers
	Rayed bean <i>(Villosa fabalis)</i>	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
Hardin	Indiana bat <i>(Myotis sodalis)</i>	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Copperbelly water snake <i>(Nerodia erythrogaster neglecta)</i>	Threatened	Wooded and permanently wet areas such as oxbows, sloughs, brushy ditches and floodplain woods
	Eastern massasauga <i>(Sistrurus catenatus)</i>	Threatened	Wetlands and adjacent uplands
	Clubshell <i>(Pleurobema clava)</i>	Endangered	Found in coarse sand and gravel areas of runs and riffles within streams and small rivers
	Rayed bean <i>(Villosa fabalis)</i>	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
Harrison	Indiana bat <i>(Myotis sodalis)</i>	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Henry	Indiana bat <i>(Myotis sodalis)</i>	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Highland	Indiana bat <i>(Myotis sodalis)</i>	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Hocking	Indiana bat <i>(Myotis sodalis)</i>	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.

	Northern monkshood (<i>Aconitum noveboracense</i>)	Threatened	Cool, moist, shaded cliff faces or talus slopes in wooded ravines, near water seeps
	American burying beetle (<i>Nicrophorus americanus</i>)	Endangered	
	Running buffalo clover (<i>Trifolium stoloniferum</i>)	Endangered	Disturbed bottomland meadows; disturbed sites that have shade during part of each day
	Small whorled pogonia (<i>Isotria medeoloides</i>)	Threatened	Dry woodland; upland sites in mixed forests (second or third growth stage)
Holmes	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Eastern prairie fringed orchid (<i>Platanthera leucophaea</i>)	Threatened	Mesic to wet prairies and meadows
Huron	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands
Jackson	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Running buffalo clover (<i>Trifolium stoloniferum</i>)	Endangered	Disturbed bottomland meadows; disturbed sites that have shade during part of each day
Jefferson	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Knox	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Lake	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests

	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Kirtland's warbler <i>(Dendroica kirtlandii)</i>	Endangered	Kirtland's warblers are known to migrate along the Lake Erie shoreline counties (Ashtabula, Cuyahoga, Erie, Lake, Lorain, Lucas, Ottawa, Sandusky counties) through Ohio in late April-May and late August-early October.
	Piping plover <i>(Charadrius melodus)</i>	Endangered	Beaches along shorelines of the Great Lakes
	Piping plover <i>(Charadrius melodus)</i>	Critical Habitat Designated	
	Red Knot (Rufa) <i>Calidris canutus rufa</i>	Threatened	Present in Ohio during spring and fall migration
	Snuffbox <i>(Epioblasma triquetra)</i>	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
Lawrence	Indiana bat <i>(Myotis sodalis)</i>	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Fanshell (<i>Cyprogenia stegaria</i>) (= <i>C. irrorata</i>)	Endangered	Found in areas of packed sand and gravel at locations in a good current
	Pink mucket pearlymussel <i>(Lampsilis abrupta)</i>	Endangered	The lower Ohio River and its larger tributaries
	Sheepnose <i>(Plethobasus cyphus)</i>	Endangered	Shallow areas in larger rivers and streams
	Snuffbox <i>(Epioblasma triquetra)</i>	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
	Running buffalo clover <i>(Trifolium stoloniferum)</i>	Endangered	Disturbed bottomland meadows; disturbed sites that have shade during part of each day
Licking	Indiana bat <i>(Myotis sodalis)</i>	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Eastern massasauga <i>(Sistrurus catenatus)</i>	Threatened	Wetlands and adjacent uplands
Logan	Indiana bat <i>(Myotis sodalis)</i>	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.

	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands
	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
Lorain	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Kirtland's warbler (<i>Dendroica kirtlandii</i>)	Endangered	Kirtland's warblers are known to migrate along the Lake Erie shoreline counties (Ashtabula, Cuyahoga, Erie, Lake, Lorain, Lucas, Ottawa, Sandusky counties) through Ohio in late April-May and late August-early October.
	Piping plover (<i>Charadrius melodus</i>)	Endangered	Beaches along shorelines of the Great Lakes
	Red Knot (Rufa) <i>Calidris canutus rufa</i>	Threatened	Present in Ohio during spring and fall migration
Lucas	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Kirtland's warbler (<i>Dendroica kirtlandii</i>)	Endangered	Kirtland's warblers are known to migrate along the Lake Erie shoreline counties (Ashtabula, Cuyahoga, Erie, Lake, Lorain, Lucas, Ottawa, Sandusky counties) through Ohio in late April-May and late August-early October.
	Piping plover (<i>Charadrius melodus</i>)	Endangered	Beaches along shorelines of the Great Lakes
	Red Knot (Rufa) <i>Calidris canutus rufa</i>	Threatened	Present in Ohio during spring and fall migration
	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands
	Karner blue butterfly (<i>Lycaeides melissa samuelis</i>)	Endangered	Pine barrens and oak savannas on sandy soils and containing wild lupines (<i>Lupinus perennis</i>), the only known food plant of larvae.
	Rusty patched bumble bee <i>Bombus affinis</i> Note for project proponents: this bee is not known to occur throughout the entire county. To determine if your project or ongoing action is within an area that is likely to have the rusty patched bumble bee, use our online tool at https://ecos.fws.gov/ipac/	Endangered	Grasslands with flowering plants from April through October, underground and abandoned rodent cavities or clumps of grasses above ground as nesting sites, and undisturbed soil for hibernating queens to overwinter.

	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
	Eastern prairie fringed orchid (<i>Platanthera leucophaea</i>)	Threatened	Mesic to wet prairies and meadows
Madison	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Scioto madtom (<i>Noturus trautmani</i>)	Endangered	Stream riffles of moderate flow over sandy gravel bottom
	Clubshell (<i>Pleurobema clava</i>)	Endangered	Found in coarse sand and gravel areas of runs and riffles within streams and small rivers
	Northern riffleshell (<i>Epioblasma torulosa rangiana</i>)	Endangered	Large streams and small rivers in firm sand of riffle areas; also occurs in Lake Erie
	Rabbitsfoot <i>Quadrula cylindrica cylindrica</i>	Threatened	
	Rabbitsfoot <i>Quadrula cylindrica cylindrica</i>	Critical Habitat	Little Darby Creek Map of Critical Habitat Unit
	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
	Snuffbox (<i>Epioblasma triquetra</i>)	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
Mahoning	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands
Marion	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands
	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers

Medina	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Meigs	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Fanshell (<i>Cyprogenia stegaria</i> (= <i>C. irrorata</i>))	Endangered	Found in areas of packed sand and gravel at locations in a good current
	Pink mucket pearlymussel (<i>Lampsilis abrupta</i>)	Endangered	The lower Ohio River and its larger tributaries
	Sheepnose (<i>Plethobasus cyphus</i>)	Endangered	Shallow areas in larger rivers and streams
	Snuffbox (<i>Epioblasma triquetra</i>)	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
Mercer	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Miami	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
	Snuffbox (<i>Epioblasma triquetra</i>)	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
Monroe	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.

Montgomery	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands
	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
	Snuffbox (<i>Epioblasma triquetra</i>)	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
Morgan	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Fanshell (<i>Cyprogenia stegaria</i>) (= <i>C. irrorata</i>)	Endangered	Found in areas of packed sand and gravel at locations in a good current
	Pink mucket pearlymussel (<i>Lampsilis abrupta</i>)	Endangered	The lower Ohio River and its larger tributaries
	Sheepnose (<i>Plethobasus cyphus</i>)	Endangered	Shallow areas in larger rivers and streams
	Snuffbox (<i>Epioblasma triquetra</i>)	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
	American burying beetle (<i>Nicrophorus americanus</i>)	Endangered	
Morrow	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Muskingum	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Fanshell (<i>Cyprogenia stegaria</i>) (= <i>C. irrorata</i>)	Endangered	Found in areas of packed sand and gravel at locations in a good current

	Rabbitsfoot <i>Quadrula cylindrica cylindrica</i>	Threatened	Muskingum River
	Sheepnose <i>(Plethobasus cyphus)</i>	Endangered	Shallow areas in larger rivers and streams
	Snuffbox <i>(Epioblasma triquetra)</i>	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
Noble	Indiana bat <i>(Myotis sodalis)</i>	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Ottawa	Indiana bat <i>(Myotis sodalis)</i>	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Kirtland's warbler <i>(Dendroica kirtlandii)</i>	Endangered	Kirtland's warblers are known to migrate along the Lake Erie shoreline counties (Ashtabula, Cuyahoga, Erie, Lake, Lorain, Lucas, Ottawa, Sandusky counties) through Ohio in late April-May and late August-early October.
	Piping plover <i>(Charadrius melodus)</i>	Endangered	Beaches along shorelines of the Great Lakes
	Red Knot (Rufa) <i>Calidris canutus rufa</i>	Threatened	Present in Ohio during spring and fall migration
	Eastern massasauga <i>(Sistrurus catenatus)</i>	Threatened	Wetlands and adjacent uplands
	Eastern prairie fringed orchid <i>(Platanthera leucophaea)</i>	Threatened	Mesic to wet prairies and meadows
	Lakeside daisy <i>(Hymenoxys herbacea)</i> (Formerly <i>H. acaulis</i>) <i>var. glabra</i>)	Threatened	Dry rocky prairies; limestone rock surfaces including outcrops and quarries
Paulding	Indiana bat <i>(Myotis sodalis)</i>	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Perry	Indiana bat <i>(Myotis sodalis)</i>	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.

	American burying beetle (<i>Nicrophorus americanus</i>)	Endangered	
Pickaway	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Scioto madtom (<i>Noturus trautmani</i>)	Endangered	Stream riffles of moderate flow over sandy gravel bottom
	Clubshell (<i>Pleurobema clava</i>)	Endangered	Found in coarse sand and gravel areas of runs and riffles within streams and small rivers
	Northern riffleshell (<i>Epioblasma torulosa rangiana</i>)	Endangered	Large streams and small rivers in firm sand of riffle areas; also occurs in Lake Erie
	Rabbitsfoot (<i>Quadrula cylindrica cylindrica</i>)	Threatened	
	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
	Snuffbox (<i>Epioblasma triquetra</i>)	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
Pike	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Clubshell (<i>Pleurobema clava</i>)	Endangered	Found in coarse sand and gravel areas of runs and riffles within streams and small rivers
	Northern riffleshell (<i>Epioblasma torulosa rangiana</i>)	Endangered	Large streams and small rivers in firm sand of riffle areas; also occurs in Lake Erie
	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
Portage	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands
	Mitchell's satyr butterfly (<i>Neonympha mitchellii mitchellii</i>)	Endangered	Fens; wetlands characterized by calcareous soils which are fed by carbonate-rich water from seeps and springs
	Northern monkshood (<i>Aconitum noveboracense</i>)	Threatened	Cool, moist, shaded cliff faces or talus slopes in wooded ravines, near water seeps

Preble	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands
Putnam	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Richland	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands
Ross	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Clubshell (<i>Pleurobema clava</i>)	Endangered	Found in coarse sand and gravel areas of runs and riffles within streams and small rivers
	Northern riffleshell (<i>Epioblasma torulosa rangiana</i>)	Endangered	Large streams and small rivers in firm sand of riffle areas; also occurs in Lake Erie
	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
	Snuffbox (<i>Epioblasma triquetra</i>)	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
	Running buffalo clover (<i>Trifolium stoloniferum</i>)	Endangered	Disturbed bottomland meadows; disturbed sites that have shade during part of each day
Sandusky	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.

	Kirtland's warbler (<i>Dendroica kirtlandii</i>)	Endangered	Kirtland's warblers are known to migrate along the Lake Erie shoreline counties (Ashtabula, Cuyahoga, Erie, Lake, Lorain, Lucas, Ottawa, Sandusky counties) through Ohio in late April-May and late August-early October.
	Piping plover (<i>Charadrius melodus</i>)	Endangered	Beaches along shorelines of the Great Lakes
	Red Knot (Rufa) <i>Calidris canutus rufa</i>	Threatened	Present in Ohio during spring and fall migration
	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands
	Eastern prairie fringed orchid (<i>Platanthera leucophaea</i>)	Threatened	Mesic to wet prairies and meadows
Scioto	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Clubshell (<i>Pleurobema clava</i>)	Endangered	Found in coarse sand and gravel areas of runs and riffles within streams and small rivers
	Fanshell (<i>Cyprogenia stegaria</i>) (= <i>C. irrorata</i>)	Endangered	Found in areas of packed sand and gravel at locations in a good current
	Northern riffleshell (<i>Epioblasma torulosa rangiana</i>)	Endangered	Large streams and small rivers in firm sand of riffle areas; also occurs in Lake Erie
	Pink mucket (<i>Lampsilis abrupta</i>)	Endangered	The lower Ohio River and its larger tributaries
	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
	Sheepnose (<i>Plethobasus cyphus</i>)	Endangered	Shallow areas in larger rivers and streams
	Snuffbox (<i>Epioblasma triquetra</i>)	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
	Running buffalo clover (<i>Trifolium stoloniferum</i>)	Endangered	Disturbed bottomland meadows; disturbed sites that have shade during part of each day
	Small whorled pogonia (<i>Isotria medeoloides</i>)	Threatened	Dry woodland; upland sites in mixed forests (second or third growth stage)
Virginia spiraea (<i>Spiraea virginiana</i>)	Threatened	Streambanks and floodplains	
Seneca	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.

Shelby	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
Stark	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Summit	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Northern monkshood (<i>Aconitum noveboracense</i>)	Threatened	Cool, moist, shaded cliff faces or talus slopes in wooded ravines, near water seeps
Trumbull	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands
	Clubshell (<i>Pleurobema clava</i>)	Endangered	Found in coarse sand and gravel areas of runs and riffles within streams and small rivers
Tuscarawas	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Union	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Scioto madtom (<i>Noturus trautmani</i>)	Endangered	Stream riffles of moderate flow over sandy gravel bottom

	Clubshell (<i>Pleurobema clava</i>)	Endangered	Found in coarse sand and gravel areas of runs and riffles within streams and small rivers
	Northern riffleshell (<i>Epioblasma torulosa rangiana</i>)	Endangered	Large streams and small rivers in firm sand of riffle areas; also occurs in Lake Erie
	Rabbitsfoot <i>Quadrula cylindrica cylindrica</i>	Threatened	
	Rabbitsfoot <i>Quadrula cylindrica cylindrica</i>	Critical Habitat	Little Darby Creek Map of Critical Habitat Unit
	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
	Snuffbox (<i>Epioblasma triquetra</i>)	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
Van Wert	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Vinton	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	American burying beetle (<i>Nicrophorus americanus</i>)	Endangered	
	Running buffalo clover (<i>Trifolium stoloniferum</i>)	Endangered	Disturbed bottomland meadows; disturbed sites that have shade during part of each day
Warren	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands
	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
	Running buffalo clover (<i>Trifolium stoloniferum</i>)	Endangered	Disturbed bottomland meadows; disturbed sites that have shade during part of each day
Washington	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests

	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Fanshell (<i>Cyprogenia stegaria</i>) (= <i>C. irrorata</i>)	Endangered	Found in areas of packed sand and gravel at locations in a good current
	Pink mucket pearlymussel (<i>Lampsilis abrupta</i>)	Endangered	The lower Ohio River and its larger tributaries
	Sheepnose (<i>Plethobasus cyphus</i>)	Endangered	Shallow areas in larger rivers and streams
	Snuffbox (<i>Epioblasma triquetra</i>)	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
Wayne	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands
	Eastern prairie fringed orchid (<i>Platanthera leucophaea</i>)	Threatened	Mesic to wet prairies and meadows
Williams	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Copperbelly water snake (<i>Nerodia erythrogaster neglecta</i>)	Threatened	Wooded and permanently wet areas such as oxbows, sloughs, brushy ditches and floodplain woods
	Clubshell (<i>Pleurobema clava</i>)	Endangered	Found in coarse sand and gravel areas of runs and riffles within streams and small rivers
	Northern riffleshell (<i>Epioblasma torulosa rangiana</i>)	Endangered	Large streams and small rivers in firm sand of riffle areas; also occurs in Lake Erie
	Rabbitsfoot <i>Quadrula cylindrica cylindrica</i>	Threatened	Fish Creek
	Rabbitsfoot <i>Quadrula cylindrica cylindrica</i>	Critical Habitat	Fish Creek Map of Critical Habitat Unit
	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
	White cat's paw pearlymussel (<i>Epioblasma obliquata perobliqua</i>)	Endangered	Firm sand or gravel riffles in small streams and medium to large rivers

Wood	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Rusty patched bumble bee <i>Bombus affinis</i> Note for project proponents: this bee is not known to occur throughout the entire county. To determine if your project or ongoing action is within an area that is likely to have the rusty patched bumble bee, use our online tool at https://ecos.fws.gov/ipac/	Endangered	Grasslands with flowering plants from April through October, underground and abandoned rodent cavities or clumps of grasses above ground as nesting sites, and undisturbed soil for hibernating queens to overwinter.
Wyandot	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands

Fulton County State Listed Animal Species

Common Name	Scientific Name	Group	State Status	Federal Status
Lark Sparrow	<i>Chondestes grammacus</i>	Bird	Endangered	
Northern Harrier	<i>Circus hudsonius</i>	Bird	Endangered	
Rayed Bean	<i>Villosa fabalis</i>	Mollusk	Endangered	Endangered
Singed Pinion	<i>Lithophane semiusta</i>	Moth	Endangered	
Folded Satyr	<i>Ufeus plicatus</i>	Moth	Endangered	
Trumpeter Swan	<i>Cygnus buccinator</i>	Bird	Threatened	
Greater Redhorse	<i>Moxostoma valenciennesi</i>	Fish	Threatened	
Kirtland's Snake	<i>Clonophis kirtlandii</i>	Reptile	Threatened	
Blanding's Turtle	<i>Emydoidea blandingii</i>	Reptile	Threatened	
Eastern Cricket Frog	<i>Acris crepitans crepitans</i>	Amphibian	Species of Concern	
Four-toed Salamander	<i>Hemidactylium scutatum</i>	Amphibian	Species of Concern	
Sharp-shinned Hawk	<i>Accipiter striatus</i>	Bird	Species of Concern	
Henslow's Sparrow	<i>Ammodramus henslowii</i>	Bird	Species of Concern	
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	Bird	Species of Concern	
Marsh Wren	<i>Cistothorus palustris</i>	Bird	Species of Concern	
Bobolink	<i>Dolichonyx oryzivorus</i>	Bird	Species of Concern	
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	Bird	Species of Concern	
Vesper Sparrow	<i>Pooecetes gramineus</i>	Bird	Species of Concern	
Prothonotary Warbler	<i>Protonotaria citrea</i>	Bird	Species of Concern	
Virginia Rail	<i>Rallus limicola</i>	Bird	Species of Concern	



Common Name	Scientific Name	Group	State Status	Federal Status
Least Darter	<i>Etheostoma microperca</i>	Fish	Species of Concern	
Big Brown Bat	<i>Eptesicus fuscus</i>	Mammal	Species of Concern	
Red Bat	<i>Lasiurus borealis</i>	Mammal	Species of Concern	
Hoary Bat	<i>Lasiurus cinereus</i>	Mammal	Species of Concern	
Badger	<i>Taxidea taxus</i>	Mammal	Species of Concern	
Creek Heelsplitter	<i>Lasmigona compressa</i>	Mollusk	Species of Concern	
Buck Moth	<i>Hemileuca maia</i>	Moth	Species of Concern	
Eastern Hognose Snake	<i>Heterodon platirhinos</i>	Reptile	Species of Concern	
Green-winged Teal	<i>Anas crecca</i>	Bird	Special Interest	
American Black Duck	<i>Anas rubripes</i>	Bird	Special Interest	
Veery	<i>Catharus fuscescens</i>	Bird	Special Interest	
Wilson's Snipe	<i>Gallinago delicata</i>	Bird	Special Interest	
Red-breasted Nuthatch	<i>Sitta canadensis</i>	Bird	Special Interest	
Western Meadowlark	<i>Sturnella neglecta</i>	Bird	Special Interest	
Solitary Vireo	<i>Vireo solitarius</i>	Bird	Special Interest	





Fulton County

Scientific Name	Common Name	Last Observed	State Status	Federal Status
<i>Androsace occidentalis</i>	Western Rock-jasmine	2010-05-10	E	
<i>Anemone cylindrica</i>	Prairie Thimbleweed	2000-07-11	T	
<i>Arabis pycnocarpa</i> var. <i>pycnocarpa</i>	Western Hairy Rock Cress	1977-05	X	
<i>Aristida purpurascens</i>	Purple Triple-awned Grass	2000-10-11	P	
<i>Asclepias amplexicaulis</i>	Blunt-leaved Milkweed	2004-09	P	
<i>Bromus kalmii</i>	Prairie Brome	2000-07-11	P	
<i>Calamintha arkansana</i>	Limestone Savory	1965-08-04	P	
<i>Carex bebbii</i>	Bebb's Sedge	1983-06-27	P	
<i>Carex brevior</i>	Tufted Fescue Sedge	2011-06-22	P	
<i>Carex conoidea</i>	Field Sedge	2000-06-09	T	
<i>Carex crus-corvi</i>	Raven-foot Sedge	2013-07-03	T	
<i>Chimaphila umbellata</i>	Pipsissewa	2008-09-29	T	
<i>Comptonia peregrina</i>	Sweet-fern	2011-09-16	T	
<i>Conyza ramosissima</i>	Bushy Horseweed	2009-06-30	P	
<i>Descurainia pinnata</i>	Tansy Mustard	2000-05-22	T	
<i>Desmodium sessilifolium</i>	Sessile Tick-trefoil	2008-09-29	T	
<i>Dichanthelium praecocius</i>	Early Panic Grass	2011-09-16	E	
<i>Gentianopsis crinita</i>	Fringed Gentian	2000-09-16	P	
<i>Gentianopsis procera</i>	Small Fringed Gentian	1986-09-16	P	
<i>Hedeoma hispida</i>	Rough Pennyroyal	2000-07-11	P	
<i>Helianthemum bicknellii</i>	Plains Frostweed	2000-10-11	P	
<i>Hesperostipa spartea</i>	Porcupine Grass	2000-07-11	E	
<i>Hieracium longipilum</i>	Long-bearded Hawkweed	1979-08-03	E	
<i>Juncus greenei</i>	Greene's Rush	2000-07-11	T	
<i>Krigia virginica</i>	Virginia Dwarf-dandelion	1961-06-03	T	
<i>Lechea minor</i>	Thyme-leaved Pinweed	2000-08-04	T	
<i>Lechea villosa</i>	Hairy Pinweed	2011-09-16	P	
<i>Lithospermum caroliniense</i>	Plains Puccoon	2000-07-11	T	



Fulton County

Scientific Name	Common Name	Last Observed	State Status	Federal Status
<i>Lupinus perennis</i>	Wild Lupine	2000-08-04	P	
<i>Monarda punctata</i>	Dotted Horsemint	2007-07-12	E	
<i>Opuntia humifusa</i>	Common Prickly Pear	2007-08-01	P	
<i>Penstemon pallidus</i>	Downy White Beard-tongue	1996-06-12	T	
<i>Phlox latifolia</i>	Mountain Phlox	2000-05-31	E	
<i>Polygala polygama</i>	Racemed Milkwort	2011-09-16	T	
<i>Prenanthes racemosa</i>	Prairie Rattlesnake-root	2000-09-16	P	
<i>Pycnanthemum verticillatum var. pilosum</i>	Hairy Mountain-mint	2011-06-29	T	
<i>Rosa blanda</i>	Smooth Rose	2008-11-03	P	
<i>Scleria pauciflora</i>	Few-flowered Nut-rush	2011-09-16	P	
<i>Scleria triglomerata</i>	Tall Nut-rush	2000-08-04	P	
<i>Solidago speciosa</i>	Showy Goldenrod	2004-09-28	P	
<i>Ulmus thomasii</i>	Rock Elm	1994-05-18	P	
<i>Viola pedata</i>	Birdfoot Violet	1987-05	T	



Ohio Division of Wildlife
Ohio Natural Heritage Database
Date Accessed: March 6, 2015
Status based on 2014-15 Rare Plant List.

Status:

X = Extirpated

E = Endangered

T = Threatened

P = Potentially Threatened

List Created: July 2016



OHIO'S LISTED SPECIES

**WILDLIFE THAT ARE CONSIDERED TO BE
ENDANGERED, THREATENED, SPECIES OF CONCERN,
SPECIAL INTEREST, EXTIRPATED, OR EXTINCT IN OHIO**



Blanding's turtle
Emydoidea blandingii

photo by TIM DANIEL



WILDLIFE THAT ARE CONSIDERED TO BE ENDANGERED, THREATENED, SPECIES OF CONCERN, SPECIAL INTEREST, EXTIRPATED, OR EXTINCT IN OHIO

The Division of Wildlife's mission is to conserve and improve the fish and wildlife resources and their habitats, and promote their use and appreciation by the public so that these resources continue to enhance the quality of life for all Ohioans. The Division has legal authority over Ohio's fish and wildlife, which includes about 56 species of mammals, 200 species of breeding birds, 84 species and subspecies of amphibians and reptiles, 170 species of fish, 100 species of mollusks, and 20 species of crustaceans. In addition, there are thousands of species of insects and other invertebrates which fall under the Division's jurisdiction. Furthermore, Ohio law grants authority to the chief of the Division to adopt rules restricting the taking or possession of native wildlife threatened with statewide extirpation and to develop and periodically update a list of endangered species (Ohio Revised Code 1531.25).

The status of native wildlife species is very important to the Division. While the listing process identifies individual wildlife species needing protection, it also serves as a powerful tool in the

Division's planning process. It provides direction for the allocation of personnel time and funds in Division programs and projects.

The first list of Ohio's endangered wildlife was adopted in 1974 and included 71 species. An extensive examination of the list is conducted every five years. The Division seeks input from our staff along with other noted professional and amateur wildlife experts across Ohio. In 2001, as part of our comprehensive management plan, the Division initiated a reevaluation of the endangered species list. During this process, the need for an additional state-list category was recognized and has been designated as "Special Interest." The name of the previous special interest category has been changed to "Species of Concern," but retains its original definition.

Therefore, in addition to endangered the Division uses five other categories: threatened, species of concern, special interest, extirpated, and extinct, to further define the status of selected wildlife. These categories and the species contained within them are dynamic and will be revised as our knowledge of the status of Ohio's wildlife evolves.

Definitions of these categories, a summary of the numbers of species and subspecies in each category, and the list of species and subspecies in each category follow:

ENDANGERED - A native species or subspecies threatened with extirpation from the state. The danger may result from one or more causes, such as habitat loss, pollution, predation, interspecific competition, or disease.

THREATENED - A species or subspecies whose survival in Ohio is not in immediate jeopardy, but to which a threat exists. Continued or increased stress will result in its becoming endangered.

SPECIES OF CONCERN - A species or subspecies which might become threatened in Ohio under continued or increased stress. Also, a species or subspecies for which there is some concern but for which information is insufficient to permit an adequate status evaluation. This category may contain species designated as a furbearer or game species but whose statewide population is dependent on the quality and/or quantity of habitat and is not adversely impacted by regulated harvest.

SPECIAL INTEREST - A species that occurs periodically and is capable of breeding in Ohio. It is at the edge of a larger, contiguous range with viable population(s) within the core of its range. These species have no federal endangered or threatened status, are at low breeding densities in the state, and have not been recently released to enhance Ohio's wildlife diversity. With the exception of efforts to conserve occupied areas, minimal management efforts will be directed for these species because it is unlikely to result in significant increases in their populations within the state.

EXTIRPATED - A species or subspecies that occurred in Ohio at the time of European settlement and that has since disappeared from the state.

EXTINCT - A species or subspecies that occurred in Ohio at the time of European settlement and that has since disappeared from its entire range.

**Number of Species in Major Taxa Classified as
Endangered, Threatened, Species of Concern, Special Interest,
Extirpated, or Extinct in Ohio**

Taxon	Endangered	Threatened	Species of Concern	Special Interest	Extirpated	Extinct
Mammals	3	2	20	2	9	0
Birds	12	6	20	39	6	2
Reptiles	5	4	11	0	0	0
Amphibians	5	1	2	0	0	0
Fishes	22	11	8	0	9	2
Mollusks	24	4	8	0	11	6
Crayfishes	0	2	3	0	0	0
Isopods	2	1	0	0	0	0
Pseudoscorpions	1	0	0	0	0	0
Dragonflies	13	3	1	0	0	0
Damselflies	3	3	0	0	0	0
Caddisflies	3	6	3	0	0	0
Mayflies	2	0	1	0	0	0
Midges	1	3	1	0	0	0
Cricket	0	0	1	0	0	0
Butterflies	8	1	2	1	1	0
Moths	14	4	22	11	0	0
Beetles	3	2	7	0	0	1
Bees	1	0	0	0	0	0
Total	122	53	110	53	36	11

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OHIO'S ENDANGERED SPECIES

NOTE: *E & *T denote federal (U.S. Fish and Wildlife Service) listed endangered and threatened species respectively.

MAMMALS ENDANGERED

Indiana myotis *E	<i>Myotis sodalis</i>
Allegheny woodrat	<i>Neotoma magister</i>
Black bear	<i>Ursus americanus</i>

BIRDS ENDANGERED

American bittern	<i>Botaurus lentiginosus</i>
Northern harrier	<i>Circus cyaneus</i>
King rail	<i>Rallus elegans</i>
Piping plover *E	<i>Charadrius melodus</i>
Common tern	<i>Sterna hirundo</i>
Black tern	<i>Chlidonias niger</i>
Loggerhead shrike	<i>Lanius ludovicianus</i>
Kirtland's warbler *E	<i>Setophaga kirtlandii</i>
Lark sparrow	<i>Chondestes grammacus</i>
Snowy egret	<i>Egretta thula</i>
Cattle egret	<i>Bubulcus ibis</i>
Upland sandpiper	<i>Bartramia longicauda</i>

REPTILES ENDANGERED

Copperbelly watersnake *T	<i>Nerodia erythrogaster neglecta</i>
Plains gartersnake	<i>Thamnophis radix</i>
Timber rattlesnake	<i>Crotalus horridus</i>
Massasauga	<i>Sistrurus catenatus</i>
Smooth greensnake	<i>Opheodrys vernalis</i>

AMPHIBIANS ENDANGERED

Eastern hellbender	<i>Cryptobranchus alleganiensis alleganiensis</i>
Blue-spotted salamander	<i>Ambystoma laterale</i>
Green salamander	<i>Aneides aeneus</i>
Cave salamander	<i>Eurycea lucifuga</i>
Eastern spadefoot	<i>Scaphiopus holbrookii</i>

FISHES ENDANGERED

Ohio lamprey	<i>Ichthyomyzon bdellium</i>
Northern brook lamprey	<i>Ichthyomyzon fossor</i>
Mountain brook lamprey	<i>Ichthyomyzon greeleyi</i>
Lake sturgeon	<i>Acipenser fulvescens</i>
Shovelnose sturgeon	<i>Scaphirhynchus platyrhynchus</i>

Spotted gar	<i>Lepisosteus oculatus</i>
Shortnose gar	<i>Lepisosteus platostomus</i>
Cisco (or Lake herring)	<i>Coregonus artedii</i>
Goldeye	<i>Hiodon alosoides</i>
Shoal chub	<i>Macrhybopsis hyostoma</i>
Pugnose minnow	<i>Opsopoeodus emiliae</i>
Popeye shiner	<i>Notropis ariommus</i>
Longnose sucker	<i>Catostomus catostomus</i>
Northern madtom	<i>Noturus stigmosus</i>
Scioto madtom *E	<i>Noturus trautmani</i>
Pirate perch	<i>Aphredoderus sayanus</i>
Western banded killifish	<i>Fundulus diaphanus menona</i>
Spotted darter	<i>Etheostoma maculatum</i>
Iowa darter	<i>Etheostoma exile</i>
Gilt darter	<i>Percina evides</i>
Bigeye shiner	<i>Notropis boops</i>
Tonguetied minnow	<i>Exoglossum laurae</i>

MOLLUSKS ENDANGERED

Snuffbox *E	<i>Epioblasma triquetra</i>
Ebonysnail	<i>Fusconaia ebenas</i>
Fanshell *E	<i>Cyprogenia stegaria</i>
Butterfly	<i>Ellipsaria lineolata</i>
Elephantear	<i>Elliptio crassidens crassidens</i>
Purple catspaw *E	<i>Epioblasma obliquata obliquata</i>
White catspaw *E	<i>Epioblasma obliquata perobliqua</i>
Northern riffleshell *E	<i>Epioblasma torulosa rangiana</i>
Longsolid	<i>Fusconaia subrotunda</i>
Pink mucket *E	<i>Lampsilis orbiculata</i>
Pocketbook	<i>Lampsilis ovata</i>
Yellow sandshell	<i>Lampsilis teres</i>
Eastern pondmussel	<i>Ligumia nasuta</i>
Washboard	<i>Megaloniaias nervosa</i>
Sheepnose *E	<i>Plethobasus cyphus</i>
Clubshell *E	<i>Pleurobema clava</i>
Ohio pigtoe	<i>Pleurobema cordatum</i>
Pyramid pigtoe	<i>Pleurobema rubrum</i>
Rabbitsfoot *T	<i>Quadrula cylindrica cylindrica</i>
Monkeyface	<i>Quadrula metanevra</i>

MOLLUSKS (CONT.) ENDANGERED

Wartyback	<i>Quadrula nodulata</i>
Purple lilliput	<i>Toxolasma lividum</i>
Rayed bean *E	<i>Villosa fabalis</i>
Little spectaclecase	<i>Villosa lienosa</i>

DRAGONFLIES ENDANGERED

Hine's emerald *E	<i>Somatochlora hineana</i>
Mottled darner	<i>Aeshna clepsydra</i>
Plains clubtail	<i>Gomphus externus</i>
American emerald	<i>Cordulia shurtleffi</i>
Uhler's sundragon	<i>Helocordulia uhleri</i>
Frosted whiteface	<i>Leucorrhinia frigida</i>
Elfin skimmer	<i>Nannothemis bella</i>
Canada darner	<i>Aeshna canadensis</i>
Racket-tailed emerald	<i>Dorocordulia libera</i>
Brush-tipped emerald	<i>Somatochlora walshii</i>
Blue corporal	<i>Ladona deplanata</i>
Chalk-fronted corporal	<i>Ladona julia</i>
Yellow-sided skimmer	<i>Libellula flava</i>

DAMSELFLIES ENDANGERED

Lilypad forktail	<i>Ischnura kellicotti</i>
Seepage dancer	<i>Argia bipunctulata</i>
River jewelwing	<i>Calopteryx aequabilis</i>

CADDISFLIES ENDANGERED

–	<i>Chimarra socia</i>
–	<i>Oecetis eddlestoni</i>
–	<i>Brachycentrus nigrosoma</i>

MAYFLIES ENDANGERED

–	<i>Rhithrogena pellucida</i>
–	<i>Litobrancha recurvata</i>

MIDGES ENDANGERED

–	<i>Rheopelopia acra</i>
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BUTTERFLIES ENDANGERED

Persius dusky wing	<i>Erynnis persius</i>
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Frosted elfin	<i>Callophrys irus</i>
Karner blue *E	<i>Lycaeides melissa samuelis</i>
Purplish copper	<i>Lycaena helloides</i>
Swamp metalmark	<i>Calephelis muticum</i>
Regal fritillary	<i>Speyeria idalia</i>
Mitchell's satyr *E	<i>Neonympha mitchellii</i>
Grizzled skipper	<i>Pyrgus centaureae wyandot</i>

MOTHS ENDANGERED

Unexpected cynthia	<i>Cynthia inopinatus</i>
Graceful underwing	<i>Catocala gracilis</i>
–	<i>Spartiniphaga inops</i>
–	<i>Hypocoena enervata</i>
–	<i>Papaipema silphii</i>
–	<i>Papaipema beeriana</i>
–	<i>Lithophane semiusta</i>
–	<i>Trichoclea artesta</i>
–	<i>Tricholita notata</i>
–	<i>Melanchra assimilis</i>
Pointed swallow	<i>Epiglaea apiata</i>
–	<i>Ufeus plicatus</i>
–	<i>Ufeus satyricus</i>
Hebard's noctuid moth	<i>Erythroecia hebardii</i>

BEETLES ENDANGERED

Ohio cave beetle	<i>Pseudanophthalmus ohioensis</i>
American burying beetle *E	<i>Nicrophorus americanus</i>
Water penny beetle	<i>Dicranopselapus variegatus</i>

BEES ENDANGERED

Rusty patched bumblebee *E

ISOPODS ENDANGERED

Fern cave isopod	<i>Caecidotea filicispelunca</i>
Kindt's cave isopod	<i>Caecidotea insula</i>

PSEUDOSCORPIONS ENDANGERED

Buckskin cave pseudoscorpion	<i>Apochthonius hobbsi</i>
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OHIO'S THREATENED SPECIES

NOTE: *E & *T denote federal (U.S. Fish and Wildlife Service) listed endangered and threatened species respectively.

MAMMALS THREATENED

Eastern harvest mouse	<i>Reithrodontomys humulis</i>
Northern long-eared bat *T	<i>Myotis septentrionalis</i>

BIRDS THREATENED

Black-crowned night-heron	<i>Nycticorax nycticorax</i>
Barn owl	<i>Tyto alba</i>
Least bittern	<i>Ixobrychus exilis</i>
Rufa red knot *T	<i>Calidris canutus rufa</i>
Trumpeter swan	<i>Cygnus buccinator</i>
Sandhill crane	<i>Grus canadensis</i>

REPTILES THREATENED

Kirtland's snake	<i>Clonophis kirtlandii</i>
Spotted turtle	<i>Clemmys guttata</i>
Blanding's turtle	<i>Emydoidea blandingii</i>
Lake Erie watersnake	<i>Nerodia sipedon insularum</i>

AMPHIBIANS THREATENED

Mud salamander	<i>Pseudotriton montanus</i>
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FISHES THREATENED

Brook trout	<i>Salvelinus fontinalis</i>
Greater redhorse	<i>Moxostoma valenciennesi</i>
Channel darter	<i>Percina copelandi</i>
American eel	<i>Anguilla rostrata</i>
Paddlefish *M	<i>Polyodon spathula</i>
Bigmouth shiner	<i>Notropis dorsalis</i>
Lake chubsucker	<i>Erimyzon sucetta</i>
River darter	<i>Percina shumardi</i>
Tippecanoe darter	<i>Etheostoma tippecanoe</i>
Blue sucker	<i>Cycleptus elongatus</i>
Mountain madtom	<i>Noturus eleutherus</i>

MOLLUSKS THREATENED

Black sandshell	<i>Ligumia recta</i>
Threehorn wartyback	<i>Obliquaria reflexa</i>
Fawnsfoot	<i>Truncilla donaciformis</i>
Pondhorn	<i>Unimerus tetralasmus</i>

CRAYFISHES THREATENED

Sloan's crayfish	<i>Orconectes sloanii</i>
Cavespring crayfish	<i>Cambarus tenebrosus</i>

DRAGONFLIES THREATENED

Riffle snaketail	<i>Ophiogomphus carolus</i>
Harlequin darter	<i>Gomphaeschna furcillata</i>
Green-faced clubtail	<i>Gomphus viridifrons</i>

DAMSELFLIES THREATENED

Boreal bluet	<i>Enallagma boreale</i>
Northern bluet	<i>Enallagma cyathigerum</i>
Marsh bluet	<i>Enallagma ebrium</i>

CADDISFLIES THREATENED

–	<i>Psilotreta indecisa</i>
–	<i>Hydroptila albicornis</i>
–	<i>Hydroptila artesa</i>
–	<i>Hydroptila koryaki</i>
–	<i>Hydroptila talledaga</i>
–	<i>Hydroptila valhalla</i>

MIDGES THREATENED

–	<i>Bethbilbeckia floridensis</i>
–	<i>Apsactrotanypus johnsoni</i>
–	<i>Radotanypus florens</i>

BUTTERFLIES THREATENED

Silver-bordered fritillary	<i>Boloria selene</i>
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MOTHS THREATENED

Wayward nymph	<i>Catocala antinympha</i>
–	<i>Spartiniphaga panatela</i>
–	<i>Fagitana littera</i>
The pink-streak	<i>Faronta rubripennis</i>

BEETLES THREATENED

–	<i>Cicindela hirticollis</i>
Cobblestone tiger beetle	<i>Cicindela marginipennis</i>

ISOPODS THREATENED

Frost cave isopod	<i>Caecidotea rotunda</i>
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OHIO'S SPECIES of CONCERN

NOTE: *E & *T denote federal (U.S. Fish and Wildlife Service) listed endangered and threatened species respectively.

MAMMALS SPECIES OF CONCERN

Pygmy shrew	<i>Sorex hoyi</i>
Star-nosed mole	<i>Condylura cristata</i>
Eastern small-footed bat	<i>Myotis leibii</i>
Rafinesque's big-eared bat	<i>Corynorhinus rafinesquii</i>
Little brown bat	<i>Myotis lucifugus</i>
Big brown bat	<i>Eptesicus fuscus</i>
Tri-colored bat	<i>Perimyotis subflavus</i>
Woodland jumping mouse	<i>Napaeozapus insignis</i>
Badger	<i>Taxidea taxus</i>
Ermine	<i>Mustela erminea</i>
Smoky shrew	<i>Sorex fumerus</i>
Deer mouse	<i>Peromyscus maniculatus</i>
Prairie vole	<i>Microtus ochrogaster</i>
Woodland vole	<i>Microtus pinetorum</i>
Southern bog lemming	<i>Synaptomys cooperi</i>
Silver-haired bat	<i>Lasionycteris noctivagans</i>
Red bat	<i>Lasiurus borealis</i>
Hoary bat	<i>Lasiurus cinereus</i>
Snowshoe hare	<i>Lepus americanus</i>
Gray Fox	<i>Urocyon cinereoargenteus</i>

BIRDS SPECIES OF CONCERN

Sharp-shinned hawk	<i>Accipiter striatus</i>
Sedge wren	<i>Cistothorus platensis</i>
Marsh wren	<i>Cistothorus palustris</i>
Henslow's sparrow	<i>Ammodramus henslowii</i>
Cerulean warbler	<i>Setophaga cerulea</i>
Prothonotary warbler	<i>Protonotaria citrea</i>
Bobolink	<i>Dolichonyx oryzivorus</i>
Northern bobwhite	<i>Colinus virginianus</i>
Common moorhen	<i>Gallinula chloropus</i>
Great egret	<i>Ardea alba</i>
Sora rail	<i>Porzana carolina</i>
Virginia rail	<i>Rallus limicola</i>
Ruffed grouse	<i>Bonasa umbellus</i>
American coot	<i>Fulica americana</i>
Black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>
Common nighthawk	<i>Chordeiles minor</i>
Eastern whip-poor-will	<i>Caprimugus vaciferus</i>

Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>
Vesper sparrow	<i>Pooecetes gramineus</i>
Grasshopper sparrow	<i>Ammodramus savannarum</i>

MOLLUSKS SPECIES OF CONCERN

Purple wartyback	<i>Cyclonaias tuberculata</i>
Wavyrayed lampmussel	<i>Lampsilis fasciola</i>
Round pigtoe	<i>Pleurobema sintoxia</i>
Salamander mussel	<i>Simpsonaias ambigua</i>
Deertoe	<i>Truncilla truncata</i>
Elktoe	<i>Alasmidonta marginata</i>
Kidneyshell	<i>Ptychobranchus fasciolaris</i>
Creek heelsplitter	<i>Lasmigona compressa</i>

REPTILES SPECIES OF CONCERN

Woodland box turtle	<i>Terrapene carolina carolina</i>
Ouachita map turtle	<i>Graptemys ouachitensis</i>
Black kingsnake	<i>Lampropeltis getula nigra</i>
Eastern gartersnake (melanistic)	<i>Thamnophis sirtalis sirtalis</i>
Northern rough greensnake	<i>Ophedryx aestivus</i>
Eastern foxsnake	<i>Pantherophis gloydi</i>
Queensnake	<i>Regina septemvittata</i>
Little brown skink	<i>Scincella lateralis</i>
Smooth earthsnake	<i>Virginia valeriae</i>
Short-headed gartersnake	<i>Thamnophis brachystoma</i>
Eastern hognose snake	<i>Heterdon platirhinos</i>

AMPHIBIANS SPECIES OF CONCERN

Four-toed salamander	<i>Hemidactylium scutatum</i>
Eastern cricket frog	<i>Acris crepitans crepitans</i>

FISHES SPECIES OF CONCERN

Lake trout	<i>Salvelinus namaycush</i>
Lake whitefish	<i>Coregonus clupeaformis</i>
Burbot	<i>Lota lota</i>
Muskellunge	<i>Esox masquinongy</i>
Least darter	<i>Etheostoma microperca</i>
Blue catfish	<i>Ictalurus furcatus</i>
Longnose dace	<i>Rhinichthys cataractae</i>
Western creek chubsucker	<i>Erimyzon claviformis</i>

CRAYFISHES SPECIES OF CONCERN

Great Lakes crayfish	<i>Orconectes propinquus</i>
Northern crayfish	<i>Orconectes virilis</i>
Allegheny crayfish	<i>Orconectes obscurus</i>

DRAGONFLIES SPECIES OF CONCERN

Tiger spiketail	<i>Cordulegaster erronea</i>
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MAYFLIES SPECIES OF CONCERN

–	<i>Maccaffertium ithica</i>
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MIDGES SPECIES OF CONCERN

–	<i>Cantopelopia gesta</i>
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CADDISFLIES SPECIES OF CONCERN

–	<i>Hydroptila chattanooga</i>
–	<i>Asynarchus montanus</i>
–	<i>Nemotaulius hostilis</i>

BUTTERFLIES SPECIES OF CONCERN

Two-spotted skipper	<i>Euphyes bimacula</i>
Dusted skipper	<i>Atrytonopsis hianna</i>

MOTHS SPECIES OF CONCERN

Milnei's looper moth	<i>Euchlaena milnei</i>
Buck moth	<i>Hemileuca maia</i>
One-eyed sphinx	<i>Smerinthus cerisyi</i>
Precious underwing	<i>Catocala pretiosa</i>
–	<i>Macrochilo bivittata</i>
–	<i>Phalaenostola hanhami</i>
–	<i>Paectes abrostolella</i>
–	<i>Capis curvata</i>
–	<i>Tarachidia binocula</i>
–	<i>Apamea mixta</i>
–	<i>Agroperina lutosa</i>
Columbine borer	<i>Papaipema leucostigma</i>
Bracken borer moth	<i>Papaipema pterisii</i>
Osmunda borer moth	<i>Papaipema speciosissima</i>
–	<i>Chytonix sensilis</i>
–	<i>Amolita roseola</i>
Goat sallow	<i>Homoglaea hircina</i>
–	<i>Brachylochia algens</i>

Purple arches	<i>Polia purpurissata</i>
Scurfy quaker	<i>Homorthodes furfurata</i>
–	<i>Trichosilia manifesta</i>
–	<i>Agonopterix pteleae</i>

BEETLES SPECIES OF CONCERN

Six-banded longhorn beetle	<i>Dryobius sexnotatus</i>
–	<i>Cicindela splendida</i>
–	<i>Cicindela ancocisconensis</i>
–	<i>Cicindela cursitans</i>
–	<i>Cicindela cuprascens</i>
–	<i>Cicindela macra</i>
Whirligig beetle	<i>Gyretes sinuatus</i>

CRICKETS SPECIES OF CONCERN

Laricis tree cricket	<i>Oecanthus laricis</i>
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OHIO'S SPECIAL INTEREST

NOTE: *E & *T denote federal (U.S. Fish and Wildlife Service) listed endangered and threatened species respectively.

MAMMALS SPECIAL INTEREST

Evening bat	<i>Nycticeius humeralis</i>
Fisher	<i>Pekania pennanti</i>

BIRDS SPECIAL INTEREST

Canada warbler	<i>Wilsonia canadensis</i>
Magnolia warbler	<i>Setophaga magnolia</i>
Northern waterthrush	<i>Seiurus noveboracensis</i>
Winter wren	<i>Troglodytes troglodytes</i>
Black-throated blue warbler	<i>Setophaga caerulescens</i>
Brown creeper	<i>Certhia americana</i>
Chuck-will's-widow	<i>Caprimulgus carolinensis</i>
Bell's vireo	<i>Vireo bellii</i>
Long-eared owl	<i>Asio otus</i>
Mourning warbler	<i>Oporornis philadelphia</i>
Northern saw-whet owl	<i>Aegolius acadicus</i>
Pine siskin	<i>Carduelis pinus</i>
Purple finch	<i>Carpodacus purpureus</i>
Red-breasted nuthatch	<i>Sitta canadensis</i>
Short-eared owl	<i>Asio flammeus</i>
Western meadowlark	<i>Sturnella neglecta</i>
Golden-crowned kinglet	<i>Regulus satrapa</i>
Blackburnian warbler	<i>Setophaga fusca</i>
Wilson's snipe	<i>Gallinago delicata</i>
Gadwall	<i>Anas strepera</i>
Green-winged teal	<i>Anas crecca</i>
Northern pintail	<i>Anas acuta</i>
Northern shoveler	<i>Anas clypeata</i>
Redhead	<i>Aythya americana</i>
Ruddy duck	<i>Oxyura jamaicensis</i>
American black duck	<i>Anas rubripes</i>
Wilson's phalarope	<i>Phalaropus tricolor</i>
Yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>
Common raven	<i>Corvus corax</i>
Dark-eyed junco	<i>Junco hyemalis</i>
Yellow-crowned night-heron	<i>Nyctanassa violacea</i>
Hermit thrush	<i>Catharus guttatus</i>
Least flycatcher	<i>Empidonax minimus</i>
Nashville warbler	<i>Oreothlypis ruficapilla</i>
Veery	<i>Catharus fuscescens</i>

Common merganser	<i>Mergus merganser</i>
Yellow-bellied sapsucker	<i>Sphyrapicus varius</i>
Golden-winged warbler	<i>Vermivora chrysoptera</i>
Blue-headed vireo	<i>Vireo solitarius</i>

BUTTERFLIES SPECIAL INTEREST

Olympia marble	<i>Euchloe olympia</i>
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MOTHS SPECIAL INTEREST

Slender clearwing	<i>Hemaris gracilis</i>
–	<i>Sphinx lucitiosa</i>
–	<i>Tathorhynchus exsiccatus</i>
–	<i>Catocala marmorata</i>
–	<i>Catocala maestosa</i>
Subflava sedge borer moth	<i>Archanara subflava</i>
–	<i>Caradrina meralis</i>
–	<i>Calophasia lunula</i>
–	<i>Leucania insueta</i>
–	<i>Protorthodes incincta</i>
Variiegated orange moth	<i>Epelis truncataria</i>

OHIO'S EXTIRPATED SPECIES

NOTE: *E & *T denote federal (U.S. Fish and Wildlife Service) listed endangered and threatened species respectively.

MAMMALS EXTIRPATED

Rice rat	<i>Oryzomys palustris</i>
Porcupine	<i>Erethizon dorsatum</i>
Timber wolf	<i>Canis lupus</i>
Marten	<i>Martes americanus</i>
Mountain lion	<i>Puma concolor</i>
Lynx	<i>Lynx canadensis</i>
Wapiti (Elk)	<i>Cervus elaphus</i>
Bison	<i>Bison bison</i>
Southern red-backed vole	<i>Clethrionomys gapperi</i>

BIRDS EXTIRPATED

Swallow-tailed kite	<i>Elanoides forficatus</i>
Greater prairie-chicken	<i>Tympanuchus cupido</i>
Ivory-billed woodpecker	<i>Campephilus principalis</i>
Bachman's sparrow	<i>Aimophila aestivalis</i>
Golden-winged warbler	<i>Vermivora chrysoptera</i>
Bewick's wren	<i>Thryomanes bewickii</i>

FISHES EXTIRPATED

Alligator gar	<i>Lepisosteus spatula</i>
Pugnose shiner	<i>Notropis anogenus</i>
Longhead darter	<i>Percina macrocephala</i>
Diamond darter	<i>Crystallaria cincotta</i>
Spoonhead sculpin	<i>Cottus ricei</i>
Blackchin shiner	<i>Notropis heterodon</i>
Blacknose shiner	<i>Notropis heterolepis</i>
Mississippi silvery minnow	<i>Hybognathus nuchalis</i>
Great Lakes mottled sculpin	<i>Cottus bairdii kumlieni</i>

MOLLUSKS EXTIRPATED

Orangefoot pimpleback *E	<i>Plethobasus cooperianus</i>
Rough pigtoe *E	<i>Pleurobema plenum</i>
Fat pocketbook *E	<i>Potamilus capax</i>
Winged mapleleaf *E	<i>Quadrula fragosa</i>
Mucket	<i>Actinonaias l. ligamentina</i>
Spectaclecase	<i>Cumberlandia monodonta</i>
Cracking pearly mussel *E	<i>Hemistena lata</i>
White wartyback	<i>Plethobasus cicatricosus</i>
Hickorynut	<i>Obovaria olivaria</i>
Ring pink	<i>Obovaria retusa</i>
Scale shell	<i>Leptodea leptodon</i>

BUTTERFLIES EXTIRPATED

Mustard white	<i>Pieris napi</i>
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OHIO'S EXTINCT SPECIES

NOTE: *E & *T denote federal (U.S. Fish and Wildlife Service) listed endangered and threatened species respectively.

BIRDS EXTINCT

Passenger pigeon	<i>Ectopistes migratorius</i>
Carolina parakeet	<i>Conuropsis carolinensis</i>

FISHES EXTINCT

Harelip sucker	<i>Lagochila lacera</i>
Blue pike	<i>Sander vitreus glaucus</i>

MOLLUSKS EXTINCT

Leafshell	<i>Epioblasma flexuosa</i>
Forkshell	<i>Epioblasma lewisi</i>
Round snuffbox	<i>Epioblasma personata</i>
Cincinnati riffleshell	<i>Epioblasma phillipsi</i>
Scioto pigtoe	<i>Pleurobema bournianum</i>
Tubercled blossom	<i>Epioblasma torulosa torulosa</i>

BEETLES EXTINCT

Kramer's cave beetle	<i>Pseudanophthalmus krameri</i>
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Arche Energy Project, LLC

APPENDIX

E

WETLAND AND WATERBODY
IMPACT TABLES

Table E-1. Wetlands within the Arche Solar Project Boundary

Wetland ID	Latitude (center)	Longitude (center)	Acres within Project Area	Wetland Type	ORAM Score	Wetland Category	Anticipated Jurisdictional	Drainage Basin	Crossed (Yes/No)	
W-01	41.6678	-84.296	0.22	PFO	45	2	Yes	Deer Creek - Bean Creek	No	
W-02	41.6673	-84.2958	0.17	PFO	41	2	Yes	Deer Creek - Bean Creek	No	
W-03	41.6722	-94.2818	0.56	PEM	40	2	Yes	Deer Creek - Bean Creek	No	
W-04	41.6669	-84.2784	0.30	PEM	32	Modified 2	Yes	Deer Creek - Bean Creek	No	
Total Acres			1.25							0

Table E-2. Proposed Impacts to Wetlands within the Arche Solar Project Boundary

Wetland ID	Access Roads				Collection Lines			
	Temporary Impacts		Permanent Impacts		Temporary Impacts		Permanent Impacts	
	Square Feet	Acres	Square Feet	Acres	Square Feet	Acres	Square Feet	Acres
W-01	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W-02	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W-03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
W-04	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Wetland Totals	0	0.00	0	0.00	0	0	0	0

Table E-3. Waterbodies within the Arche Solar Project Boundary

Feature ID	County	Linear Feet in Project Area	Flow Regime	Type	Drainage Basin	Anticipated Jurisdictional (Yes/No)	Crossed (Yes/No)
S-01a	Fulton	10,519	Perennial	Stream	Deer Creek-Bean Creek	Yes	Yes
S-01b	Fulton	1,485	Perennial	Stream	Deer Creek-Bean Creek	Yes	No
S-02	Fulton	3,296	Perennial	Stream	Deer Creek-Bean Creek	Yes	No
S-03	Fulton	,2152	Perennial	Stream	Deer Creek-Bean Creek	Yes	No
S-04	Fulton	1,209	Ephemeral	Stream	Deer Creek-Bean Creek	Yes	No
S-05	Fulton	646	Ephemeral	Stream	Deer Creek-Bean Creek	Yes	No
P-01	Fulton	n/a	Perennial	Pond	Deer Creek-Bean Creek	No	No
Waterbody Totals		17,155				6	1

Table E-4. Proposed Waterbody Crossing Methods and Impacts for the Arche Solar Project

Feature ID	Access Roads						Collection Lines					
	Crossings		Temporary Impacts		Permanent Impacts		Crossings		Temporary Impacts		Permanent Impacts	
	Number	Method	Linear Feet	Acres	Linear Feet	Acres	Number	Method	Linear Feet	Acres	Linear Feet	Acres
S-01a	0	n/a	n/a	n/a	n/a	n/a	3	HDD	0	0	0	0
S-01b	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
S-02	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
S-03	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
S-04	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
S-05	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
P-01	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
Waterbody Totals	0	n/a	0	0.000	0	0.00	3	HDD	0	0.00	0	0.00

Arche Energy Project, LLC

APPENDIX

F

INADVERTENT RELEASE OF
DRILLING FLUID CONTINGENCY
PLAN

INADVERTENT RELEASE OF DRILLING FLUID CONTINGENCY PLAN

For Horizontal Directional Drilling
Arche Energy Project, LLC
Fulton County, Ohio

I. Introduction

Construction of the Arche Solar Project in Fulton County, Ohio, will include the use of trenchless excavation methods known as horizontal directional drilling (“HDD”). This widely used technique accomplishes the installation of buried utilities with minimal impact, by routing the utility under a sensitive feature (such as a stream, river or wetland). The HDD procedure uses a bentonite slurry, a fine clay material as a drilling lubricant (“drilling mud”). Although bentonite is non-toxic and non-hazardous, a potential environmental risk associated with conducting HDD under sensitive features occurs when bentonite is released to the surface during construction (sometimes referred to as an inadvertent release or “frac-out”).

Seepage of drilling fluid is most likely to occur near the bore entry and exit points where the drill head is shallow. Frac-outs can occur, however, in any location along a directional bore. This plan establishes operational procedures and responsibilities for the prevention, containment, and remediation of any of frac-outs that may occur in connection with the proposed HDD as part of the construction of the Arche Solar Project.

The objectives of this Plan are to:

1. Minimize the potential for an inadvertent release associated with HDD activities;
2. Provide for the timely detection of an inadvertent release;
3. Protect sensitive water courses and associated riparian vegetation;
4. Ensure an organized, timely, and minimum-impact response in the event an inadvertent release occurs; and
5. Ensure that all appropriate notifications are made immediately to management and environmental personnel.

Measures to be deployed as part of the contingency plan include site inspection, proper training of the contractor and construction personnel, development of response procedures, provision of containment materials, and implementation of appropriate clean up procedures. These measures are described in detail below:

II. Description of Work

Drilling operations will be carefully monitored to determine if and when a frac-out may be occurring. Operations will be halted immediately upon detection of a significant decline in drilling pressure or other evidence that a frac-out may be occurring. The clean-up of all spills shall begin immediately. Management and environmental personnel shall be notified immediately of any spills and shall be consulted regarding remediation procedures. Spill response kits shall be maintained on-site and used if a frac-out occurs. A vacuum truck and containment materials, such as straw bales, shall also be readily available. In the event of a frac-out, the on-site supervisor of construction activities (“Site Supervisor”) will conduct an evaluation of the situation and direct recommended mitigation actions, based on the following guidelines:

1. If the frac-out is minor, easily contained, has not reached the surface, and is not threatening sensitive resources, then drilling operations may resume after use of a leak-stopping compound or redirection of the bore; and
2. If the frac-out has reached the surface, any hazardous materials within the bentonite shall be removed, contained and properly disposed of, as required by law. The drilling contractor shall be responsible for ensuring that the bentonite either is properly disposed of at an approved disposal facility or properly recycled in an approved manner. The Site Supervisor shall notify and take any necessary follow-up response actions in coordination with the relevant regulatory agency representatives. The Site Supervisor shall coordinate the mobilization of equipment stored at off-site locations (e.g., vacuum trucks) on an as needed basis.

III. Site Supervisor Responsibilities

The Site Supervisor has ultimate responsibility for implementing this plan. The Site Supervisor shall ensure that all relevant employees are trained prior to drilling. The Site Supervisor shall be notified immediately when a frac-out is detected. The Site Supervisor shall be responsible for ensuring that environmental personnel are aware of the frac-out, and coordinate personnel, response, remediation, and regulatory agency notification. The Site Supervisor shall ensure all waste materials are properly containerized, labeled, and removed from the site to an approved disposal facility by personnel experienced in the removal, transport and disposal of drilling mud.

The Site Supervisor shall be familiar with all aspects of the drilling activity, the contents of this plan and the conditions of approval under which the HDD is authorized to take place. The Site Supervisor shall have the authority to stop work and commit the resources (personnel and equipment) necessary to implement this plan. The Site Supervisor shall ensure that a copy of this plan is available (at the project work site) and accessible to all construction personnel. The Site Supervisor shall ensure that all workers are properly trained and familiar with the necessary procedures for response to a frac-out, prior to commencement of drilling operations.

IV. Equipment

The Site Supervisor shall ensure that:

1. Spill responses kit and spill containment materials are available on-site at all times, and that the equipment is in good working order;
2. Equipment required to contain and remediate a frac-out release either will either be available at the work site or readily available at an offsite location within 15- minutes of the bore site; and

If equipment is required to be operated adjacent to a water course, absorbent pads and plastic sheeting for placement beneath motorized equipment shall be used to protect sensitive areas from engine fluids.

V. Training

Prior to the start of construction, the Site Supervisor shall ensure that relevant workers receive training in the following areas:

1. The provisions of this plan, equipment maintenance and site-specific permit and monitoring requirements;
2. Inspection procedures for release prevention and containment equipment and materials;
3. Contractor/employee obligations to immediately stop the drilling operation upon first evidence of the occurrence of a frac-out and to immediately report any frac-out releases;
4. Contractor/employee responsibilities in the event of a release;
5. Operation of release prevention and control equipment and the location of release control materials, as necessary and appropriate; and
6. Protocols for communication with relevant regulatory agency representatives who might be on-site during the remediation effort.

VI. Procedures

The following procedures shall be followed each day, prior to the start of work. This plan shall be available on-site during all construction. The Site Supervisor shall be on-site at any time that HDD is occurring or is planned to occur. The Site Supervisor shall ensure that a briefing is held at the start of each day of HDD to review the appropriate procedures to be followed in case of a frac-out. Questions shall be answered and clarification given on any point over which the HDD operating crew or other employees or contractors have concerns.

A. Drilling

Drilling pressures shall be closely monitored so they do not exceed those needed to penetrate the target formation. Pressure levels shall be monitored randomly by the operator. Pressure levels shall be set at a minimum level to prevent frac-outs. During the pilot bore, the drilled annulus shall be maintained. Cutters and reamers shall be pulled back into previously-drilled sections after each new joint of pipe is added.

Exit and entry pits shall be enclosed by silt fences and straw or similar material. A spill kit shall be on-site and used if a frac-out occurs. A vacuum truck shall be readily available prior to and during all HDD operations. Containment materials (straw, silt fencing, sand bags, frac-out spill kits, etc.) shall be staged on-site at locations where they are readily available and easily mobilized for immediate use in the event of a frac-out. If necessary, barriers (straw bales or sedimentation fences) between the bore site and the edge of the water source, shall be constructed, prior to drilling, to prevent released bentonite material from reaching the water.

Once the drill rig is in place, and drilling begins, the drill operator shall stop work whenever the pressure in the drill rig significantly drops or there is a lack of returns in the entrance pit. If either of these occur, the Site Supervisor shall be informed that a possible frac-out has occurred. The

Site Supervisor and the drill rig operator(s) shall work to coordinate the likely location of the frac-out.

The location of the frac-out shall be recorded and notes made on the location and measures taken to address the concern. The following subsections shall be adhered to when addressing a frac-out situation.

Water containing mud, silt, bentonite, or other pollutants from equipment washing or other activities, shall not be allowed to enter any water course. The bentonite used in the drilling process shall be either disposed of at an approved disposal facility or recycled in an approved manner. Other construction materials and wastes shall be recycled, or disposed of, as appropriate.

B. Vacuum Truck

A vacuum truck shall be staged at a location from which it can be mobilized and relocated so that any place along the drill shot, can be reached by the apparatus, within thirty (30) minutes of information indicating a possible frac-out.

C. Field Response

The response of the field crew to a frac-out release shall be immediate and in accordance with procedures set forth in this plan. All appropriate emergency actions that do not pose additional threats to sensitive resources will be taken, as follows:

1. Boring shall stop immediately;
2. The bore stem shall be pulled back to relieve pressure on the frac-out;
3. The Site Supervisor shall be notified to ensure that management and environmental personnel are notified, adequate response actions are taken and required notifications are made;
4. The Site Supervisor shall evaluate the situation and recommend the type and level of response warranted, including the level of notification required;
5. If the frac-out is minor, easily contained, has not reached the surface and is not threatening any sensitive resources, then a leak-stopping compound shall be employed to block the frac-out. If the use of leak-stopping compound is not fully successful, then the bore stem shall be redirected to a new location along the desired drill path (i.e., where a frac-out has not occurred);
6. If the frac-out has reached the surface, any hazardous materials within the bentonite shall be removed to a depth of 48 inches, contained and properly disposed of, as required by law. A dike or berm may be constructed around the frac-out to entrap released drilling fluid, if necessary. Clean sand shall be deployed and the area returned to pre-project contours; and
7. If a frac-out occurs, reaches the surface and becomes widespread, the Site Supervisor shall authorize a vacuum truck and bulldozer stored off-site to be mobilized. The vacuum

truck may be either positioned at either end of the line of the drill so that the frac-out can be reached by crews on foot, or may be pulled by a bulldozer, so that contaminated soils can be vacuumed up.

D. Response Close-out Procedures

1. When the release has been contained and remediated, response close-out activities shall be conducted at the direction of the Site Supervisor. These activities shall include those below.
2. The recovered drilling fluid shall either be recycled or transported to an approved facility for disposal. No recovered drilling fluids may be discharged into streams, storm drains or any other water source;
3. All frac-out excavation and remediation sites shall be returned to pre-project contours using clean fill, as necessary; and
4. All containment measures (fiber rolls, straw bale, etc.) shall be removed, unless otherwise specified by the Site Supervisor.

E. Resumption of HDD

For minor releases not necessitating external notification, HDD may continue, if full containment is achieved through the use of a leak-stopping compound or redirection of the bore and the cleanup crew remains at the frac-out location throughout the HDD activity. For releases necessitating external notification, HDD activities shall not restart without prior approval from the Site Supervisor.

F. Bore Abandonment

Abandonment of the bore will only be required when all efforts to control the frac-out within the existing directional bore have failed.

VII. Notification

In the event of a frac-out that reaches a water source, the Site Supervisor shall notify safety personnel so they can notify the appropriate regulatory agencies. All agency notifications will occur within 24 hours and proper documentation will be created in a timely and complete manner.

The following information will be provided:

1. Name and telephone number of person reporting;
2. Location of the release;
3. Date and time of release;
4. Type and quantity, estimated size of release;

5. How the release occurred;
6. The type of activity that was occurring around the area of the frac-out;
7. Description of any sensitive areas, and their location in relation to the frac-out; and
8. Description of the methods used to remediate the site.

A. Communicating with Regulatory Agency Personnel

All employees and subcontractors shall adhere to the following protocols when regulatory agency personnel arrive on site. Regulatory agency personnel shall be required to comply with appropriate safety rules. Only the Site Supervisor, safety personnel and environmental should coordinate communication with regulatory agency personnel.

B. Documentation

The Site Supervisor shall record the frac-out event in his or her daily log. The log will include the following:

1. Details on the release event, including an estimate of the amount of bentonite released;
2. The location and time of release;
3. The size of the area impacted, and the success of the remediation action;
4. Name and telephone number of person reporting;
5. Date;
6. How the release occurred;
7. The type of activity that was occurring around the area of the frac-out;
8. Description of any sensitive areas, and their location in relation to the frac-out;
9. Description of the methods used to remediate the site; and
10. Listing of the water-related permits for the project.

VIII. Project Completion and Clean-up

1. All materials and any rubbish-construction debris shall be removed from the construction zone at the end of each work day;
2. Sump pits at bore entry and exits will be filled and returned to natural grade; and
3. All protective measures (fiber rolls, straw bale, silt fence, etc.) will be removed unless otherwise specified by the Site Supervisor.