Ecological Assessment

Alamo Solar Project
Preble County, Ohio

Open Road Renewables, LLC

E317504900

Document Information

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Acronyms

AC	Alternating current
Alamo Solar	Alamo Solar I, LLC
AWS	Agricultural Water Supplies
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best management practice
CECPN	Certificate of Environmental Compatibility and Public Need
CFR	Code of Federal Regulations
CGP	Construction General Permit
CWA	Clean Water Act
DC	Direct current
DOW	Division of Wildlife
ESA	Endangered Species Act
EW	Possible Exceptional Warm Water Habitat
FEMA	Federal Emergency Management Agency
FSA	Farm Service Agency
FWS	U.S. Fish and Wildlife Service
GIS	Geographic Information Systems
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
LRW	Limited Resource Water
MBTA	Migratory Bird Treaty Act
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
ORR	Open Road Renewables, LLC
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
POI	Point of interconnection
Project	Alamo Solar Project
PV	Photovoltaic
QHEI	Qualitative Habitat Evaluation Index
RTE	Rare, Threatened or Endangered species
s.f.	Square foot
SESC	Soil erosion and sediment control
SMS	Solar meteorological station
SWPPP	Storm water pollution prevention plan
TNW	Traditional Navigable Water
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WEG	Wind Erodibility Group
WOTUS	Waters of the United States
WQC	Water Quality Certificate
WWH	Warm Water Habitat

Executive Summary

Alamo Solar I, LLC (Alamo Solar), an affiliate of Open Road Renewables, LLC (ORR), is proposing to construct the Alamo Solar Project (Project) near Eaton, Ohio, which is located approximately 25 miles west of Dayton. The proposed photovoltaic (PV) solar energy facility will have a generation capacity of 90 megawatts (MW). The Project is proposed to be constructed within 999 acres (1.56 square miles) of private leased land and easements (Project Area). The Project Area is entirely contained within Gasper and Washington Townships, Preble County, Ohio.

Proposed Project infrastructure will have a permanent footprint (or Buildable Area) up to 919 acres, which includes solar panels on metal racking (or modules, organized into strings), inverter pads, buried collection lines, pyranometer stations, access roads, and a Project Substation. The Project will be served by an 11.66-mile (maximum length) network of access roads. To construct the access roads, Alamo Solar will utilize a 25-foot wide temporary construction work space (6.88 acres). Once constructed, the access roads will be maintained as gravel roads with a smaller 16-foot wide work space (12.19-acre permanent footprint). For construction, up to approximately 16 acres of temporary equipment laydown areas will be needed, in 1 to 5-acre blocks. Approximately 5 acres (maximum) of permanent laydown areas will be maintained as permanent gravel-covered areas for vehicle parking and equipment storage. The solar arrays will be connected through a network of buried collection lines (up to 20.48 miles of buried cable), using a 20-foot wide temporary work area during construction (22.20 acres temporary footprint).

For this ecological assessment, Cardno reviewed the environmental features within the 999-acre Project Area, and conducted a habitat assessment on the Project Area, plus a visual assessment on a ¼-mile buffer. Cardno 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, totaling approximately 1,786 acres on 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. Ultimately, not all parcels surveyed were included in the final 999-acre Project Area.

The desktop review for environmental resources within the proposed Project Area included a review of land use, bedrock geology, glacial drift, wetlands, water quality/floodplain, and major species habitat.

Based on preliminary survey data and habitat evaluations, the Alamo Solar Project is proposed to be primarily built on land that has already been impacted by land clearing; and is actively disturbed annually for agriculture. 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 a commercial solar field. This conversion in land use is not likely to have a significant or adverse impact on the current wildlife utilizing the Project Area. Upon decommissioning of the Project, land use can return to agricultural.

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 Clean Water Act (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

[1] OEPA 2017.

Permitting Program, were also identified. Cardno's wetland delineation efforts focused on approximately 999 acres on leased parcels within the Project Area. Interior areas of larger woodlots were not delineated unless they were planned to be cleared for infrastructure, as most will be avoided for Project construction, operation, and maintenance.

Based on the field survey, a total of 13 wetlands were identified totaling 4.71 acres. Wetland WL-013, was greater than 1 acre, with all the other wetlands accounting for less than one acre each. The majority of wetlands were identified as palustrine emergent (PEM) and scored as lower quality wetlands on the Ohio Rapid Assessment Methodology (ORAM). Based on current Project designs, no delineated wetlands will be impacted by the construction, operation, or maintenance of this Project.

A total of 30 waterbodies (streams, ponds, and ditches) were delineated within the Project Area, totaling 25,521 linear feet (lf) of waterway. The most significant waterbody was Beasley Run, a perennial stream that runs through the middle of the Project Area. The waterbodies observed were mostly National Hydrography Dataset (NHD) stream features (i.e., unnamed tributaries of Sevenmile Creek and Beasley Run) with a few ditches and man-made ponds. WB-005 and WB-030 scored high enough on the Headwater Habitat Evaluation Index (HHEI) to be considered a Class III waterbody. Twelve of the waterbodies were considered modified with the others classified as natural features. Many of the streams delineated within the Project Area ran through narrow windrows or woodlots and were categorized as either perennial or intermittent features. Current Project designs avoid direct impacts to the majority of stream reaches (via horizontal directional drilling technology [HDD] or avoidance). The Project will cross up to three streams and ditches, totaling 106.79 lf, by culvert or open cut as needed for collection lines and/or access roads. 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.

Based on preliminary survey data and habitat evaluations, the proposed Project Area is primarily agricultural land which is not known to provide a significant amount of bat habitat. Larger isolated forest stands will be avoided during construction, however, the construction of the Project infrastructure will require tree clearing of smaller woodlots and woodlot edges (up to 1.37 acres) to reduce shading and provide acreage for continuous strings of modules. 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 national bird populations, as there is limited habitat for resident raptors and other birds of prey. The Project will observe seasonal restrictions on tree clearing to protect Indiana bat (e.g., cutting trees only between October and March), or as conditions specify.

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 Alamo Solar Project.

1 Introduction

Alamo Solar I, LLC (Alamo Solar) is proposing to construct and operate the Alamo Solar Project (Project) near Eaton, Ohio, located approximately 25 miles west of Dayton. The Project is proposed as a 90-megawatt (MW) alternating current (AC) in generating capacity photovoltaic (PV) solar project within an area of approximately 999 acres (1.56 square miles) on leased private lands and easements (Project Area). The Project Area is contained entirely in Gasper and Washington Townships, Preble County, Ohio. Figure 1.1 shows the location of the proposed Alamo Solar Project. Figure 1.2 shows an Aerial Overview of the proposed Project Area along with the field delineated features.

For this ecological assessment, Cardno reviewed the environmental features and conducted a habitat assessment within the 999-acre Project Area plus a visual assessment on a ¼-mile buffer. Cardno 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, totaling approximately 1,786 acres on 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 leased parcels as well as along easements during fall of 2017, and spring and fall of 2018, with a ¼-mile visual investigation from the boundary of the Project Area, and included:

- Wetland and surface water delineations; and
- Habitat observations and sensitive species assessment.

Appendix A includes the following Project Area Figures:

- Buildable Area
- Land Use Map Overview
- Bedrock Geology
- Glacial Drift
- Regional Wildlife Areas
- Field-Delineated Surface Waters
- Watersheds

Figure 1.1 Project Location

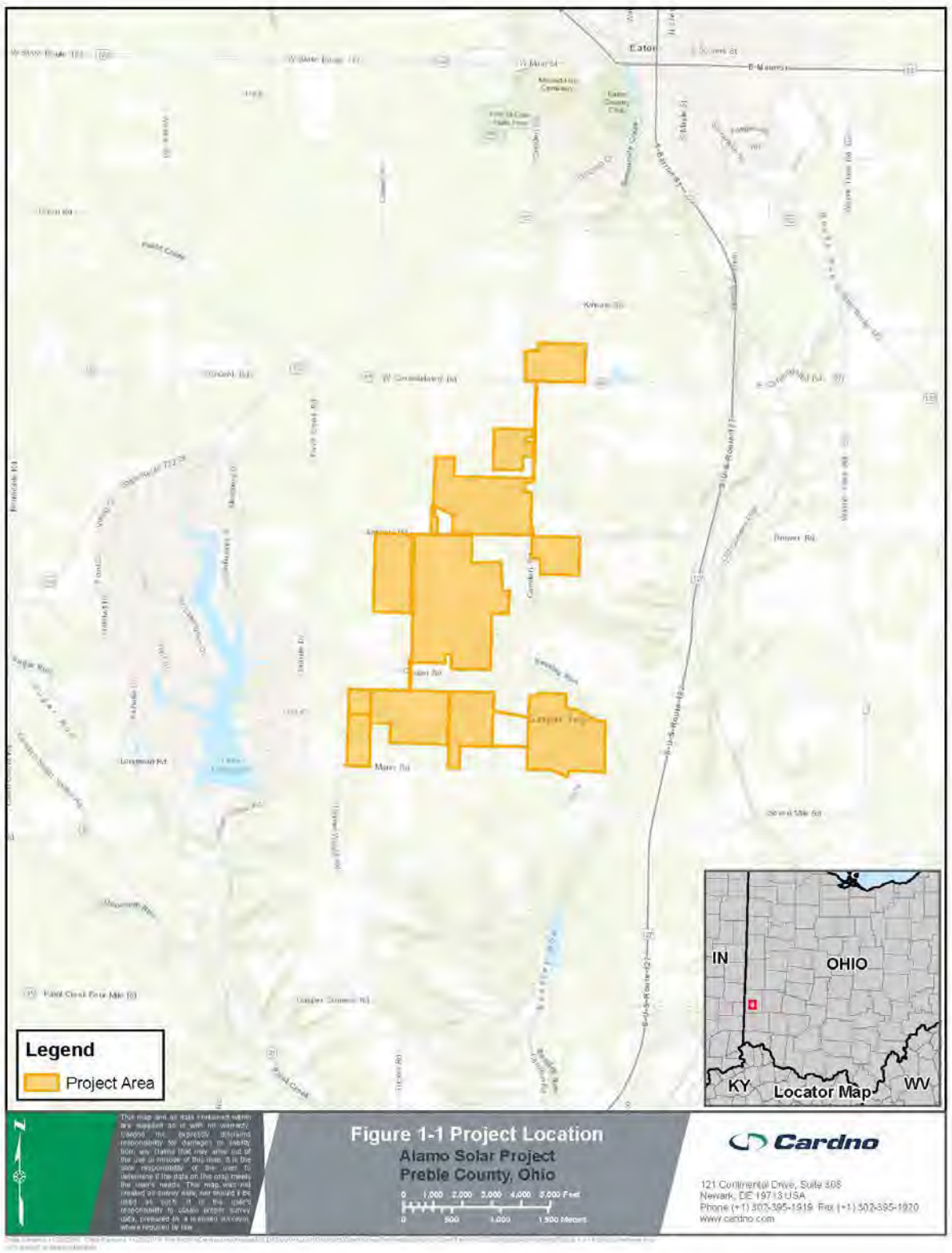
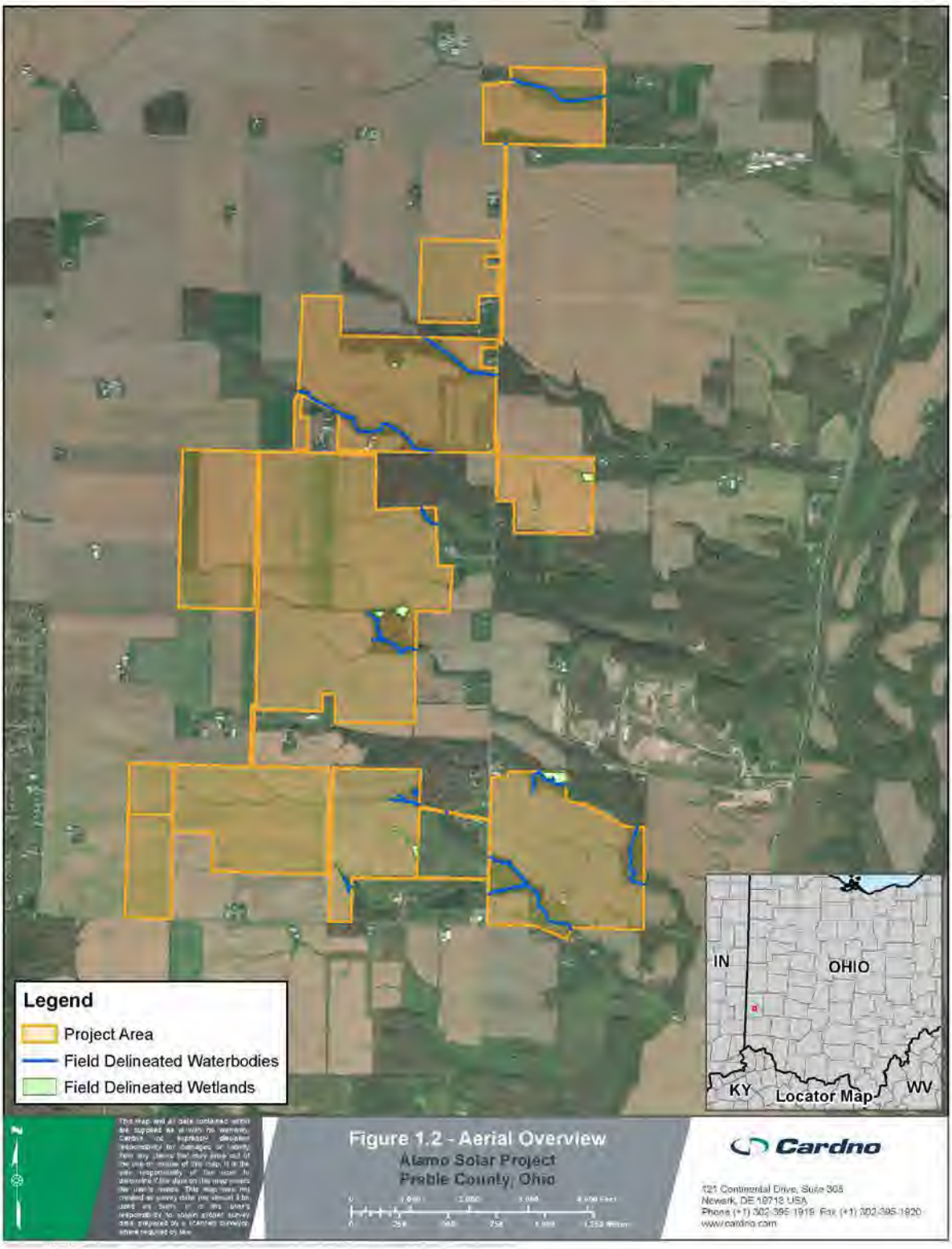


Figure 1.2 Aerial Overview



Appendix B includes agency correspondence/previous studies, as applicable.

Appendix C includes information regarding rare, threatened and endangered species potential locations in the vicinity of the Project Area.

Appendix D includes the Wetland Report, summarizing the U.S. Army Corps of Engineers (USACE) *Midwest Regional Supplement to the Corps of Engineers Wetland Delineation Manual* (USACE, 2010), the Ohio Environmental Protection Agency (OEPA), Ohio Rapid Assessment Methodology (ORAM), the OEPA Headwater Habitat Evaluation Index (HHEI) results for waterbodies and wetlands identified in the Project Area, as well as a brief description of each delineated wetland within the Project Area, and photographic documentation of the delineated surface waters.

Appendix E provides specific anticipated impacts to resources in Table E-1 - Anticipated Wetland Impacts for the Alamo Solar Project, and Table E-2 - Anticipated Waterbody Crossing Methods and Impacts for the Alamo Solar Project.

Appendix F includes a frac out contingency plan for horizontal directional drilling (HDD) crossings.

1.1 Project Description

Of the 999-acre Project Area, Cardno estimates that up to 919 acres will be needed for permanent Project infrastructure or “Buildable Area” (solar arrays, roads, substations, etc.) and no longer be available for current land use. The Project Buildable Area is presented as Figure 1 in Appendix A.

As proposed, the solar project will ultimately connect to the Dayton Power & Light Camden to Crystal 69 kilovolt (kV) transmission line.

The proposed Project includes the construction and operation of a solar project with a maximum site footprint of 919 acres. Solar Project components will include:

> A solar field of PV panels mounted on fixed and/or tracking structures, organized into strings (covering up to approximately 898 acres);

> An electrical collection system that will aggregate the output from the PV panels and convert the electricity from direct current (DC) to AC via inverters situated on up to 200 square feet (s.f.) inverter pads (up to 38 inverter pads for up to a total of 0.27 acre);

> A 69 kV Project Substation where the Project’s electrical output voltage will be combined and its voltage increased to connect Project facilities to the designated point of interconnection (POI) at the Dayton Power & Light Camden to Crystal 69 kV transmission line through a short buried or overhead 69 kV generation tie line.

> Internal infrastructure including access roads, fencing, meteorological/pyranometer stations, and communications infrastructure; and

> For construction, up to approximately 16 acres of temporary equipment laydown areas will be needed, in 1 to 5-acre blocks. Approximately 5 acres (maximum) of permanent laydown areas will be maintained as permanent gravel-covered areas for vehicle parking and equipment storage.

1.1.1 Site Preparation

Construction of the proposed Project will incorporate conventional overland construction techniques. A survey crew will stake the outside limits of the disturbed area, including temporary access roads, equipment laydown areas, existing utility lines, and sensitive resources such as surface waters.

Temporary soil erosion and sedimentation control measures will be installed within and along the proposed construction area, equipment laydown areas, access roads, and other work areas, as

applicable, in accordance with approved Preble Soil & Water Conservation District's soil erosion and sediment control (SESC) Plans.

Following the installation of the SESC control measures, minimal clearing of windrows between Project parcels and smaller woodlots is anticipated to provide contiguous usable areas and reduce lost area from shading. Because direct, or line of sight, sunlight energy is the primary source of energy for any PV array, shading of the PV array (which refers to blocking of available sunlight from reaching the PV array) can have a disproportionate impact on PV energy production. Important sources of shading include the following: mutual shading, which is shading of the PV array on itself due to the array structure; near shading due to nearby objects (e.g., tall trees, buildings and towers); and horizon shading due to more distant features such as mountains.

The tree clearing will be done primarily by hand clearing, however a skid-steer stump grinder will be used to grind stumps to ground level or just below. 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.

Since the site is relatively flat, very little grading is anticipated for the Project. Where required, grading will be limited to creating a finished grade slope suitable for the substation, roads, racking installation, and storm water management.

Temporary equipment laydown areas will be used for storage of construction equipment and supplies, and typically range in size from 1 acre to 5 acres (approximately 16 acres total). Staging areas will be covered with timber matting, temporary gravel with geosynthetic fabric, or other suitable material to separate the native soil from construction materials. Up to approximately 5 acres will be maintained as permanent gravel-covered parking/laydown area.

The Project will be served by an 11.66-mile long (maximum length) network of access roads. To construct the access roads, Alamo Solar will utilize a 25-foot wide temporary construction work space. Once constructed, the access roads will be maintained as gravel roads with a 16-foot wide permanent footprint.

Ultimately, the Project facilities will terminate at a 3.18-acre Project Substation, and connect to the designated POI at the adjacent Dayton Power & Light Camden to Crystal 69 kV transmission line.

Throughout construction and operation, Alamo Solar will employ best management practices (BMPs) to minimize sedimentation and erosion as outlined in the SESC plans approved by the Preble County's Soil and Water Conservation District prior to construction.

1.1.2 Solar Project Infrastructure

Solar energy will be captured by PV panels mounted on steel support structures that are fixed or on a tracking system. The support structures will be suspended above the ground by piles driven or screwed into the ground by a pile-driving machine to a depth of approximately 4 to 8 feet, but typically not greater than 10 feet. The piles constitute the direct impact to the ground surface of less than 1 s.f. each (up to approximately 40,731 piles). Driven support piles would have a permanent footprint of up to approximately 0.94 acre, spread over the 898-acre array area.

The support structures will be either fixed or on a single-axis tracking system, depending on the technology selected. Single-axis tracker designs generally consist of a series of horizontal steel support beams, with a drive train system in the center of the rows, dividing the array into two sides. The distance between rows of solar panels is expected to be approximately 12 feet to 16 feet. In the case of fixed supports, the rows would be aligned east-west, with each individual panel tilted south for maximum exposure. In the case of tracking arrays, rows would be aligned north to south and the PV panels would pivot, tracking the sun's motion from east to west. Both types of support systems would be similar in appearance and environmental effect. The high end of the PV panels is expected to be approximately 8 to 12 feet above the ground, and typically no higher than 14 feet.

Panels will be grouped into a series of circuits (strings or rows). These strings will be wired in parallel through electrical harnesses that travel through the cable trays underground/aboveground (either buried within the access road footprint or attached to the racking) to combiner boxes. The PV system is expected to be constructed in "blocks" of 1 to 2 MW each, with each block including a power conversion station with a DC to AC power inverters, a medium-voltage transformer, and an associated control cabinet. Each of these components are expected to be mounted on a 200-s.f. concrete slab (maximum size) depending on array size, with or without an enclosure. A DC collection system will collect electrical power from the panels and transmit it to inverters (DC to AC) located in the power conversion stations for each block. Cables outside of the perimeter of controlled fences will be buried at least 36 inches below grade.

The Project will also contain up to 5 on-site solar meteorological stations (SMSs or pyranometer), which would consist of irradiance (solar energy) meters as well as air temperature and wind meters with a footprint of up to approximately 138 s.f. each.

The Project will not be open to the public for safety reasons. Security fencing at least 6 feet high will enclose all above-ground Project components. The Project's access points will be gated, and security lighting with motion detectors is expected to be installed. Additional security measures may be utilized as necessary, such as monitoring by cameras and/or electronic security systems.

1.1.3 Operation and Maintenance

Once in operation, the Project will generate electricity during daylight hours. Operation and maintenance workers will monitor operations from an off-site location and conduct periodic cleaning and on-site maintenance procedures as needed. It is anticipated that Project-related supplies will be stored at an existing off-site storage facility.

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

The Alamo Solar Project 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 project review process involving review from 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 prior to certificating. Additional information regarding FWS and OSHPO coordination is provided in Section 3. Table 2-1 provides further detail of 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 *(OAC Chapter 4906-4-08(B))*	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 Natural 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 *(ORC Chapter 6111)*	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 1 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 USACE Huntington District in Preble 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 navigable waters under Section 10 of the Rivers and Harbors Act being crossed by the Project. Alamo 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 OEPA's Isolated Wetlands Permitting Program.

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 seeking a NWP (including #12), may review the OEPA's Stream Eligibility Map[4] to help determine if an

2 OEPA 2017

3 OAC 3745-1-02

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

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.

Using Geographic Information System (GIS), the Project Area was overlaid with the Stream Eligibility map, and reviewed the three areas:

1. Eligible Areas: As long as a project meets the Ohio 401 Certification Special Limitation and Conditions described below in Section 2.3.1, stream impacts are within the eligible area, then no Individual WQC is needed, and impacts are covered under the 401 WQC for the NWPs.

   No portions of the Alamo Solar Project fall within the 'eligible' area (depicted as white in Figure 2.1).

2. 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 Qualitative Habitat Evaluation Index (QHEI) or HHEI assessment for the stream. Using the flow charts provided in the Review of 2017 NWP for Ohio, Appendix C, the applicant shall determine if impacts to that stream are eligible for coverage under the 401 WQC for the NWPs or if an individual 401 WQC is required.

   Most of the Project Area (753.9 acres) is located within the 'Possibly Eligible' area (depicted as yellow in Figure 2.1). Within this area, the Project will impact two stream beds for the construction of access roads and collection lines. Based on Cardno's Wetland and Waterbody Delineation report (Appendix D), dated July 18, 2018, and the requirements outlined in OEPA's Appendix C, we understand that these crossings <u>will be eligible</u> for 401 coverage under the NWP.

3. 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.

   The central portion of the Project Area (244.9 acres) is located within area designated as 'Ineligible' (depicted as purple in Figure 2.1). In this area, the Project will impact one streambed. WB-004 is proposed for a culvert with co-located collection line crossings, which are anticipated to require an individual WQC from the OEPA.

The Alamo Solar Project has proposed infrastructure in two of the water quality eligibility areas (Figure 2.1) including the Ineligible Area, requiring application for an individual 401 WQC.

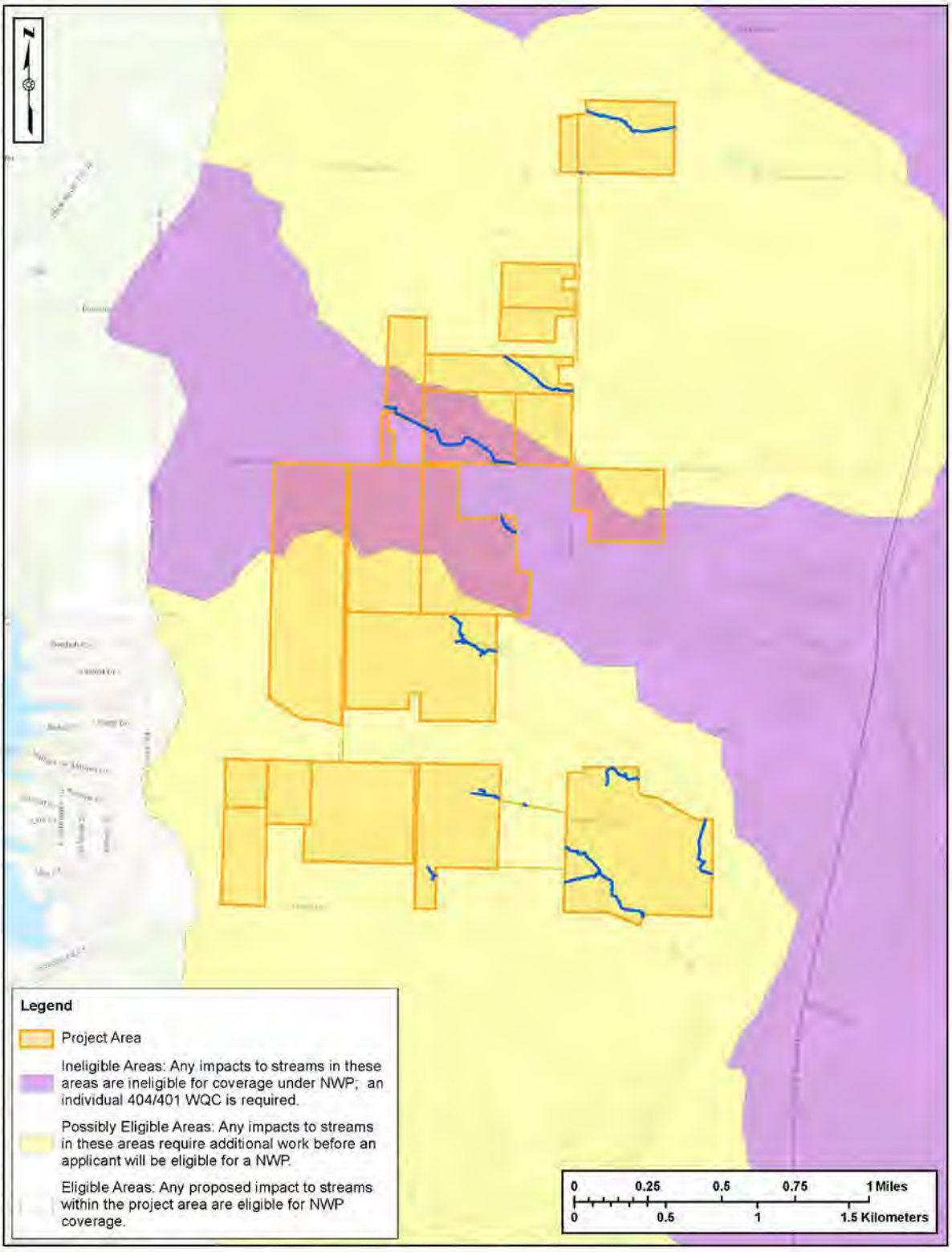
Table 2-2 Alamo Solar Project Stream Crossings and OEPA Stream Eligibility

Waterbody Crossed	Stream Type	HHEI Score[a]	PHWH Class[a]	Drainage Area (upgradient of waterbody, miles)	OEPA Stream Eligibility Area	Crossing Method (Number of crossings)
WB-002 (Trib to Sevenmile Creek)	Ephemeral Ditch	17	Class I	0	Possibly Eligible	(1) Open Cut
WB-004 (Trib to Sevenmile Creek)	Perennial Stream	75	Class III	0.75	Ineligible	Culvert (road crossing) co-located with 3 collection lines
WB-014 (Trib to Beasley Run)	Intermittent stream	46	Class II	0.21	Possibly Eligible	(1) Open Cut

[a] Based on Cardno's Wetland and Waterbody Delineation report for the Alamo Solar Project, dated July 2018.

PHWH – Primary Headwater Habitat Stream

Figure 2.1 401 Water Quality Certification and Proposed Stream Crossing Locations



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

If impacts to "Waters of the U.S." from the Project cannot be fully avoided, 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 "Waters of the U.S." 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 as depicted in the GIS NWPs Stream Eligibility Map (see Figure 2.1);
    c. Streams located in '*Possibly Eligible'* areas as depicted in the GIS NWPs Stream Eligibility Map 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's 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.

Other than the proposed crossing at WB-004 which requires Individual 401 WQC Permit, the Project may meet the 2017 NWP 12 Ohio 401 Certification special limitations and conditions.

The Project will require a National Pollution Discharge Elimination System (NPDES) Construction General Permit (CGP) based on the assessment that 1 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.

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

[5] 40 CFR 230.3

3 Agency Consultation

3.1 U.S. Fish and Wildlife Service

On behalf of Alamo Solar, Cardno submitted an Environmental Review request to the FWS on July 23, 2018. The FWS responded on July 30, 2018. The FWS stated that there are no federal wildlife areas, wildlife refuges or critical species habitats located in or around the Project. They discuss the potential for the presence of the federally endangered Indiana Bat (*myotis sodalis*) and the federally threatened Northern Long-eared Bat (*myotis septentrionalis*) in the Project Area. Preble County is known to have these species and FWS states that the Project Area has over 100-acres of suitable habitat. The FWS recommends summer surveys to identify the presence or absence of this species if a substantial amount of forest clearing is proposed.

Due to the marginal amount of forest clearing (1.37 acres) proposed by Alamo Solar, it is expected that additional surveys will not be necessary. No other adverse effects to federally endangered, threatened, or sensitive species are anticipated by FWS. Alamo Solar is committed to minimizing the tree clearing where possible, and adhering to seasonal restrictions on tree clearing to protect Indiana bat (e.g., cutting trees only between October and March), 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 Alamo Solar, Cardno submitted an Environmental Review request to the ODNR on July 23, 2018. ODNR provided a response dated September 20, 2018. ODNR's response was based 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: Sloan's crayfish (*Orconectes sloanii*) a state threatened species, and the Woodland Trails Wildlife Area.

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 also commented that the Project is within range of the Indiana bat. The DOW recommends that if suitable habitat is located in the Project Area, that Indiana bat roost 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 Eastern massasauga (*Sistrurus catenatus*), however, due to the location, type of habitat present at the Project site, and within the vicinity of the Project Area, and the type of work proposed, DOW stated that this Project is not likely to impact this species.

The Project is within the range of the Sloan's crayfish (*Orconectes sloanii*), a state threatened species. Due to the location, they do not expect the Project to impact this species.

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

Alamo Solar is coordinating with Ohio State Historic Preservation Office (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. Sources of this reference material included, but was not limited to, the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Survey for Preble 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 (USDI, 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 also 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.

> **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)

> **Scrub Shrub Wetlands** – Areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions and the soil or substrate is periodically saturated with or covered with water.

The Project is located within the rural, unincorporated portion of Preble County, Ohio, near Eaton. Based on a review of available aerial imagery, the Project Area appeared to generally occur in cultivated crop areas, with few isolated wood lots and windrows. Review of the 2011 NLCD (Homer et al. 2015) confirmed this assessment, which showed that cultivated crops accounted for approximately 89% of the

total Project Area acreage. The second most prominent land use within the Project Area was classified as deciduous forest and occurred as isolated, regularly shaped woodlots or windrows between agricultural areas, which accounted for 4% of the Project Area. Roughly 3% of the Project Area is classified as Developed, Open Space and mostly occurs as residential lawns. An additional 2% of the Project Area occurs as agricultural land in the form of pastures and hay. Mixed forest and developed, low intensity areas 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 2 of Appendix A.

Table 4-1 Land Use within the Project Area

Type	Project Area (acres)	Project Area (%)
Agriculture, Cultivated Crops	889.49	89%
Deciduous Forest	43.32	4%
Developed, Open Space	33.14	3%
Pasture/Hay	24.42	2%
Mixed Forest	8.37	1%
Agriculture, Pasture/Hay	0.15	<1%
Total	**998.81**	**100%**

Source: Compiled from NLCD 2011, amended 2014

4.1.1 Agricultural Conversion Considerations

As described above, the Project Area currently is primarily used as active agricultural lands (89%). 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 a commercial solar field.

With respect to converting an agricultural field to a solar project, 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 and harvesting. Solar projects would similarly provide minimal habitat, but would not be intensely disturbed on a regular basis. A conversion of land use could create different species mix within the Project Area. Faunal species tolerant of an agricultural field could likely be tolerant of a solar field, as both are managed land. No significant losses of vegetation in these open areas are anticipated, as the solar fields will consist of low growing grasses between and underneath the solar arrays. Generally, solar projects' ground surface 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 PV panels, which are dust, snow, and other particles that can settle on the array.

Alamo Solar will implement a vegetation management plan to maintain the vegetation growth within the solar fields after construction. This plan will include invasive species management, clearing methods, and other industry standards for maintaining the grounds within the solar array fence line. Outside the fence line, large unused areas will be returned to the land owner for use (likely agriculture). In other select areas (primarily too small to farm) that do not need to be maintained as part of the operation of the Project, Alamo Solar will consider selective use of pollinator habitat or similar low growing grasses to stabilize the sediment in these margins, such as those recommended by the Ohio Pollinator Habitat Initiative. This Initiative works with the USDA FSA to develop and maintain CP42-Pollinator Habitat which provides a

diversity of pollinator-friendly wildflowers throughout the seasons[6]. Enrolling pollinator areas previously used for agriculture may result in a net benefit environmentally.

4.2 Geology

The Project is located within the Central Lowland Physiographic Region of Ohio, and in particular, the Southern Ohio Loamy Till Plain. The Southern Ohio Loamy Till Plain is composed of loamy, high-lime Wisconsinan-age till over resistant Mississippian-age Berea Sandstone. Elevations range from 530 to 1,150 feet, with moderate relief. (ODGS, 1998, Physiographic Regions of Ohio[7]).

The Project Area is overlain by seven bedrock formations, with the majority of the Project Area being within the Drakes, Whitewater, Saluda and Liberty Formations. Small portions of the northern and southern Project Area fall within the Clinton and Cataract Formations. A small section of the northern part of the Project Area falls within the Lockport Dolomite Formation. These Formations consist of alternating shale and limestone sequences[8]

Bedrock geology of the Project Area is illustrated in Figure 3 of Appendix A.

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 100-150 feet thick. Portions of north and south fall within areas of 50-100 feet of glacial drift deposits, with a small section of the north having deposits of 30-50 feet.

Glacial drift thickness of the Project Area is illustrated in Figure 4 of Appendix A.

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 located within the Ordovician Uplands karst region, however, in this region, the limestone and shale are overlain by more than 20 feet of glacial drift. It is unlikely that karst terrain will affect Project construction or operation.

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 NRCS (USDA-NRCS 2018, and from the Soil Survey of Preble County, Ohio (USDA-NRCS 2006. The dominant soil types were the Corwin silt loam series and the Crosby-Celina (2 to 4 percent slope) silt loam series, each accounting for 18% of the Project Area. The next most dominant soil types were the Kokomo silt loam series, accounting for 15% of the Project Area, and the Crosby-Celina (2 to 6 percent slope) silt loam series and the Celina silt loam, both accounting for 10% 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 drainage and permeability limits the use of subsurface drainage features (such as tiles). Soil series within the Project

6 https://www.fsa.usda.gov/Internet/FSA_File/cp42_habitat.pdf

7 http://geosurvey.ohiodnr.gov/portals/geosurvey/PDFs/Misc_State_Maps&Pubs/physio.pdf

8 http://geosurvey.ohiodnr.gov/portals/geosurvey/PDFs/BedrockGeology/BG-1_8.5x11.pdf

Area were identified as low slope, which matched topographic and aerial maps. A discussion of specific soil series is provided below for the soils that each comprise at least 10% of the Project Area:

Table 4-2 Soils within the Project Area

Type	Map Unit Description	Hydric Rating	Acreage	Project Area (%)
CeB	Corwin silt loam, 0 to 2 percent slopes	10	184.76	18%
CtB	Crosby-Celina silt loams, 2 to 4 percent slopes, eroded	8	175.04	18%
KnA	Kokomo silt loam, 0 to 1 percent slopes	90	144.94	15%
CtA	Crosby-Celina silt loams, 0 to 2 percent slopes	10	101.53	10%
CeB2	Celina silt loam, 2 to 6 percent slopes, eroded	4	96.04	10%
MfB2	Miamian-Celina silt loams, 2 to 6 percent slopes, eroded	5	68.20	7%
KoA	Kokomo silty clay loam, 0 to 1 percent slopes	90	56.30	6%
MhC3	Miamian-Losantville clay loams, 6 to 12 percent slopes, severely eroded	0	45.45	5%
MfB	Miamian-Celina silt loams, 2 to 6 percent slopes	5	34.13	3%
MhD3	Miamian-Losantville clay loams, 12 to 18 percent slopes, severely eroded	0	33.78	3%
MeC2	Miamian silt loam, 6 to 12 percent slopes, eroded	0	19.24	2%
CeA	Celina silt loam, 0 to 2 percent slopes	5	12.86	1%
RpA	Rossburg silt loam, moderately wet, sandy substratum, 0 to 1 percent slopes, occasionally flooded	5	9.02	1%
MaA	Medway silt loam, 0 to 1 percent slopes, occasionally flooded	5	6.40	1%
MeD2	Miamian silt loam, 12 to 18 percent slopes, eroded	0	5.89	1%
MeC	Miamian silt loam, 6 to 12 percent slopes	5	4.91	<1%
W	Water	0	0.40	<1%
Total			**998.91**	**100%**

Source: Compiled from NLCD 2011, amended 2014

The Crosby-Celina, both 2 to 4 percent slopes and 0 to 2 percent slopes, account for 28% of the Project Area combined. This series is formed in loess or other silty material in underlying loamy till and consists of very deep, somewhat poorly drained soils. Ponding is not typical with these soils and permeability is typically slow to very slow. Most areas are used to grow corn, soybeans, small grains and hay. Native vegetation is deciduous forest.

The Corwin silt loam series, approximately 18% of the Project Area, forms in loess deposits in underlying till. This series consists of very deep, fairly well drained soils. Permeability is moderate above the dense till and slow to very slow in the dense till. These soils are typically used to grow corn, soybeans, and small grains such as wheat. Native vegetation is prairie grass.

The Kokomo silt loam series, approximately 15% of the Project Area, forms in depressions on till plains out of loamy materials. This series consists of very deep, very poorly drained soils. Permeability is moderately slow or slow in the loamy materials and slow in the underlying till. Most soils are used to grow corn, soybeans, oat, wheat and hay, with native vegetation being deciduous hardwood forest of elm, maple and ash.

The Celina silt loam series, approximately 10% of the Project Area, forms in loess of the underlying loamy till of high-lime content. This series consists of very deep, moderately well drained soils of moderately deep to dense till. Permeability is moderately slow above the dense till and very slow in the dense till. Soils are typically used for cultivation of crops such as corn, soybean, wheat, oats, and meadows of legumes or legume-grass mixtures. Native vegetation is deciduous forest, typically consisting of oak, maple, elm, hickory and ash.

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, all with Wind Erodibility Group (WEG) ratings between 5 and 6 (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 two hydric soils - the Kokomo silt loam series (15% of the Project Area) and the Kokomo silty clay series (6% of the Project Area) which both have a hydric rating of 90. 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 less than 10.

4.4 Biological/Conservation

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 it 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, pasture grasslands, isolated wooded lots, and wetland areas. Few wildlife species were observed during the field delineations but included white-tailed deer, squirrels and common woodland and grassland songbirds. 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, and endangered (RTE) species is found below in Section 4.4.3. Common game species in southwestern Ohio include cottontail rabbit, northern bobwhite (quail), Canadian geese, gray and fox squirrels, mallard and other ducks, mourning doves, ring-necked pheasants, ruffed grouse, white-tailed deer, and wild turkey.[9] Other than the agricultural crops and livestock 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 and field verification. Agricultural land and forestland are the dominant community types in the Project Area, with scattered developed/disturbed lands clustered along public roads. Successional communities (e.g., old fields and shrubland) do not occur to any significant extent. Brief descriptions are provided below for each of the ecological communities in the Project Area. All of the major plant communities found within the Project Area are common to Ohio. Surface waters and wetlands, including associated habitats such as riparian corridors and vernal pools, are described in Section 6.2.

4.4.1.1 Agricultural Land

Much of the acreage within the Project Area is used for agricultural production. The dominant crops produced on agricultural lands in the Project Area include soybeans and corn. During the winter months,

[9] http://www.dnr.state.oh.us/Home/wild_resourcessubhomepage/ResearchandSurveys/WildlifePopulationStatusLandingPage/tabid/19230/Default.aspx

fields may be planted in a cover crop such as winter wheat (*Triticum aestivum*) to control erosion and restore soil nutrients. Small, maintained pastures for livestock (i.e. chickens, sheep, and goats) are also present within the Project Area. The Project Area consists of agricultural fields that are currently active or recently fallowed.

4.4.1.2 Forestland

Two types of forestland were observed within the Project Area, windrows and larger woodlots. The windrows consisted of narrow forested strips between cultivated areas, and likely served as property boundaries historically. Windrows typically ranged in depth from 30 to 60 feet, with the wider windrows often containing ditches or streams, improving drainage along the adjoining cultivated areas. Woodlots within the Project Area were often much deeper, but surrounded by cultivated areas or pasture along at least two sides. Larger woodlots are likely maintained for hunting opportunities as evidenced by the presence of tree stands, trail cameras and UTV trails through many. Some woodlots are kept as a buffer around larger surface water features.

4.4.1.3 Disturbed/Developed

Disturbed/developed lands are found in low densities throughout the Project Area. These areas are characterized by the presence of buildings, parking lots, paved and unpaved roads, and lawns/landscaped areas. Vegetation in these areas is generally either lacking or highly managed including ornamental plantings and managed lawns of tall fescue (*Festuca arundinacea*). In areas that are not intensely managed, weedy herbaceous species may develop.

4.4.2 Wildlife Resources

Wildlife resources such as, birds, bats, terrestrial, and aquatic organisms have the potential of being impacted with any utility-scale energy 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 with limited use by wildlife species. Discussions on birds, raptors and bald eagles, and bats species in relation to the Project Area are provided below.

4.4.2.1 Birds

The National Audubon Society (2018) designates Important Bird Areas (IBA) 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 IBAs in the vicinity of the Project Area and the surrounding 40-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. One eBird 'hotspots' were identified near the Project Area. The Woodland Trails Wildlife Area is located approximately 1 mile southwest of the southernmost Project Boundary. Since 2007, 72 bird species have been identified in this Wildlife Area. No federally or state listed-protected species were observed in this area.

The Woodland Trails Wildlife Area in relation to the Project Area is illustrated in Figure 5 of Appendix A.

No Federal or State-listed bird species or evidence of their habitat was observed during the field efforts conducted by Cardno. Based on a review of publically available data, 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 Tranquility State Wildlife Area or Grant Lake Wildlife Area for roosting, foraging and breeding.

4.4.2.2 Bald Eagles and Raptors

The bald eagle is no longer a state-threatened species, although 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 observed no evidence of bald eagle nests or activity during the field surveys. Additionally, no records were identified for known bald eagle nests in the Project Area or ¼-mile buffer. Through Cardno, Alamo Solar is coordinating with the ODNR on this Project; see Section 3.2 for a discussion on agency coordination.

No nests of listed or sensitive raptor species were observed during the field survey within the Project Area or ¼-mile buffer surrounding the Project Area boundaries.

4.4.2.3 Bats

Of the 46 bat species in the United States, 5 potentially occur in the Project Area based on ODNR's Preble County listings:

- Indiana Bat – *Myotis sodalis* (Federally listed and Ohio-listed Endangered)
- Northern Long-eared Bat – *Myotis septentrionalis* (Federally threatened and Ohio Species of Concern)
- Big Brown Bat – *Eptesicus fuscus* (Ohio Species of Concern)
- Eastern Red Bat – *Lasiurus borealis* (Ohio Species of Concern)
- Little Brown Bat – *Myotis lucifugus* (Ohio Species of Concern)

Cardno conducted a desktop evaluation for potential 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. Based on Cardno's evaluation, a total of approximately 64 potential acres of suitable bat habitat was identified within the Project Area.

Cardno observed no evidence of bat activity during the field surveys. Additionally, there are no publicly available records of known hibernacula in the Project Area or ¼-mile buffer. The woodlots in the Project Area did have a few shagbark hickories (*Carya ovata*), which may provide roosting habitat for bats. However, the actual utilization of available habitat could not be determined by Cardno field staff as surveys were conducted during the day.

Through Cardno, Alamo Solar is coordinating with the ODNR on the Project; see Section 3.2 for a discussion on agency coordination.

4.4.3 Rare, Threatened and Endangered Species

4.4.3.1 Federal Listings

The ESA and ODNR regulations protect species that are listed as threatened or endangered. Significant changes to the habitats of these species, or projects that will result in "take," would require special permitting from the FWS.

The FWS lists federally listed species by county. The list for Preble County, Ohio (updated January 29, 2018) included one endangered bat species, one threatened bat species, and one threatened snake species. (FWS, 2018). A copy of the FWS Preble County listing is provided in Appendix D. See Table 4-3:

Table 4-3 FWS Ohio County Distribution of Federally-Listed Threatened, Endangered, Proposed, and Candidate Species – Preble County (Revised January 29, 2018)

Species	Federal Status	Habitat
Indiana bat (*Myotis sodalis*)	Endangered	Hibernates in caves and mines; maternity and foraging habitat includes small stream corridors with well-developed riparian woods; upland forests
Northern long-eared bat (*Myotis septentrionalis*)	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 *(Epioblasma triquetra)*	Endangered	Typically found in wetlands and adjacent uplands

FWS Federally listed Species Status Definitions:

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

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

Cardno also utilized the FWS's IPaC tool to screen the Project Area for sensitive species under FWS jurisdiction. These species may occur or could potentially be affected by activities in the Project Area. The IPaC report identified no Critical Habitats, Wildlife Refuges, or Fish Hatcheries within the Project Area. The findings in the FWS list of Threatened and Endangered species for Preble County and the IPaC for the Project Area produced the same list of species.

The IPaC report also provides a list of one migratory bird (Kentucky Warbler, *Oporornis formosus*) that could potentially be affected by activities in this location, although it is unlikely that any species will be affected by this Project. The Kentucky Warbler may breed in the vicinity of the Project from April 20 through August 20.

A copy of the IPaC report is included in Appendix C.

4.4.3.2 State Listings

Cardno reviewed the available State species listings from two sources: ODNR DOW's Ohio's Listed Species report, updated July 2018 (ODNR DOW, 2018) and ODNR's State-Listed Wildlife and Plant Species by County, for Preble County, dated July 2016 (ODNR DOW, 2016a and ODNR DOW 2016b). A complete listing of State-listed Species for Preble County is included in Appendix C. Cardno compared the three sources of listings, and on advice from an ODNR DOW representative, considered the more conservative status between the two sources for a particular species.

Regarding State-listed endangered species, the Indiana Bat and Eastern Massasauga are listed in Preble County. Sloan's crayfish is the only listed threatened species. Species of Concern include the Eastern Cricket Frog, Least Darter, Creek Heelsplitter, Kidneyshell, Big Brown Bat, Red Bat, Woodland Vole, Little Brown Bat, Northern Long-eared Bat, Deer Mouse, Southern Bog Lemming, Badger and Eastern Box Turtle. Cardno did not observe any sensitive wildlife species during surveys.

Plant species are included on ODNR's list for Preble County and two threatened species, the Midland Sedge and the Soft-leaved Arrow-wood and one potentially threatened species, the Three-birds Orchid. Drummond's Ptychomitrium is listed extirpated. (ODNR DOW, 2016b). Cardno did not observe any of these species during the habitat assessments; however, Cardno did not conduct species-specific surveys for these plants. 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, Alamo

Solar is coordinating with the ODNR, in part, to confirm potential impacts to sensitive plant species populations. A complete listing of State-listed plant species for Preble County is included in Appendix C.

During the field surveys, the Cardno team also recorded the presence or absence of freshwater mussels within the field-delineated streams. The survey teams also designated the field-delineated streams for their potential for RTE habitat (i.e., Low, Moderate, High). Many of the waterbodies delineated were identified as potential habitat, but at reduced quality due to surrounding land use impacting the water chemistry (i.e., high sediment loading during storms and fertilizer in runoff). Therefore, it is highly unlikely species will actually utilize these areas for habitat. Additionally, the agricultural drainage systems often exhibit maintained stream banks that are unlikely to provide suitable habitat for rare fish and freshwater mussels. Mussels prefer streams with well-developed banks and forested buffer areas that provide locations for the mussels to adhere to. During the field surveys, Cardno observed no individuals or populations of freshwater mussel species.

The woodlots in the Project Area had only a few shagbark hickory trees, which may provide roosting habitat for bats. However, the actual utilization of available habitat could not be determined by Cardno field staff as surveys were conducted during daylight hours when bats are generally not active. The relative narrowness of the woodlots and fragmentation of wooded habitats by roads, residential land use, and farm fields reduces the likelihood of significant wildlife occurring in the Project Area as well.

The majority of the listed species that may occur in the Project Area are expected to inhabit the wetland and stream areas. However, it is unlikely that the habitats are well-developed enough within the Project Area due to constant disturbance and existing habitat fragmentation.

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 site investigations, the Project Area was screened using the FWS NWI, USGS NHD, and OWI remote data for potential surface waters in the vicinity of the Project. The NWI data shows remotely identified wetlands, which may be based on previous aerial imagery interpretation and soils surveys, while the NHD uses digital stream information to identify potential waterways.

Multiple surface waters were identified within the Project Area, with some additional streams and wetlands occurring in the vicinity of the Project Area. Approximately a dozen NHD features were identified, including unnamed tributaries and the main stem of Beasley Run. The majority of the streams identified in the NHD were confirmed by the aerial.

The NWI and OWI data indicated a relatively high number of wetlands in the Project Area and surrounding landscape, with the NWI data identifying almost twice the number of potential wetlands as OWI. The majority of the remotely identified wetlands corresponded to ponds, with a limited number occurring as isolated occurrences along the edges of farm fields or in woodlots. The remotely identified features along crop areas were not identifiable in aerial imagery and likely reflected historic wetlands.

An overview of field-delineated surface waters is included as Figure 6 of Appendix A.

4.5.1 Navigable Waters

No TNWs are located within the Project Area. The vast majority of the Project Area is located within the Beasley Run-Sevenmile Creek watershed (Hydrologic Unit Code (HUC)-12). All of the streams in this watershed are located within the larger Ohio River drainage basin, which ultimately drains southwest toward the Mississippi River. Beasley Run was the only named waterbody within the Project Area and was a potential tributary to the Ohio River. This is also the only feature in the Project Area with a

designated use, is identified as warm water habitat (WWH) in the Water Quality Standards[10] and can be considered a tributary to the Ohio River.

A Watershed Map of the Project Area is illustrated in Figure 7 of Appendix A.

4.5.2 Water Quality

The majority of the waterbodies within the Project Area were not classified under OEPA's Water Quality Standards, except for a portion of Beasley Run which is listed as WWH (OEPA, 2007). The waterbodies identified as WWH are also classified as Agricultural Water Supplies (AWS), Industrial Water Supplies (IWS) and Primary Contract Recreation (PCR) waters. The current Project layout crosses unnamed tributaries of Sevenmile Creek and Beasley Run at several locations, including one HDD crossing, and six crossings via open cut.

4.5.3 Floodplains

Based on review of the Federal Emergency Management Agency (FEMA) Flood Insurance Maps, no 100-Year Floodplains are located within the Project Area.

[10] http://epa.ohio.gov/Portals/35/rules/01-17.pdf

5 Other Studies

Alamo 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.

6 Pre-Construction Surveys

The following is a discussion of the results of field surveys of the Project Area conducted in November 2017, April 2018 and October 2018. An overview of field-delineated surface waters is included as Figure 6 of Appendix A. A Watershed Map of the Project Area is illustrated in Figure 7 of Appendix A.

6.1 Habitat Assessment

Desktop habitat assessments and field surveys were completed on the Project Area (999 acres). The data obtained during the desktop review was found to be generally consistent with the results of the field survey, 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 and forestland are the dominant community types in the Project Area, with scattered developed/disturbed lands clustered along public roads. Successional communities (e.g., old fields and shrubland) do not occur to any significant extent. As identified in Table 4-1, the predominant land use in the Project Area was agricultural (crops), followed by deciduous forest areas (woodlots), and some developed/open space.

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. Many agricultural areas had limited amounts of forestland remaining, typically as isolated woodlots. Appendix B 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 dominant crops produced on agricultural lands in the Project Area include soy beans (*Glycine max*) and corn (*Zea mays*); during the winter months fields may be planted in a cover crop such as winter wheat (*Triticum aestivum*) to control erosion and restore soil nutrients. The type of crop may change seasonally, but the general extent of the crop area would remain consistent. Several maintained pastures for livestock (i.e. cattle) were also identified on parcels at the southern end of the Project Area. Vegetation within the grazing lots was a mix of upland herbaceous species, such as common Timothy (*Phleum pretense*), broom-sedge (*Andropogon virginicus*), tall goldenrod (*Solidago altissima*) and wet tolerant plants such as common fox sedge (*Carex vulpinoidea*). The mix of species was a result of micro-topographical differences in pastures which allowed some areas to retain moisture for longer periods of time.

In between many of the fields, as well as along many roadsides, there were grassy swales (consisting of Festuca and Fescue grasses, and reed canary grass *(Phalaris arundinacea*)) that helped to direct stormwater runoff away from the crop area. Some of the fields appeared to be tiled to help with additional field drainage and this water travels to the nearby waterbodies. Some fields had waterbodies running along the edges, with bank areas covered in additional weedy species such as: Canada goldenrod (*Solidago canadensis*), pokeweed (*Phytolacca americana*), Queen Anne's lace (*Daucus carota*), common teasel (*Dipsacus fullonum*), and White American aster (*Symphyotrichum pilosum*). Where limited woody vegetation and shrub growth was observed, species included willows (*Salix spp.*) and black locust (*Robinia pseudoacacia*).

6.1.1.2 Forestland

Two types of forestland were observed within the Project Area: windrows and woodlots. The windrows consisted of narrow forested strips between cultivated areas, and likely served as property boundaries historically. Windrows typically ranged in depth from 30 to 60 feet, with the wider windrows often containing man-made ditches which served to improve drainage along the adjoining cultivated areas. Woodlots within the Project Area were often larger in size, but surrounded by cultivated areas along at least two sides. Larger woodlots are likely maintained for hunting opportunities as evidenced by the presence of tree stands and vehicle trails. Some woodlots were maintained to serve as a buffer around larger surface water features.

Both the windrows and woodlots have a dominance of weedy vegetation along the edges including pokeweed, blackberry (*Rubus* spp.), and poison ivy (*Toxicodendron radicans*). Mature trees along windrows and within the interiors of the woodlots include: black walnut (*Juglans nigra*), oaks (*Quercus* sp.), cherry (*Prunus* sp.), pawpaw (*Asiminia triloba*), American beech (*Fagus grandifolia*), Osage orange (*Maclura pomifera*) and a few shagbark hickories (*Carya ovata*). Size and maturity of trees in forestland varied greatly, with isolated individuals appearing to be relatively old.

6.1.1.3 Developed/Disturbed

Developed/disturbed lands are found in low densities throughout the Project Area, and are characterized by the presence of buildings, parking lots, paved and unpaved roads, and lawns/landscaped areas. Vegetation in these areas is generally either lacking or highly managed (i.e., ornamental plantings and managed lawns of tall fescue [*Festuca arundinacea*]). In areas that are not intensely managed, weedy herbaceous species such as dandelion (*Taraxacum officinale*), thistle (*Cirsium vulgare*), ragweed (*Ambrosia artemesiifolia*), and clover (*Trifolium* spp.) may develop.

6.1.2 Wildlife Observations

Wildlife observations during the field surveys were limited to common species in agricultural areas, including white tailed deer (*Odocoileus virginianus*) and gray squirrels (*Sciurus carolinensis*). Several forested areas were observed to have hunting stands/equipment which may be used to hunt white tailed deer or wild turkey (*Meleagris gallopavo*).

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 Project 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 November 2017, April 2018, and October 2018 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% 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 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 discusses wetland assessment methodologies in greater detail.

6.2.1.3 Wetland Survey Results

A total of 13 wetlands were delineated during field surveys, for a total of 4.17 acres within the Project Area. All wetlands, except for WL-004 and WL-013, were identified as PEM wetlands. Wetland WL-004 and WL-013 were considered to be a palustrine forested (PFO) wetland of moderate quality. Four of the wetlands scored poorly on the ORAM and were identified as Category 1. The remaining nine wetlands were identified as Category 2/Modified 2. None of the wetlands in the Survey Area were identified as Category 3.

Cardno considers five of the wetlands jurisdictional (2.44 acres), 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 Project Area. Additional detail on each feature can be found in Appendix D.

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
WL-001	39.71362	-84.643632	0.93	PEM	31	Modified 2	Yes	Beasley Run-Sevenmile Creek
WL-002	39.70245	-84.649904	0.03	PEM	38	Modified 2	No	Beasley Run-Sevenmile Creek
WL-003	39.69858	-84.644921	0.46	PEM	48	2	No	Beasley Run-Sevenmile Creek
WL-004	39.70361	-84.656408	0.18	PFO	45	2	No	Beasley Run-Sevenmile Creek
WL-005	39.73524	-84.666055	0.05	PEM	19	1	Yes	Headwaters Sevenmile Creek
WL-006	39.6922	-84.655715	0.59	PEM	39	Modified 2	No	Beasley Run-Sevenmile Creek
WL-007	39.6912	-84.656386	0.04	PEM	40	Modified 2	No	Beasley Run-Sevenmile Creek
WL-008	39.69202	-84.657088	0.26	PEM	29.5	1	Yes	Beasley Run-Sevenmile Creek
WL-009	39.68018	-84.659194	0.08	PEM	16	1	No	Beasley Run-Sevenmile Creek
WL-010	39.67086	-84.655884	0.13	PEM	46	2	No	Beasley Run-Sevenmile Creek
WL-011	39.6815	-84.655501	0.77	PEM	27	1	No	Beasley Run-Sevenmile Creek
WL-012	39.67941	-84.647477	0.03	PEM	31	Modified 2	Yes	Beasley Run-Sevenmile Creek
WL-013	39.68468	-84.646309	1.17	PFO	49	2	Yes	Beasley Run-Sevenmile Creek
	Total Acreage		**4.71**					

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 centerline if water depth was shallow, or top-of-bank if 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 the waterbody (such as flow regime and substrate) were recorded by the field team to categorize the types of waterbodies encountered. In order to be called out as a waterbody though, 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 Delineation Report, discusses wetland delineation methodologies in greater detail.

6.2.2.2 Waterbody Qualitative Assessment Methods

All waterbodies delineated were assessed using the HHEI as identified in OAC 3745-1-03, and summarized in Table 6-2. The HHEI allows for uniform scoring of various waterbodies using a standard methodology which identifies pertinent information about the waterbody including substrates, pool depths, and ecological value or condition. HHEI forms typically are only filled out for waterbodies with a drainage area of less than 1 square mile.

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, like the HHEI form, describes similar aspects of the waterbodies but is focused on larger (often higher quality) waterbodies. Typically, QHEI forms are only completed for those perennial features with drainage areas greater than 1 square mile and pools deeper than 40 centimeters (approximately 16 inches). In cases where a feature scored highly on the HHEI forms and failed to meet either of QHEI criteria though, they were still evaluated with the QHEI to better record the conditions present. Table 6-3 summarizes scoring descriptions under the QHEI.

None of the features delineated in the Project Area were evaluated using the QHEI.

Appendix D has additional information on the HHEI methodology used during field surveys of surface waters.

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)

6.2.2.3 Waterbody Survey Results

A total of 30 waterbodies were delineated during field surveys within the Project Area; 22 streams, 2 ponds, and 6 ditches. The waterbody delineation results are summarized in Table 6-4. Using the HHEI scoring, six of the waterbodies were designated as Primary Headwater Habitat (PHWH) Stream Class I (four streams, two ditches), indicating typically ephemeral flow regimes and poorly defined channels and pools that likely had limited ecological value. An additional 19 waterbodies were designated as PHWH Class II (15 streams, 4 ditches), which generally indicated intermittent flow regimes and moderate development of channel features that could provide ecological value. Two waterbodies, WB-004 and WB-030, were identified as a PHWH Class III since they are perennial, semi-forested tributaries to Sevenmile Creek and Beasley Run. The two ponds were not assessed using the HHEI, as they are non-flowing waterbodies.

Ditches were identified as man-made or modified channels, which were manipulated by landowners or communities to improve drainage amongst 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 were identified as having ephemeral or intermittent flows and heavily vegetated channels. 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 was a result of eddies and currents of stormwater flow creating erosion. Most ditches lacked flowing water throughout and were primarily either moist channels or had limited isolated pools along the reaches surveyed.

Streams were more often considered natural channels which had indications of significant recovery since any historic modification had occurred. Streams often had perennial or intermittent flows (with isolated pools and moist channel areas). 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 Project Area were man-made impoundments which may be used for holding water for irrigation or recreational fishing and aesthetics.

While delineating the waterbodies for the Project, Cardno evaluated the features for suitability as habitat for RTE species. Due to the modification and disturbance present in the surrounding land use, none of the ditches were identified as highly likely to serve as habitat for any RTE species. The streams on average, had a slightly higher potential for providing suitable habitat to RTE species (such as mussels and snakes), but no individuals or populations of these species were observed during the field surveys. Often a waterbody may be able to provide physical habitat, but due to intensive land use in the upland areas it may lack suitable water chemistry.

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	SRW	WWH	EWH	MWH	SSH	CWH	LRW	PWS	AWS	IWS	BW	PCR	SCR
WB-001	Ditch	1,792.31	47	N/A	Class II	Perennial	Beasley Run-Sevenmile Creek	Unnamed tributary to Sevenmile Creek	Yes	Low	No													
WB-002	Ditch	1,529.62	17	N/A	Class I	Ephemeral	Beasley Run-Sevenmile Creek	Unnamed tributary to Sevenmile Creek	No	Low	No													
WB-003	Stream	3,419.19	67	N/A	Class II	Perennial	Beasley Run-Sevenmile Creek	Unnamed tributary to Sevenmile Creek	Yes	Moderate	No													
WB-004	Stream	2,938.13	75	N/A	Class III	Perennial	Beasley Run-Sevenmile Creek	Unnamed tributary to Sevenmile Creek	Yes	Moderate	No													
WB-005	Ditch	22.44	22	N/A	Class I	Ephemeral	Beasley Run-Sevenmile Creek	Unnamed tributary to Sevenmile Creek	No	Low	No													
WB-006	Ditch	536.80	53	N/A	Class II	Perennial	Headwaters Sevenmile Creek	Unnamed tributary to Sevenmile Creek	Yes	Low	No													
WB-007	Stream	2,890.75	70	N/A	Class II	Perennial	Headwaters Sevenmile Creek	Unnamed tributary to Sevenmile Creek	Yes	Low	No													
WB-008	Ditch	518.14	51	N/A	Class II	Ephemeral	Headwaters Sevenmile Creek	Unnamed tributary to Sevenmile Creek	No	Low	No													
WB-009	Stream	442.15	58	N/A	Class II	Perennial	Beasley Run-Sevenmile Creek	Unnamed tributary to Sevenmile Creek	Yes	Moderate	No													
WB-010	Stream	915.96	66	N/A	Class II	Perennial	Beasley Run-Sevenmile Creek	Beasley Run	Yes	Moderate	No		X						X	X		X		
WB-011	Stream	79.13	29	N/A	Class I	Ephemeral	Beasley Run-Sevenmile Creek	Unnamed tributary to Beasley Run	No	Low	No													
WB-012	Stream	703.92	43	N/A	Class II	Intermittent	Beasley Run-Sevenmile Creek	Unnamed tributary to Beasley Run	Yes	Low	No													
WB-013	Stream	75.63	22	N/A	Class I	Ephemeral	Beasley Run-Sevenmile Creek	Unnamed tributary to Beasley Run	No	Low	No													
WB-014	Stream	577.00	46	N/A	Class II	Intermittent	Beasley Run-Sevenmile Creek	Unnamed tributary to Beasley Run	Yes	Low	No													
WB-015	Stream	48.65	33	N/A	Class II	Ephemeral	Beasley Run-Sevenmile Creek	Unnamed tributary to Beasley Run	No	Low	No													
WB-016	Pond	N/A	N/A	N/A	N/A	Perennial	Beasley Run-Sevenmile Creek	Private Pond	No	Low	No													
WB-017	Stream	165.12	33	N/A	Class II	Intermittent	Beasley Run-Sevenmile Creek	Unnamed tributary to Beasley Run	Yes	Low	No													
WB-018	Stream	230.26	55	N/A	Class II	Intermittent	Beasley Run-Sevenmile Creek	Unnamed tributary to Beasley Run	No	Low	No													
WB-019	Stream	106.75	48	N/A	Class II	Ephemeral	Beasley Run-Sevenmile Creek	Unnamed tributary to Beasley Run	No	Low	No													
WB-020	Stream	396.95	23	N/A	Class I	Ephemeral	Beasley Run-Sevenmile Creek	Unnamed tributary to Beasley Run	No	Low	No													
WB-021	Stream	475.62	33	N/A	Class II	Ephemeral	Beasley Run-Sevenmile Creek	Unnamed tributary to Beasley Run	No	Low	No													

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	SRW	WWH	EWH	MWH	SSH	CWH	LRW	PWS	AWS	IWS	BW	PCR	SCR
WB-022	Stream	619.42	33	N/A	Class II	Ephemeral	Beasley Run-Sevenmile Creek	Unnamed tributary to Beasley Run	No	Low	No													
WB-023	Stream	258.98	22	N/A	Class I	Ephemeral	Beasley Run-Sevenmile Creek	Unnamed tributary to Beasley Run	No	Low	No													
WB-024	Ditch	1,419.43	61	N/A	Class II	Perennial	Beasley Run-Sevenmile Creek	Unnamed tributary to Beasley Run	Yes	Low	No													
WB-025	Pond	N/A	N/A	N/A	N/A	Perennial	Beasley Run-Sevenmile Creek	Private Pond	No	Low	No													
WB-026	Stream	737.06	49	N/A	Class II	Intermittent	Beasley Run-Sevenmile Creek	Unnamed tributary to Beasley Run	Yes	Low	No													
WB-027	Stream	1,292.30	59	N/A	Class II	Perennial	Beasley Run-Sevenmile Creek	Beasley Run	Yes	Moderate	No													
WB-028	Stream	406.71	36	N/A	Class II	Intermittent	Beasley Run-Sevenmile Creek	Unnamed tributary to Beasley Run	Yes	Low	No													
WB-029	Stream	649.84	64	N/A	Class II	Perennial	Beasley Run-Sevenmile Creek	Unnamed tributary to Beasley Run	Yes	Moderate	No													
WB-030	Stream	2,273.19	75	N/A	Class III	Perennial	Beasley Run-Sevenmile Creek	Unnamed tributary to Beasley Run	Yes	Moderate	No													
Total Linear Feet		**25,521.43**																						

Notes:
HHEI – Headwater Habitat Evaluation Index
n/a – No QHEI performed
PHWH – Primary Headwater Habitat Stream
QHEI – Qualitative Habitat Evaluation Index
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 steams. 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 has additional descriptive information delineated waterbodies.

6.3 Ohio Mussel Survey

All native mussels in the State of Ohio are protected per ORC 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. However, the survey protocol notes that use of 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 this criteria, full mussel surveys are not required for any areas of the Project.

None of the delineated streams within the Project Area meet the requirements for survey; however, WB-003 and WB-004 are direct tributaries of Sevenmile Creek which is a Group 1 listed stream for mussels.

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

Of the 999-acre Project Area, approximately 919 acres will be needed for permanent Project infrastructure (solar arrays, roads, substations, etc.) and no longer be available for current land use. 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. The Project Buildable Area is presented as Figure 1 in Appendix A.

Alamo Solar Project will generally consist of the following infrastructure:

> Solar Panel Areas (approximate):

- Typical PV panel size 4-feet by 6-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 4 to 8 feet below ground surface (up to 40,731 piles, or up to 0.94 acre total spread across 898-acre array area)
- 12 to 16 feet of open space between panel strings
- Up to 200 s.f. concrete slab per Inverter Pad (up to 38 inverter pads total, 0.27 acre)
- Up to 898 acres of solar array blocks (5 to 10 acres per block)

> Project Substation and Support Facilities:

- Up to 3.18 acre Project Substation
- Up to 5 SMSs (up to 138 s.f. each, 690 s.f. total)
- Security fencing and access gates

> Collection Lines:

- Up to 20.48 miles of buried cable, 20-foot wide temporary work area (22.20 acres)
- Buried 36 inches below grade (outside fence lines)
- All jurisdictional perennial streams will be avoided using HDD technology

> Access Roads:

- Up to 11.66 miles of access roads
- Access roads will have a temporary impact width of up to 25 feet during construction (6.88 acres)
- Following construction, gravel access roads will be maintained using a permanent up to 16-foot wide road for operations and maintenance (12.19 acres)

> Equipment Laydown Areas:

- Up to 16 acres will be used for temporary laydown areas; 1 to 5-acre lots each, for storage of construction equipment and supplies during construction
- Up to 5 acres 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 Alamo Solar Project Permanent Infrastructure

Features	Maximum Values
Project Generation Capacity	90 MW
Project Area	998.91 acres
Available Buildable Area / Permanent Project Infrastructure	919.30 acres
Solar Arrays	898 acres
Solar Array Piles	0.94 acre
Project Substation	3.18 acres
Gravel-covered Parking / Laydown Area	5.00 acres
Supporting Facilities (Pyranometer Stations, Inverter Pads)	0.27 acre
Collection Lines (buried)	0 acre (all buried) (20.48 miles)
Permanent Access Roads (gravel-covered)	12.19 acres (11.66 miles)

7.2 Natural Resource Impacts Summary

Overall, the Alamo Solar Project will have limited environmental impacts. The Project is proposed to be primarily built on land that has already been disturbed seasonally/annually for agriculture. 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 898 acres). Alamo Solar has designed the Project to avoid and minimize impacts to wetlands, waterbodies, woodlots, and aquatic and terrestrial wildlife species where possible. If the proposed Alamo Solar 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 utilizing the full 919-acre Buildable Area, will likely be significantly lower for the Project as-built. In most cases micro-siting the infrastructure away from known and delineated features will avoid impacts to wetlands, minimize impacts waterbodies, and minimize tree clearing.

Appendix E provides specific anticipated impacts to resources in Table E-1 - Anticipated Wetland Impacts for the Alamo Solar Project, and Table E-2 - Anticipated Waterbody Crossing Methods and Impacts for the Alamo Solar Project.

Table 7-2 Summary of Proposed Alamo Solar Project Temporary Impacts

Impact Type	Upland Soil (acres)	Wetland (acres)	Streams (acres)	Streams (linear feet)	Ditches (acres)	Ditches (linear feet)	Ponds (acres)
Access Roads	6.88	0	0.01	11	0	0	0
Collection Line	22.20	0	0.02	75	0.02	20	0
Equipment Laydown Area	16.07	0	0	0	0	0	0
Substation	0	0	0	0	0	0	0
Array Pilings / Panels	0	0	0	0	0	0	0
Inverter Pads	0	0	0	0	0	0	0
Pyranometer	0	0	0	0	0	0	
Totals	***48.67***	***0***	***0.03***	***87***	***0.02***	***20***	***0***

Table 7-3 Summary of Proposed Alamo Solar Project 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	12.19	0.09	0	0.01	29	0	0	0
Collection Line	0	0.65	0	0	0	0	0	0
Equipment Laydown Area	0	0	0	0	0	0	0	0
Substation	3.18	0	0	0	0	0	0	0
Array Pilings / Panels	0.94	0.63	0	0	0	0	0	0
Inverter Pads	0.27	0	0	0	0	0	0	0
Pyranometer	0.005	0	0	0	0	0	0	0
Totals	***16.58***	***1.37***	***0***	***0.01***	***29***	***0***	***0***	***0***

7.2.1 Land Use

The Project Area currently is primarily used as active agricultural lands (89%). The wooded areas of the Project Area occurred as isolated woodlots, windrows between crop areas and along roads (4%). The most significant impact will come from the conversion of agricultural land to provide for the solar panel arrays. Following the construction of the proposed Project and conversion of the land to a commercial solar project, the majority of the Project Area will no longer be available for agricultural use. 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 (6.88 acres) and permanent (12.19 acres).

Solar panels are supported by permanent pilings in the ground. Each support will be directly driven 4 to 8 feet below the ground, with a footprint of less than 1 s.f. each. Approximately 40,731 pilings will total 0.94 acre, spread across the 898 acres of panel arrays. Support infrastructure, including 5 pyranometer stations (138 s.f. each, 690 s.f. total), inverter pads (38 total, 0.27 acre total), a permanent equipment storage area (5 acres), and a Project Substation (3.18) 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, Alamo Solar anticipates the need to clear select windrows and edges of woodlots in order to construct and operate the Project. Approximately 1.37 acres of woodlot are anticipated to be cleared. The windrows within the Project Area provide minimal habitat and were used as historical property boundaries.

Alamo 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 construct 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 a total of 13 wetlands during field surveys, for a total of 4.71 acres of wetland within the Project Area. Only wetland WL-13018 accounted for over 1 acre, with the other wetlands each accounting for less than 1 acre each. The majority of wetlands were identified as emergent and scored as lower quality wetlands on the ORAM.

Several waterbodies were delineated within the Project Area, primarily stream reaches, agricultural ditches, and a few ponds. Based on desktop analysis, the waterbodies identified were 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, Alamo Solar anticipates no impacts to delineated wetlands within the Project Area.

The installation of the collection lines will require crossing four streams and one ditch within the Project Area, with seven crossings (95 lf) in total. Three collection lines will be bundled to cross one stream by traditional open cut at a single location (WB-004, unnamed tributary to Beasley Run), and will also be co-located with an access road culvert. In an effort to avoid impacts to two of these streams, Alamo Solar proposes to utilize HDD technology (at WB-003 and WB-030). Waterbody WB-030 is a Class III unnamed tributary of Beasley Run. WB-014 is an intermittent stream proposed for a temporary open cut to install a collection line (51 lf). WB-002 is an ephemeral ditch proposed for an open cut to install a

collection line (20 lf). A detailed frac out contingency plan for stream crossings to be completed via HDD is attached in Appendix F.

For features that will be crossed using traditional open cut, traditional excavation of the ditch will be involved for the collection line installation. If the stream has flowing water at the time of construction, work will be conducted using a dam and pump method. A dam will be constructed using materials to prevent sediment from entering the waterbody (i.e., sandbags or barrier). Equipment in the waterbody will be limited to only what is necessary to complete the crossing. Flow will be diverted using a pump to maintain flow upstream and downstream during in-water activities. During pumping operations, a construction representative would oversee the pump and generator to ensure aquatic resources are protected in the event of a spill. Energy dissipation devices will be used at the downstream outlet to prevent excessive scour or erosion of the streambed. At each open cut, the time between initial disturbance of the stream and final stabilization will be kept to a minimum (i.e., trenching, installing the line, restoring to pre-construction contours). Alamo Solar is committed to observing any potential temporal restrictions that may apply to these streams.

Final array and layout designs are not finalized, but based on preliminary work, up to 12.61 miles of new permanent gravel roads will be installed for construction, operation, and maintenance of the Project. The Project anticipates that one delineated stream reach may be affected due to construction of access roads. Construction of the Project access roads will likely require one stream crossing (culvert/open cut) for a total of 11 lf of temporary impact, and 19 lf of permanent impact. Alamo Solar will design the crossing to continue adequate flow in the stream and not affect the flow of water within the Project Area. All temporary and permanent crossings will be approved by Preble Soil & Water Conservation District prior to construction. Where feasible, Alamo Solar would use existing farm road crossings to minimize crossing impacts.

In addition to the above-mentioned measures, Alamo 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. Alamo Solar will 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 trucked to the Project Area or groundwater wells may be used if needed. To prevent adverse effects from construction-related stormwater runoff, Alamo 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, Alamo Solar will maintain needed controls for operations to prevent and minimize stormwater runoff.

There are no planned operations and/or maintenance facilities as part of this Project and no water and/or sewer requirements. As a result, the Project will not necessitate any water withdrawals or waste water 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 (including crossing methods), and SESCs (including inspection protocols) will be provided in Alamo Solar construction drawings (currently under development).

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 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. Alamo 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. There will be no sanitary sewer waste generated by Project operations.

8 References

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats in the United States. U.S. Fish and Wildlife Service, Office of Biological Services. FWS/OBS 79/31: 47 p.

Homer, C.G., Dewitz, J.A., Yang, L., Jin, S., Danielson, P., Xian, G., Coulston, J., Herold, N.D., Wickham, J.D., and Megown, K. 2015. Completion of the 2011 National Land Cover Database for the conterminous United States-Representing a decade of land cover change information. Photogrammetric Engineering and Remote Sensing, v. 81, no. 5, p. 345-354.

National Audubon Society. Important Bird Areas. 2018. Available at: http://www.audubon.org/important-bird-areas/. Accessed February 2018.

Natural Resources Conservation Service (NRCS), United Stated Geologic Service (USGS), and Environmental Protection Agency (EPA). 2017. Watershed Boundary Dataset for Preble County Ohio. Accessed November 2017. Available at: http://datagateway.nrcs.usda.gov.

Ohio Department of Natural Resources Division of Wildlife (ODNR DOW). 2018 *Ohio's Listed Species* report, updated July 2018. Available at: https://wildlife.ohiodnr.gov/portals/wildlife/pdfs/publications/information/pub356.pdf

Ohio Department of Natural Resources Division of Wildlife (ODNR DOW). 2016a. State-Listed Wildlife Species by County, Preble County list, dated June 2016. Available at: http://wildlife.ohiodnr.gov/portals/wildlife/pdfs/species%20and%20habitats/state-listed%20species/preble.pdf

Ohio Department of Natural Resources Division of Wildlife (ODNR DOW). 2016b. State-Listed Plant Species by County, Preble County list, dated June 2016 Available at: http://wildlife.ohiodnr.gov/portals/wildlife/pdfs/species%20and%20habitats/state-listed%20species/preblep.pdf

Ohio Division of Geological Survey (ODGS). 1998. Physiographic regions of Ohio: Ohio Department of Natural Resources, Division of Geological Survey, page-size map with text, 2 p., scale 1:2,100,00. Available at: http://geosurvey.ohiodnr.gov/portals/geosurvey/PDFs/Misc_State_Maps&Pubs/physio.pdf.

Ohio Division of Geological Survey (ODGS). 2006. Bedrock geologic map of Ohio: Ohio Department of Natural Resources, Division of Geological Survey Map BG-1, generalized page-size version with text, 2 p., scale 1:2,000,000. Available at: http://geosurvey.ohiodnr.gov/portals/geosurvey/PDFs/BedrockGeology/BG-1_8.5x11.pdf

Ohio Environmental Protection Agency (OEPA). 2007. Water Quality Standards: Chapter 3745-1-12. Available at: http://epa.ohio.gov/Portals/35/rules/01-17.pdf. Accessed April 2017.

Ohio Environmental Protection Agency (OEPA). 2017. Water Quality Standards: Chapter 3745-1-02. Accessed November 2017. Available at: http://www.epa.ohio.gov/portals/35/rules/01-02.pdf.

U.S. Army Corps of Engineers (USACE). 1987. Wetlands Delineation Manual. Technical Report Y-87-1. USACE Waterways Experiment Station, Vicksburg, MS: U.S. Army Engineer Research and Development Center.

U.S. Army Corps of Engineers (USACE). 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region Version 2.0, ed. J.S. Wakeley, R.W. Lichvar, C.V. Noble. ERDC/EL TR-10-16. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

U.S. Department of the Interior (USDI) 2011. National Land Cover Database 2011, issued 2011, amended 2014. Available at: https://www.mrlc.gov/nlcd2011.php

U.S. Department of Agriculture National Resources Conservation Service (USDA-NRCS) 2017. Web Soil Survey. Available at: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

U.S. Department of Agriculture National Resources Conservation Service (USDA-NRCS) 2006. Soil Survey of Preble County, Ohio. Available at: https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/ohio/OH135/0/Preble_OH.pdf

U.S. Fish and Wildlife Service (FWS). 2017. National Wetlands Inventory website. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Available at: http://www.fws.gov/wetlands.

U.S. Fish and Wildlife Service (FWS). 2018. Ohio County Distribution of Federally-Listed Endangered, Threatened, and Proposed species, Preble County List, dated January 2018. Available at: https://www.fws.gov/midwest/endangered/lists/ohio-cty.html

Alamo Solar Project

APPENDIX A

PROJECT AREA FIGURES

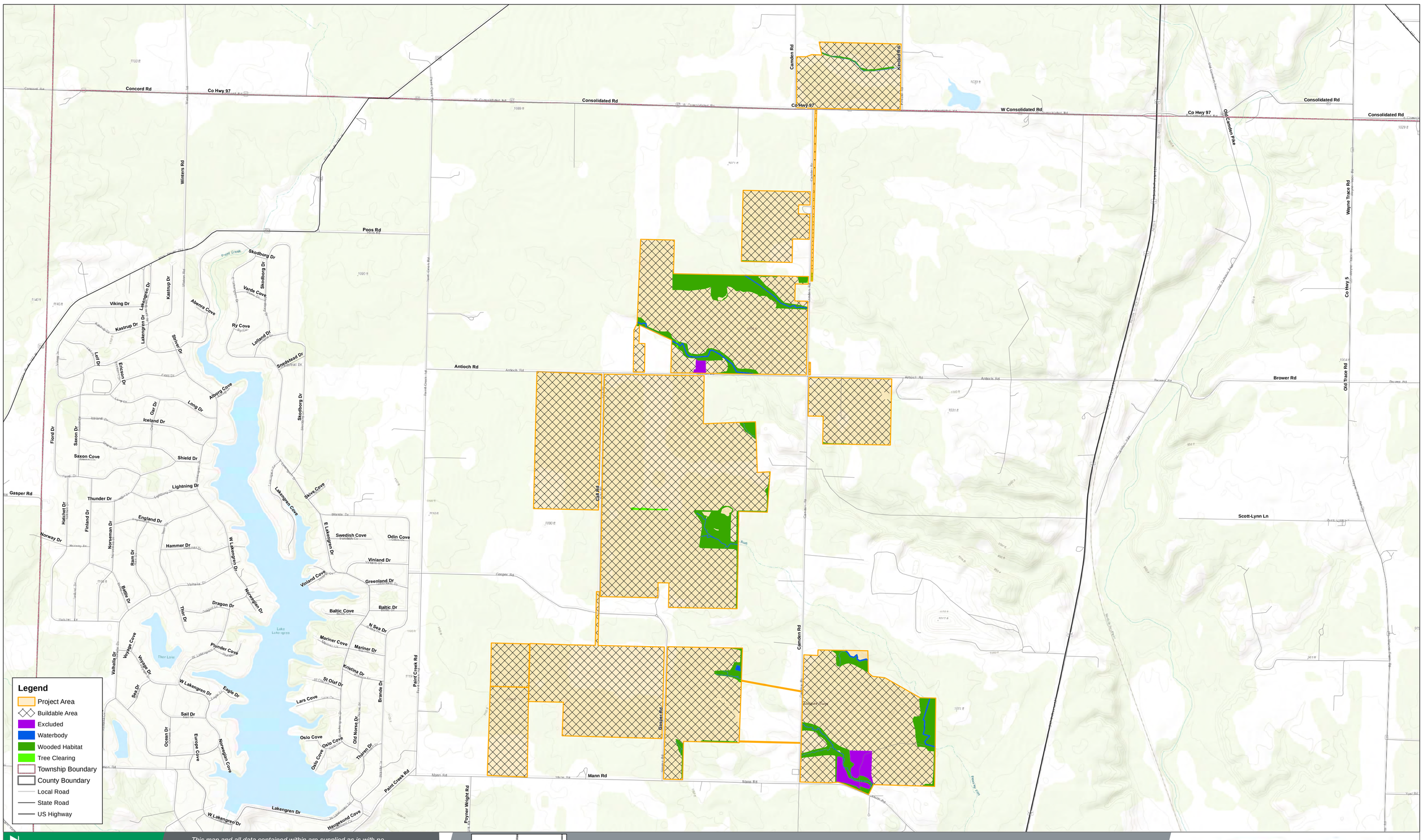


Figure 1 - Buildable Area

Alamo Solar Farm
Preble County, Ohio

Cardno
121 Continental Drive, Suite 308
Newark, DE 19713
Phone (+1) 302-395-1919 Fax (+1) 302-395-1920
www.cardno.com

Date Created: 11/6/2018 Date Revised: 11/6/2018 File Path: S:\GIS\Open Road Renewables\Alamo Solar Farm\MXD\Ecological Assessment\Figure 1 - Buildable Area.mxd
GIS Analyst: Peter.Marsey

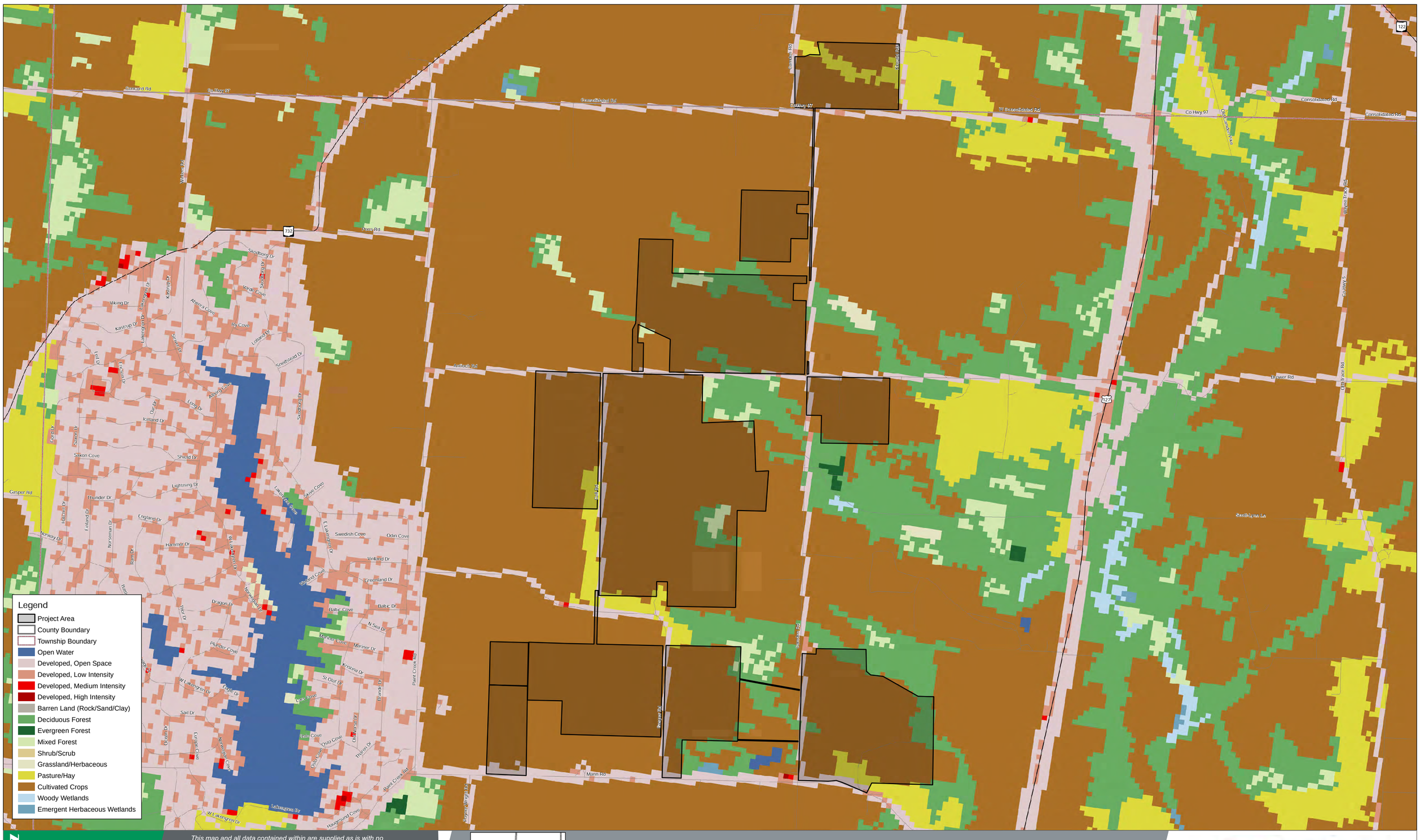


Figure 2 - Land Use

Alamo Solar Farm
Preble County, Ohio

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Date Created: 11/6/2018 Date Revised: 11/6/2018 File Path: S:\GIS\Open Road Renewables\Alamo Solar Farm\MXD\Ecological Assessment\Figure 2 - Land Use.mxd
GIS Analyst: Peter.Marsey

Summary: Application Exhibit G (Part 1 of 7) electronically filed by Mr. Michael J. Settineri on behalf of Alamo Solar I, LLC