Ecological Assessment

Hillcrest Solar Farm
Brown County, Ohio

Open Road Renewables, LLC

E317501800

Cardno
Shaping the Future

Document Information

Prepared for	Open Road Renewables, LLC
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Project Number	E317501800
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Date	June 2017

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Acronyms

AC	Alternating current
CWA	Clean Water Act
DOH	Ditches
DOW	Division of Wildlife
EDR	Environmental Design & Research, Landscape Architecture, Engineering & Environmental Services, DPC
ESA	Endangered Species Act
FACU	Facultative Upland
FEMA	Federal Emergency Management Agency
FSA	Farm Service Agency
GIS	Geographic Information Systems
GPS	Global Positioning System
HDD	Horizontal directional drilling
HHEI	Headwater Habitat Evaluation Index
IBA	Important Bird Areas
IPaC	Information for Planning and Conservation
IWP	Isolated Wetland Permit
JD	Jurisdictional Determination
MBTA	Migratory Bird Treaty Act
MRLC	Multi-Resolution Land Characteristics Consortium
MW	Megawatt
NHD	National Hydrography Dataset
NLCD	National Land Cover Database
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
OAC	Ohio Administrative Code
ODNR	Ohio Division of Natural Resources
OEPA	Ohio Environmental Protection Agency
OHS	Ohio Historic Society
OHWM	Ordinary High Water Mark
ONHD	Ohio Natural Heritage Database
OPSB	Ohio Power Siting Board
ORAM	Ohio Rapid Assessment Methodology
ORR	Open Road Renewables, LLC
OWI	Ohio Wetland Inventory
PEM	Palustrine Emergent Wetlands
POH	Ponds
POI	Point of interconnection
Project	Hillcrest Solar Farm
PV	photovoltaic
QHEI	Qualitative Habitat Evaluation Index
RTE	Rare, Threatened or Endangered species
SESC	Soil erosion and sediment control
s.f.	Square foot
SHPO	State Historic Preservation Office
SOH	Streams
SWPPP	Storm water pollution prevention plan
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish & Wildlife Service
USGS	U.S. Geological Survey
WEG	Wind Erodibility Group
WQC	Water Quality Certificate
WWH	Warm Water Habitat

Executive Summary

Hillcrest Solar I, LLC, an affiliate of Open Road Renewables, LLC (ORR), is proposing to construct the Hillcrest Solar Farm (Project) near Mt. Orab, Ohio, which is located approximately 30 miles east of Cincinnati. The proposed photovoltaic (PV) solar energy facility will have a generation capacity of 125 megawatts (MW). The Project is proposed to be constructed within 2,083 acres (3.25 square miles) of private leased land and 100-foot wide easements (Project Area). The Project Area is entirely contained within Green Township, Brown County, Ohio. Figure 1.1 shows the Hillcrest Solar Farm Proposed Project Area.

Proposed permanent Project infrastructure will have a footprint up to 1,100 acres, or 53% of the overall Project Area, which includes solar panels on metal racking (or modules, organized into strings), inverter pads, buried collection lines, pyranometer stations, and a Project Substation. The Project will also include a <1,000-foot long generation tie line (underground), security fencing, and a dead end structure. Up to approximately 26.4 miles of gravel-covered access roads will be utilized for construction, operation, and maintenance of the solar farm. These access roads will have a total temporary footprint of 25-feet wide during construction phase, then maintained as 16-foot wide permanent access roads for use during operation and maintenance. For construction, up to approximately 15 acres of temporary equipment lay down areas will be needed. An additional 5 acres (maximum) of temporary lay down areas will be maintained as permanent gravel-covered areas for vehicle parking and equipment storage.

For this ecological assessment, Cardno reviewed the environmental features within the 2,083-acre Project Area, and conducted a habitat assessment on the Project Area, plus a visual assessment on a ¼-mile buffer. 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 Hillcrest 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 go back to agricultural use.

Cardno also conducted a wetland delineation field survey to identify wetland or potential waterbodies of the United States, in accordance with Section 404 of the Clean Water Act (CWA). Cardno's wetland delineation efforts focused on approximately 1,855 acres on 32 leased parcels within the Project Area. Interior areas of larger woodlots were not delineated, as they will be avoided for Project construction, operation, and maintenance.

Based on the field survey, a total of six wetlands were identified for a total of 11.61 acres. Wetland WOH-001 accounted for over 8.5 acres, with the other wetlands accounting for less than 1 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) (all were Category 1). Current Project designs avoid impacts to all wetland areas.

A total of 42 waterbodies (e.g., ditches, streams, ponds) were delineated within the Project Area, totaling 74,125 linear feet of waterway. The waterbodies observed were primarily ditches (n=34), with four stream reaches and four ponds identified within the Project Area. Only SOH-002 (delineated portion of Sterling Run) scored high enough on the Headwater Habitat Evaluation Index (HHEI) to be considered a Class III waterbody. The vast majority of the waterbodies were considered modified (n=38). Sterling Run is the

only feature in the Project Area with a designated use, and is identified as warm water habitat (WWH) in the Water Quality Standards. Current Project designs avoid direct impacts to all stream reaches (via horizontal directional drilling [HDD] of two streams) and ponds, and will cross up to 21 agricultural ditches by culvert or open cut as needed.

Cardno anticipates that 3 wetlands and 14 waterbodies would likely be jurisdictional, based on their likely hydrologic connectivity to a potential Water of the U.S. Final verification of their boundaries for regulatory purposes can only be completed through a Jurisdictional Determination (JD) review by the U.S. Army Corps of Engineers (USACE) or its duly appointed representative.

Based on current proposed Project design, the construction of the Project infrastructure will require tree clearing of windrows (up to 35.1 acres) between Project parcels and smaller woodlots and woodlot edges (up to 7.5 acres total) 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.

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 Hillcrest Solar Project.

Based on preliminary survey data and habitat evaluations, the proposed Project Area does not have a significant amount of bat habitat. The woodlots in the Project Area did have a modest amount of shagbark hickories (*Carya ovata*) which may provide roosting habitat for bats, but 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. Larger isolated forest stands will be avoided during construction, however, some windrows between Project parcels will be cleared to provide larger usable areas for the array. 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.

Project designs currently avoid all impacts to streams and ponds; therefore, aquatic habitats are not anticipated to be impacted by the Project. HDD will be used to install the collection line under up to two perennial stream (SOH-001 & SOH-004) and four perennial ditches (DOH-002, DOH-013, DOH-020, DOH-027). Project collection line installation will require up to four crossings (82.51 linear feet) of ephemeral or intermittent ditches via open cut method. Three additional collection line crossings will be co-located with access road crossing, which will reduce the overall impact to the waterbody. 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.

The total acres of permanent impact may be further reduced with additional micro-siting of facilities.

1 Introduction

Open Road Renewables, LLC (ORR) is proposing to construct and operate the Hillcrest Solar Farm (Project) in Mt. Orab, Ohio, located approximately 30 miles east of Cincinnati. The Project is proposed as a 125-megawatt (MW) alternating current (AC) in generating capacity photovoltaic (PV) solar farm within an area of approximately 2,083 acres (3.25 square miles) on leased private lands as well as 100-foot wide easements (Project Area). The Project Area is entirely contained within Green Township, Brown County, Ohio. Figure 1.1 shows the Hillcrest Solar Farm Proposed Project Area.

For this ecological assessment, Cardno reviewed the environmental features and conducted a habitat assessment within the 2,083-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 Section 404 of the Clean Water Act (CWA). Cardno's wetland delineation efforts focused on approximately 1,855 acres on 32 leased parcels within the Project Area. Interior areas of larger woodlots were not delineated, as they 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 the 100-foot wide easements during April 2017, with a ¼ mile visual investigation on either side 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:

1 – Buildable Area
2 – Land Use Map Overview
3 – Bedrock Geology
4 – Glacial Drift
5 – Regional Wildlife Areas
6 – Field-Delineated Wetlands and Waterbodies
7 – Watersheds

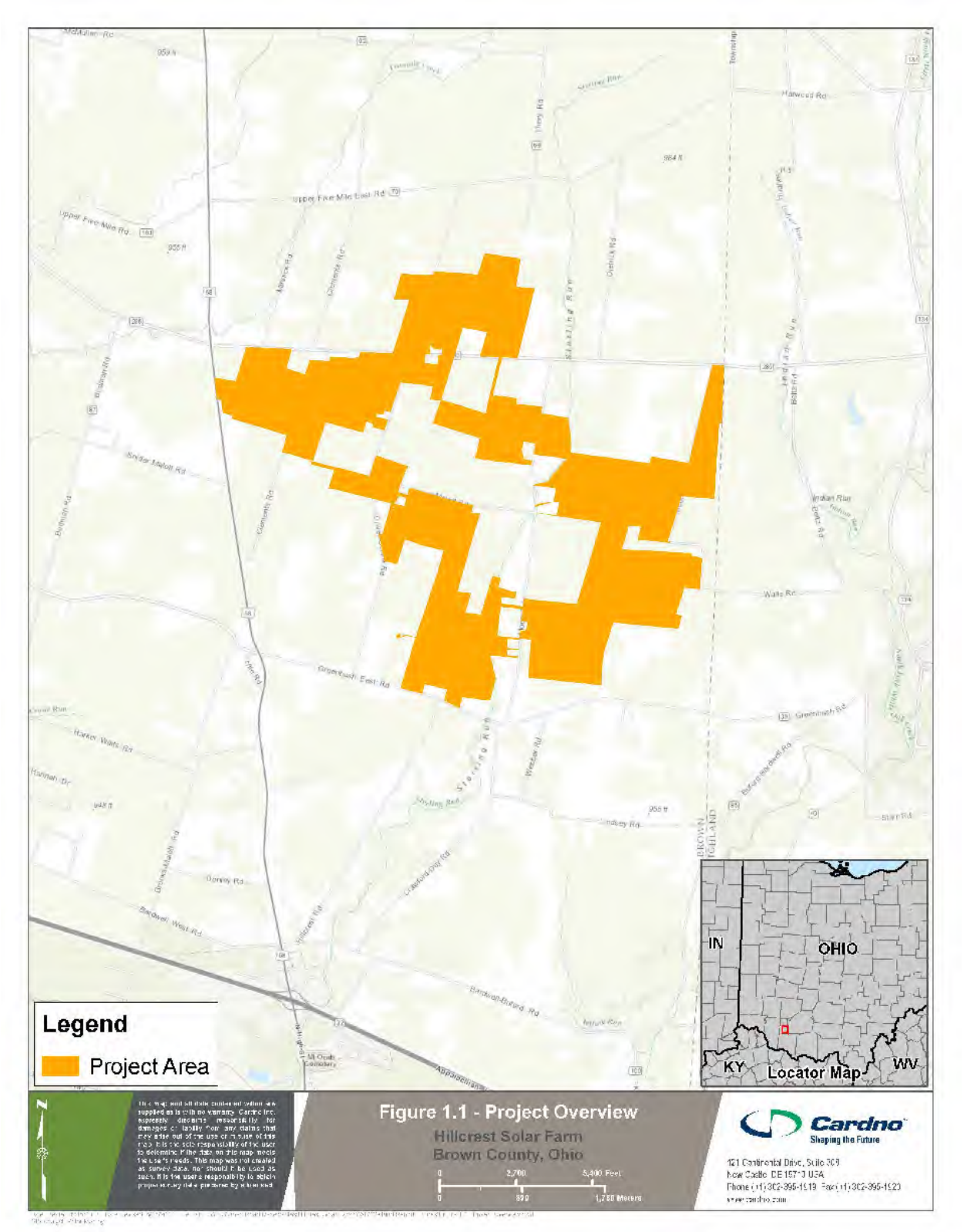

Figure 1.1 Project Overview

Appendix B includes the Wetland Report, summarizing the USACE *Midwest Regional Supplement to the Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory, 2010), the Ohio Environmental Protection Agency (OEPA), ORAM, the OEPA HHEI and Qualitative Habitat Evaluation Index (QHEI) results for waterbodies and wetlands identified in the Project Area, as well as a brief description of each delineated wetland within the Project Area, photographic documentation of the delineated wetlands and waterbodies.

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

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

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

Appendix F includes a frac out contingency plan for HDD crossings.

1.1 Project Description

The Hillcrest Solar Farm in Mt. Orab, Ohio, is a proposed solar PV generation facility of 125 megawatt (MW) within an area of approximately 2,083 acres (3.25 square miles) on private lands (Project Area). The Project Area is entirely contained within Green Township, Brown County, Ohio.

Of the 2,083-acre Project Area, Cardno estimates that up to 1,855 acres (89% of the total Project Area) could be used ("Buildable Area"); however, only up to 1,100 acres will be needed for permanent Project infrastructure (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 farm will ultimately connect to Duke Energy's Hillcrest 138 kV substation. ORR holds development rights to a parcel adjacent to the Hillcrest substation for the construction of a Project Substation (up to 3-acres), to connect via a <1,000-foot 138 kV generation tie line.

The proposed Project includes the construction and operation of solar farm, with a maximum site footprint of 1,100 acres. Solar Farm Project components will include:

- A solar field of PV panels mounted on fixed and/or tracking structures, organized into strings (up to approximately 109,952 strings total, covering up to approximately 1,000 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 25 square feet (s.f.) inverter pads (up to 90 inverter pads total);
- A 138 kV Project Substation where the Project's electrical output voltage will be combined and its voltage increased to the generation tie line voltage of 138 kV via a step-up transformer;
- A buried generation tie line (gen-tie) facility < 1,000-feet in length that will terminate at a dead end structure in order to connect Project facilities to the designated point of interconnection (POI) at the Hillcrest substation;
- Internal infrastructure including access roads, fencing, meteorological/pyranometer stations, and communications infrastructure; and
- Temporary and permanent laydown areas for equipment storage during construction and operation.

1.1.1 Site Preparation

Construction of the proposed Project will incorporate conventional overland construction techniques. A survey crew will begin to stake the outside limits of the disturbed area, including temporary access roads, equipment lay down areas, existing utility lines, and sensitive resources such as wetlands and waterbodies.

Temporary soil erosion and sedimentation control measures will be installed within and along the proposed construction area, equipment lay down areas, access roads, and other work areas, as applicable, in accordance with approved Brown County Soil & Water Conservation District soil erosion and sediment control (SESC) Plans.

Following the installation of the SESC control measures, 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 roads, racking installation, and storm water management.

Temporary equipment lay down areas will be used for storage of construction equipment and supplies, and typically range in size from 0.5 acre to 5 acres (up to 15 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 / lay down area

The Project will be served by a 26.4-mile long (maximum length) network of access roads. To construct the access roads, ORR will utilize a 25-foot wide temporary construction work space; once constructed the access roads will be maintained as gravel roads with a permanent 16-foot wide footprint.

A generation tie line will be installed to connect the Project Substation to the Duke Energy Hillcrest 138 kV substation parcel. This gen-tie line will require a temporary work space of up to 40 feet wide by 1,000 feet in length, for a total temporary impact area of up to 0.92 acre. The gen-tie line will connect to a dead end structure with up to 0.36 acre permanent footprint, located within the Duke substation parcel.

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

1.1.2 Solar Farm 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 not greater than 10 feet. The piles constitute the direct impact to the ground surface of less than 1 s.f. each. Driven support

piles would have a permanent footprint of up to approximately 2.16 acres, dispersed over the 1,000-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 no higher than 14 feet.

Panels will be grouped into a series of circuits (strings or rows). This Project is estimated to use up to 109,952 strings across the Project Area. 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 25-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 six on-site solar meteorological stations (SMSs), which would consist of irradiance (solar energy) meters as well as air temperature and wind meters with a footprint of up to approximately 15 s.f. each.

The Project will not be open to the public for safety reasons. Security fencing up to 8 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 & 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 network. The level of vehicle activity entering and leaving the site during operation will be limited to scheduled and emergency maintenance visits. Scheduled maintenance is expected to occur in the early evening or early morning hours to avoid interference with the Project's peak hours of generation. Manual solar panel washing will likely take place 2 to 3 times per year, depending on seasonal precipitation in the Project Area.

2 Desktop Ecological Assessment

Cardno performed a desktop habitat survey using Geographic Information Systems (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 Natural Resources Conservation Service (NRCS) Soil Survey for the Brown County, historic aerial photographs or farmed wetland maps from the U.S. Department of Agriculture (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. GIS layer data that did not contain data within the Project Area, or if applicable buffer area were not studied further.

2.1 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 (NLCD2011). 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), and 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 Brown County, Ohio near Mt. Orab. Based on a review of available aerial imagery, the Project Area appeared to generally occur in cultivated crop areas. Review of the 2011 NLCD (Homer et al. 2015) confirmed this assessment, which showed that cultivated crops accounted for approximately 83% of the total Project Area acreage. The second most prominent land use within the Project Area was classified as “Deciduous Forest” for approximately 10% of the acreage and was observed to occur as isolated, regularly shaped woodlots between

agricultural areas. Developed, Open Space accounted for an additional 3% of the Project Area. The classification of "Developed, Open Space" refers to "areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses" (Homer et al. 2015). All other land use activities accounted for 1% or less of the total acreage in the Project Area. A summary is provided in Table 2-1 below.

Land Use of the Project Area is illustrated in Figure 2 of Appendix A.

Table 2-1 Land Use within the Project Area

Type	Project Area (acres)	Project Area (%)
Agriculture, Cultivated Crops	1,734.09	83%
Forested, Deciduous	210.79	10%
Developed, Open Space	66.34	3%
Agriculture, Pasture/Hay	58.75	3%
Mixed Developed, Low Intensity	11.36	1%
Scrub/Shrub Wetlands	1.50	<1%
Mixed Developed, Medium Intensity	0.22	<1%
Mixed Developed, High Intensity	0.22	<1%
TOTAL	***2,083.27***	***100%***

Compiled from NLCD 2011, amended 2014

2.1.1 Agricultural Conversion Considerations

As described above, the Project Area currently is primarily used as active agricultural lands. 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 farm, 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 farms would similarly provide minimal habitat, but would not be intensely disturbed. 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. The solar fields will consist of low growing grasses between and underneath the solar arrays. Generally, solar farms 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. Dust, snow, and other particles that can settle on the array are referred to as soiling.

ORR 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) and in other areas (primarily too small to farm) that do not need to be maintained as part of the operation of the Project or in select locations, ORR 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[1]. Enrolling pollinator areas previously used for agriculture may result in a net benefit environmentally.

2.2 Geology

The Project is located within the Central Lowland Physiographic Region of Ohio, and in particular, the Illinoian Till Plain Section, which covers the northern portion of Brown County. The Illinoian till plain is composed of rolling ground from older till with many buried valleys. Elevations range from 600 to 1,000 feet, with moderately low relief (Ohio Division of Geological Survey, 1998, Physiographic Regions of Ohio[2]).

The Project Area is overlain by two bedrock formations – the Grant Lake Limestone and Fairview Formation in the central and southern portions, and Waynesville Formation and Arnheim shale and limestone in the northern and eastern portions. These Formations consist of alternating shale and limestone sequences[3].

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

2.2.1 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 thick glacial drift deposits (>40 feet thick), with a smaller portion in the northwest portion of the Project Area at 20-30 feet thick.

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

2.2.2 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. According to the Ohio Department of Natural Resources (ODNR), the carbonate-rich members of the Grant Lake Formation (Bellevue and Mount Auburn), Grant Lake Limestone (Bellevue and Straight Creek), and the upper portion of the Arnheim formation are the Ordovician units most prone to karstification; however, the shale-rich (70% shale, 30% limestone) Waynesville Formation also has been subjected to a surprising amount of karst development in southeastern Brown and southwestern Adams Counties, just north of the Ohio River.

The Project Area is not anticipated to be located within a probable karst area[4].

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

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

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

4 http://geosurvey.ohiodnr.gov/portals/geosurvey/PDFs/karst/karstmap.pdf

2.3 Soils

Soils within the Project Area were represented by seven types as outlined in Table 2-2 below. Project soil information was obtained from the Web Soil Survey, an application of the NRCS (USDA-NRCS 2017), and from the Soil Survey of Brown County, Ohio (USDA-SCS 1992). The dominant soil type were Clermont silt loams, which accounted for 66% of the total acreage. The other remaining soil were significantly smaller totals 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 Area were identified as low slope, which matched general expectations in consulting the topographic and aerial maps.

The Clermont series, approximately 66% of the total Project Area, consists of poorly drained, nearly level flats along the Illinoian till plain. Permeability in this soil series is very slow which can lead to seasonally high water tables during extended wet periods and reduces the effectiveness of subsurface drains (tiles). Areas of Clermont silt loams are irregularly shaped and vary in size (within the county, areas can range from 10 acres to several thousand). Most areas are used for cultivated crops if drained, though extended periods of wetness can greatly delay planting.

Blanchester soils made up 15% (311 acres) of the Project Area. The Blanchester series consists of deep, poorly drained soils formed in lacustrine deposits and the underlying till on till plains. Permeability in this soil series is very slow which can lead to seasonally high water tables during extended wet periods and reduces the effectiveness of subsurface drains (tiles). Areas of Clermont silt loams are irregularly shaped and vary in size (within the county, areas can range from 5 to 100 acres in size). Most areas are used for cultivated crops if drained, though extended periods of wetness can greatly delay planting.

The Westboro-Schaffer series, approximately 17% of the total Project Area, consist of loess deposits overlaying the Illinoian till plain. The series exhibits somewhat poor drainage, which allows for easier improvements to drainage. Most areas are used for cultivated crops if drained, though extended periods of wetness can greatly delay planting.

The Shoals series, approximately 2% of the total Project Area, consists of poorly drained flood plain soils, with most areas occurring as long and narrow strips (within the county, areas can range from 5 to more than 100 acres). Compared to other soils within the county and Project Area, permeability is much higher allowing for enhanced drainage. Most areas are used for cultivated crops if drained, though extended periods of wetness can greatly delay planting.

The Jonesboro-Rossymoyne series, approximately 1% of the total Project Area, are moderately well-drained areas, normally occurring along the rises of till plains. The moderate drainage and higher permeability allow for cultivation with minimal improvement.

The Algiers series, less than 1% of the Project Area, occurs primarily on flood plains as deep frequently flooded layers. Additional pockets of Algiers soils can occur in depressional areas in nearby uplands. Areas of the soil are typically long and narrow and range from 5 to 15 acres in size within the county. Most of the soils within the series are used for cultivation, though managed to flooding hazard.

Table 2-2 Soils within the Project Area

Type	Map Unit Description	Acres	Percentage of Area
Cle1A	Clermont silt loam, 0 to 1% slopes	1,365.56	66%
Bln3A	Blanchester silty clay loam, 0 to 1% slopes	311.43	15%
WsS1A1	Westboro-Schaffer silt loams, 0 to 2% slopes	262.34	13%
WsS1B1	Westboro-Schaffer silt loams, 2 to 4% slopes	85.29	4%
Sh	Shoals silt loam, 0 to 2% slopes, frequently flooded, brief duration	33.08	2%
JoR1B1	Jonesboro-Rossmoyne silt loams, 2 to 6% slopes	20.72	1%
Ag	Algiers silt loam, frequently flooded	4.86	<1%
	TOTAL	**2,083.28**	**100%**

2.3.1 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). Additionally, no soil types within the Project Area are found to have 12% slopes or greater.

2.3.2 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. Only one soil type in the Project Area is considered fully hydric (i.e., soils contain 100% hydric components), the Blanchest silty clay loam. Based upon Table 2-2, approximately 15% (311 acres) of the Project Area was determined to be located in fully hydric soils. The remaining Project Area is located in areas of non-hydric or predominantly non-hydric soils.

2.4 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. Typical wildlife species evidence of which was observed during the field delineations included white-tailed deer, red fox, common woodland and grassland songbirds, and ducks. Major species, as defined by Ohio Administrative Code (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 species is found below in Section 2.4.3. 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.[5] Other than the agricultural crops and livestock in the area, no commercially valuable species are anticipated to be present in the Project Area. Descriptions of the general habitat, floral and faunal communities observed during the field surveys are included in Section 5.1.

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

2.4.1 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 separately in Sections 5.3 and 5.2 respectively.

2.4.1.1 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 soy beans and corn. 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. Small, maintained pastures for livestock (i.e. chickens, sheep, and goats) are also common though not widespread within the Project Area. The Project Area consists of agricultural fields that are currently active or recently fallowed.

2.4.1.2 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 man-made ditches which served to improve drainage along the adjoining cultivated areas. Woodlots within the Project Area were often much deeper, 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 UTV trails through many. Some woodlots are kept as a buffer around larger surface water features.

Both the windrows and woodlots have a dominance of weedy vegetation along the edges including pokeweed (*Phylotacca americana*), blackberry (*Rubus sp.*), and poison ivy (*Toxicodendron radicans*). Mature trees along windrows and inside of the woodlots include: maples (*Acer sp.*), oaks (*Quercus* sp.), American elm (*Ulmus americana*), American beech (*Fagus grandifolia*), and shagbark hickories (*Carya ovata*).

2.4.1.3 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 such as dandelion (*Taraxacum officinale*), thistle (*Cirsium vulgare*), ragweed (*Ambrosia artemesiifolia*), clover (*Trifolium* sp.), and common purslane (*Portulaca oleracea*) may develop.

2.4.2 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.

2.4.2.1 Birds

The Audubon Society 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 or thousands of acres in size, but usually they are discrete sites that stand out from the surrounding landscape. The East Fork State Park is a Recognized IBA, located approximately 10 miles southwest of the Project Area. Several high-priority birds regularly use this IBA for breeding, migration, and/or wintering. It holds large numbers of waterfowl when lakes further north become frozen. The William H. Harsha Lake rarely freezes, which provides roosting for large numbers of gulls. It may have the highest concentration of Pied-billed Grebes in the State in winter and also regularly holds significant numbers of loons (e.g. Pied-billed Grebe 40 max. daily; Common Loon 200 max. daily). Both migratory and breeding landbirds use the park, which functions as a vagrant trap (i.e. Sooty Tern, Western Grebe, Little Gull, jaeger spp.).[6]

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 'hotspot' was identified near the Project Area. The Grant Lake Wildlife Area is located approximately 5 miles south-southwest of the Project Boundary. Since 2007, 74 bird species have been identified in this Wildlife Area. Two species of concern were identified here: the cerulean warbler and the black vulture (ODNR, 2016a). None of the other bird species are listed as federally or state-protected species (ODNR, 2016a).

The Grant Lake Wildlife Area and East Fork State Park, are illustrated in relation to the Project Area in Figure 5 of Appendix A.

No State- or Federal-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 Grant Lake Wildlife Area or East Fork State Park for roosting, foraging and breeding.

2.4.2.2 Bald Eagles and Raptors

The bald eagle is no longer a state-threatened species, although it is still protected under the Bald and Golden Eagle Protection Act (Eagle Protection Act). This Act was passed in 1940 to prevent the extinction of the bald eagle and was amended in 1962 to include protection of the golden eagles. In addition, the Migratory Bird Treaty Act (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, ORR is coordinating with the ODNR on this Project; see Section 4.2 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.

[6] http://www.audubon.org/important-bird-areas/east-fork

2.4.2.3 Bats

Of the 46 bat species in the United States, 8 potentially occur in the Project Area based on ODNR's Brown County listing:

- Indiana Bat – *Myotis sodalis* (Federally-listed and State-listed endangered species)
- Northern Long-eared Bat – *Myotis septentrionalis* (Federally-listed and State-listed threatened)
- Big Brown Bat – *Eptesicus fuscus* (Ohio species of concern)
- Eastern Red Bat – *Lasiurus borealis* (Ohio species of concern)
- Hoary Bat – *Lasiurus cinereus* (Ohio species of concern)
- Little Brown Bat – *Myotis lucifugus* (Ohio species of concern)
- Tri-colored Bat – *Pipistrellus subfavus* (Ohio species of concern)
- Evening Bat – *Nycticeius humeralis* (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 182 potential acres of suitable bat habitat was identified within the Project Area.

Cardno observed no evidence of bat activity during the field surveys, however most work occurred during daylight hours when bats are not expected to be active. Additionally, there are no publicly available record of known hibernacula in the Project Area or ¼-mile buffer. The woodlots in the Project Area did have a modest amount of 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 daylight hours when bats are generally not active.

Through Cardno, ORR is coordinating with the ODNR on the Project; see Section 4.2 for a discussion on agency coordination.

2.4.3 Rare, Threatened & Endangered Species

2.4.3.1 Federal Listings

The Endangered Species Act (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 U.S. Fish and Wildlife (USFWS).

The USFWS lists Federally-listed species by county. The list for Brown County, Ohio (updated May 18, 2017) included one endangered bat species, one threatened bat species, five endangered freshwater mussel species, and one endangered flowering plant species (USFWS, 2017). A copy of the USFWS Brown County is provided in Appendix D. See Table 2-3 below:

Table 2-3 USFWS Ohio County Distribution of Federally-Listed Threatened, Endangered, Proposed, and Candidate Species – Brown County (updated May 18, 2017)

Species	Federal Status	Habitat
Indiana bat (*Myotis sodalis*)	Endangered	Hibernacula includes 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.
Fanshell (*Cyprogenia stegaria*)	Endangered	Found in areas of packed sand and gravel at locations in a good current
Pink mucket pearlymussel (*Lampsilis abrupta*)	Endangered	The lower Ohio River and its larger tributaries
Rayed bean (*Villosa fabalis*)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
Sheepnose (*Plethobasus cyphyus*)	Endangered	Shallow areas in larger rivers and streams
Snuffbox (*Epioblasma triquetra*)	Endangered	Small to medium sized creeks and some larger rivers, in areas with a swift current
Running buffalo clover (*Trifolium stoloniferum*)	Endangered	Disturbed bottomland meadows; disturbed sites that have shade during part of each day

USFWS 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 USFWS's Information for Planning and Conservation (IPaC) tool to screen the Project Area for sensitive species under USFWS jurisdiction. The IPaC report listed the same species as in Table 2-3, with the exception of the northern long-eared bat which was not included on the IPaC report. 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 IPaC report also provides a list of 22 migratory birds that could potentially be affected by activities in this location. A discussion of the Federal and State-listed birds is included in Section 2.4.2.1.

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

2.4.3.2 State Listings

Cardno reviewed the available ODNR Division of Wildlife (DOW) State species listings from two sources: ODNR DOW's Ohio's Listed Species report, updated March 2016 (ODNR, 2016a) and ODNR's State-Listed Plant and Wildlife Species by County, Brown County list, dated July 2016 (ODNR, 2016b). A complete listing of State-listed Species for Brown County is included in Appendix D. Cardno compared the two 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 aquatic species, the ODNR DOW lists 14 freshwater mussel species as endangered, two threatened freshwater mussel species, and three threatened fish species. A complete listing of State-listed Species for Brown County is included in Appendix D.

Plant species are included on ODNRs list for Brown County, including three State-listed endangered species, seven State-listed threatened species, and eight State-listed potentially endangered species (ODNR, 2016b). Cardno did not observe 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 is unlikely to occur in the Project Area. Through Cardno, ORR 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 Brown County is included in Appendix D.

Although Cardno did not conduct species-specific surveys, no evidence was found indicating the presence of the listed species. During the field surveys, the Cardno team 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 rare, threatened, or endangered (RTE) habitat (i.e., Low, Moderate, High). Many of the waterbodies delineated were identified as potentially providing 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). 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. No mussel populations were observed in the streams identified by Cardno, and only two streams showed moderate potential for RTE habitat (SOH-001 and SOH-002). All other streams showed low potential for RTE habitat. A professional mussel surveyor may be used for the Project if stream crossings are proposed.

The woodlots in the Project Area did have a modest amount of shagbark hickories, 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 perennial streams. Where possible, micro-siting of the Project infrastructure will further reduce or avoid potential impacts.

2.5 Wetlands/Water/Floodplain

Prior to site investigations, the Project Area was screened using the USFWS NWI and USGS NHD remote data for potential wetlands and waterbodies 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 wetlands and waterbodies were identified within the Project Area, with some additional streams and wetlands occurring in the vicinity of the Project Area. The majority of the waterbodies identified by the NHD appeared to be manipulated agricultural ditches. Additionally, the Cardno team identified several NHD features that ran directly through active agricultural areas but were not visible in any aerial imagery. These relic NHD features may have been rerouted by previous land use manipulation or even tiled which would route them under crop areas.

An overview of field-delineated wetlands and waterbodies is included as Figure 6 of Appendix A.

2.5.1 Navigable Waters

The vast majority of the Project Area is located within the Sterling Run watershed (Hydrologic Unit Code (HUC)-12), with only extreme eastern edges of the Project within the Flat Run-North Fork Whiteoak Creek watershed and extreme northwestern edges of the Project Area in the Fivemile Creek-East Fork Little Miami River watershed. All of these streams are located within the larger Ohio River drainage basin, which ultimately drains southwest toward the Mississippi River. No navigable waterways are located within the Project Area. Sterling Run is the only feature in the Project Area with a designated use, and is identified as warm water habitat (WWH) in the Water Quality Standards.[7] A Watershed Map of the Project Area is illustrated in Figure 7 of Appendix A.

See Section 5.3.2 for further discussion on Sterling Run.

2.5.2 Floodplains

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

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

3 Previous Studies

Cardno was provided with preliminary site evaluation information and ORR's critical issues assessment of an area that included the Project Area. A summary of the previous site evaluation is provided below.

3.1 Preliminary Site and Environmental Permitting Evaluation

Cardno was provided with a copy of a Preliminary Site and Environmental Permitting Evaluation report for the Project, prepared by Environmental Design & Research, Landscape Architecture, Engineering & Environmental Services, DPC (EDR), dated November 2016 ("Evaluation"). The Evaluation was performed for a broad area of approximately 10,000-acres in Sterling and Green Townships, Brown County, Ohio. The purpose of the Evaluation was to identify the potential environmental review and permitting issues associated with the development of the Project. EDR identified primary issues/concerns that may arise while planning for a solar farm in the area. EDR listed environmental issues such as:

> The high degree of active agriculture and land disturbance limits the potential for RTE in the area;

> The general area is well-drained, but agricultural ponds and small streams do occur within the area and could be considered jurisdictional water resources.

EDR recommended additional consultation with the Ohio Power Siting Board (OPSB) and ODNR to determine the need for wildlife surveys (e.g., rare plant surveys). EDR also recommended conducting wetland and stream delineations to determine the extent of jurisdiction to limit the impacts and determine total impacts.

3.2 Wetlands and Waterbodies Reconnaissance

During February 2017, EDR performed an approximate wetland and stream investigation for the Project Area. The purpose of this effort was to identify approximate wetland and stream boundaries to assist with Project design. Due to the time of year (i.e., outside the growing season), a full delineation could not be conducted. EDR approximated the location of 33 wetlands and 4 ponds, totaling approximately 58.4 acres. In addition, EDR approximated 5,147 linear feet of stream and 36,770 linear feet of ditch/drainages. The majority of wetlands identified by EDR are relatively small (< 1 acre), and occur along the edges of agricultural fields or within forested areas adjacent to agricultural fields. Potential wetlands identified within agricultural fields typically exhibited hydrological indicators and evidence of crop failure. The four identified agricultural ponds exhibited deep standing water, limited hygrophytic vegetation, and little to no connectivity with other wetlands or streams. Streams within the Project Area exhibit limited sinuosity, a moderate degree of bank erosion, and generally possess substrates of pebbles and sand. EDR also identified drainages and agricultural ditches that occurred in agricultural areas. However, these ditches did not exhibit stream characteristics such as riffles or pools, and appeared to convey water only in response to precipitation events. EDR recommended a formal wetland and waterbody delineation be conducted during the growing season to determine the boundaries and jurisdictional status of approximated wetlands, streams, and ditches observed within the Project Area.

3.3 Other Evaluations

ORR also is evaluating the Project with respect to a variety of other subjects, including noise, socioeconomic factors, and geotechnical matters. These topics are not part of this ecological assessment.

4 Regulatory Overview

The Project will fall under the jurisdiction of the USACE Huntington District, the OEPA, in addition to the USFWS and ODNR, which have jurisdiction over rare, threatened and endangered species. The Ohio Historic Society (OHS) would also have jurisdiction over potential cultural resources identified in the Project Area.

4.1 Permit Requirements

In accordance with Section 404 of the CWA, the Project is located within the jurisdiction of the USACE Huntington District in Brown County, Ohio. The USACE holds jurisdiction over "Waters of The US" determined to be non-isolated 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.

The OEPA takes jurisdiction of isolated wetlands that may exist or are impacted within the Project Area. The OEPA will administer this jurisdiction through Section 401 of the CWA and the Ohio Revised Code 6111.02 to 6111.028 for issuance of a Water Quality Certificate (WQC). The OEPA also administers the National Pollution Discharge Elimination System (NPDES) and issues permits for activities causing land disturbance under Ohio Revised Code Chapter 6111.

Table 4-1 provides further detail of agencies and their regulatory authorities that may apply to the proposed Project.

Table 4-1 Potential Permit Requirements for the Project

Lead Agency/ Address	Agency Permit/Approval	Key Permit/Approval Thresholds
Federal Approvals		
United States Army Corps of Engineers Huntington District	Clean Water Act Section 404	Discharge of dredged and fill materials into waters of the United States, 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 & Wildlife Service Ohio Field Office	50 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 megawatts (MW).

Table 4-1 Potential Permit Requirements for the Project

Lead Agency/ Address	Agency Permit/Approval	Key Permit/Approval Thresholds
Ohio Department of Natural Resources	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 finds to be threatened with statewide extinction.
Ohio Historic Preservation Office Ohio Historical Society	Section 106 compliance (36 CFR Section 800.11) Ohio Revised Code 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 C.F.R., Part 800.
Ohio Environmental Protection Agency	CWA Section 401 Water Quality Certification *(ORC Chapter 6111)*	Discharge of dredge and fill materials into waters of the United States, including wetlands with a significant nexus to navigable waterways.
Ohio Environmental Protection Agency (OEPA)	Isolated Wetlands Permit (*ORC Chapter 6111.02-.029*)	Construction activities that disturb isolated wetlands.
Ohio Environmental Protection Agency Division of Surface Water	NPDES Construction General Permit (CGP) Ohio EPA Permit No.: OHC000003	The NPDES CGP renewal authorizes NPDES permit coverage for those construction activities involving 1 or more acres of land disturbance.

If impacts to “Waters of the US” from the Project cannot be fully avoided, the Project may use USACE Nationwide Permit #51 (NWP51) for certain access roads and collection lines. Solar arrays are not expected to impact regulated resources. Under NWP51 all impacts would be assessed in a cumulative manner to a limit of no greater than ½ acre of “Water of the US” and no more than 300 linear feet of stream bed. The 300 linear feet limit may be waived by the USACE for intermittent and ephemeral stream beds if minimal adverse impact is determined. USACE Nationwide Permit #12 (NWP12) also may be used to authorize impacts from certain access roads and collection lines. Under NWP12 the USACE would determine individual crossings to be single and complete, provided the activity does not result in the loss of greater than 1/2-acre of “Waters of the US.”

If isolated wetlands are affected by the Project Area, then an Isolated Wetland Permit (IWP) would be required from the OEPA. The IWP would be issued as WQC application and if the Project is determined to collectively impact more than 0.5 acres of wetlands or affect more than 300 linear feet of streams, an Individual 401 WQC Permit would be required.

The Project will require a NPDES 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 erosion and sediment controls and storm water management practices addressing all phases of construction.

4.2 Agency Consultation

Cardno was provided with EDR's Preliminary Evaluation report, which included a preliminary data request to the ODNR Natural Heritage Database (ONHD). The ONHD indicated that two State-listed endangered mussels (rayed bean and little spectaclecase), and one state-threatened fish species (bigeye shiner) have been documented in the vicinity of the Project Area. According to EDR, the NHPA identified populations were within the East Fork Little Miami River, approximately 5 miles west of the Project Area.

4.2.1 US Fish & Wildlife Service

The USFWS provides an online list of Federally-listed species by county. The list for Brown County, Ohio included one endangered bat species, one threatened bat species, five endangered freshwater mussel species, and one endangered flowering plant species. Additional information on the USFWS Listed species can be found in Section 2.4.3.

As described in Section 2.4.3, Cardno also utilized the USFWS's IPaC tool to screen the Project Area for sensitive species under USFWS jurisdiction. The IPaC report listed the same species as in Table 2-3, with the exception of the Northern long-eared bat, which was not included on the IPaC report. These species may occur or could potentially be affected by activities in the Project Boundary. The IPaC report identified no Critical Habitats, Wildlife Refuges or Fish Hatcheries within the Project Boundary.

4.2.2 Ohio Department of Natural Resources

On behalf of ORR, Cardno submitted an Environmental Review request to the ODNR on May 25, 2017.

4.2.3 Ohio State Historic Preservation Office (SHPO)

ORR is coordinating with SHPO on the Project; additional information is provided in separate documentation.

5 Wetland & Waterbody Delineations

The following is a discussion of the results of field surveys conducted in April 2017 within the Project Area. An overview of field-delineated wetlands and waterbodies is included as Figure 6 of Appendix A. A Watershed Map of the Project Area is illustrated in Figure 7 of Appendix A.

5.1 General Habitat within the Project Area

The data obtained during the desktop review was found to be generally consistent with the results of the field survey. As identified in Section 2.1, the predominant land use in the Project Area was agricultural (crops), followed by deciduous forest areas (woodlots), and some developed/open space. One parcel had a large field on it which classified as agricultural, but was determined to be a large wetland (WOH-001) during the survey. This feature is discussed in greater detail below, but it represents the largest variance from the desktop assessments.

The agricultural fields were observed to be primarily a mix of remnants from the previous year's soybean and corn crops. Additionally, some crop areas were actively planted with spring wheat. It was likely that the type of crop may change seasonally, but the general extent of the crop area would remain consistent.

Many of the crop areas and roadsides had man-made or modified ditches which helped maintain drainage for proper growing conditions. In intermittent and ephemeral ditches, the channels were often vegetated with reed canary grass (*Phalaris arundinacea*) and narrow-leaf cattail (*Typha angustifolia*) indicating the presence of water during portions of the year. Some ditches which rarely received any runoff except during severe storm events lacked vegetation in the channel or had a mix of grasses (*Festuca sp.* and *Fescue sp.*). The majority of ditches delineated appeared to be mowed seasonally, which reduced the development of mature riparian buffers along the banks. Many of the delineated ditches had 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 purple deadnettle (*Lamium purpureum*). Where limited woody vegetation and shrub growth was observed along the bank areas, species included willows (*Salix sp*.), black locust (*Robinia p*seudoacacia), and sycamores (*Platanus occidentalis*).

The wooded areas of the Project Area occurred as isolated woodlots, windrows between crop areas and along roads. Aggressive weedy species such as pokeweed and poison ivy (*Toxicodendron radicans*) often occurred along the woodlot edges, with the interiors of woodlots comprised predominately of maples (*Acer sp*.), oaks (*Quercus sp*.), American elm (*Ulmus americana*), dogwoods (*Cornus sp*.), and shagbark hickories. Though shagbark hickories can often be used as roosting habitat for many bat species, the Cardno field teams could not verify the utilization by bats during the field surveys as surveys were conducted during daylight hours when bats are generally not active.

The habitats surveyed during field efforts appeared to lack significant or obvious evidence of RTE species due to the high level of habitat fragmentation and degradation by historic landuse manipulation and surrounding landuse (e.g. agriculture). Many of the waterbodies delineated were identified as potentially providing habitat, but at reduced quality due to surrounding landuse impacting the water chemistry (i.e., high sediment loading during storms and fertilizer in runoff). No species-specific surveys were conducted by Cardno.

5.2 Wetlands

5.2.1 Wetland Delineation Criteria and Methods

Cardno conducted wetland and waterbody delineation surveys in the Project Area during April 2017 to determine the extent and jurisdiction of wetlands and waterbodies within the Project Area. A ¼-mile visual investigation was also conducted around the Project Area for sensitive habitats.

Wetland delineations were conducted according to the 1987 U.S. Army Corps of Engineers (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.

After identifying the plant species present within a sampling area of a potential wetland, the dominance and indicator status for each identified unique species was determined. Based on the results, the vegetation community being evaluated was determined to be indicative of a either wetland or non-wetland.

Under certain circumstances, such as after disturbance from storm events or surveys occurring outside of the prime growing season, additional methods are employed to evaluate the vegetative communities of suspected wetlands. This can include calculating a prevalence index, which weights the coverage of a particular class of species (using its wetland indicator status) against the total coverage within the sampling area. If a sampling area passes this test (which requires the value to be less than or equal to 3), it can be considered a wetland. Another potential evaluation method is the presence of morphological adaptations, which can include root buttressing, shallow roots, or multi-stemmed trunks. The presence of such adaptations is considered evidence that the plants (even Facultative Upland [FACU] species) have adapted to survive in prolonged inundation or root saturation. Another method is to report "Problematic Hydrophytic Vegetation." This method is used sparingly, and reflects the delineator's opinion that conditions outside of those considered normal may be present, such as vegetation being bent or damaged to such a degree that identification to species level is impracticable. Under this method, the vegetation present would be treated as consistent with a wetland, but the vegetation could not be reliably identified.

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.

Wetland delineation data are reported on routine wetland determination data forms. The perimeter of each wetland was mapped using the Global Positioning Systems (GPS). Physical flagging is hung in areas that do not disturb the private land owners or endanger livestock. In addition to identifying the

boundaries of wetlands, additional data points are taken with the GPS to locate delineation data collection center points.

After delineations, the identified wetlands are scored using the Ohio EPA (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 are 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 59.90 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 one of these transitional ranges should be assigned to the higher Category unless collected data suggests the wetland should be placed in the lower category.

Category 1 consist of wetlands that are often isolated emergent marshes dominated by cattails with little or no upland buffers located in active agricultural fields. Category 2 consists of wetlands for which RTE species and their habitat are absent, but may have well-developed habitat for other more common 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 that contain or provide habitat for threatened or endangered species, are high quality mature forested wetlands, vernal pools, bogs, fens, or which are scarce regionally and/or statewide.

5.2.2 Wetland Survey Results

A total of six wetlands were delineated during field surveys, for a total of 11.61 acres. Wetland WOH-001 accounted for over 8 acres, with the other wetlands each accounting for less than 1 acre each. The majority of wetlands were identified as palustrine emergent (PEM), and scored as lower quality wetlands on the ORAM (all were Category 1). Cardno anticipates that three wetlands would likely be jurisdictional, based on its likely hydrologic connectivity to a potential Water of the U.S. Final verification of their boundaries for regulatory purposes can only be completed through a JD review by the USACE or its duly appointed representative.

Wetland WOH-001 is a relatively large, 8.59-acre wet meadow complex that extends into a scrub/shrub field to the west. The bulk of the wetland is located along the edge of active farm field in a parcel south of Mount Road. There was high saturation of clay soils, and a prevalence of common rush (*Juncus effusus*) throughout the area. Conditions indicate that the wetland may include some hummocky areas (potentially historic till piles or tire ruts from previous activity) that do not retain wetland conditions year round because they contained isolated stands of broomsedge (*Andropogon virginicus*) (a FACU species). However, during the survey the majority of the wetland had pools of standing water, saturated low chroma clayey soils, crayfish burrows, and rush species throughout.

Table 5-1 provides a list of the delineated wetlands and associated characteristics for the Hillcrest Project. Details for each waterbody can be found in the Wetland Delineation Report for Hillcrest Solar Farm, prepared by Cardno, dated June 2017.

Table 5-1 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	Parcel
WOH-001	39.08570	-83.90175	8.59	PEM/ PSS	20.5	Category 1	No	Sterling Run	100190480000
WOH-003	39.09099	-83.90761	0.11	PEM	18.0	Category 1	No	Sterling Run	100190480000
WOH-004	39.08690	-83.90824	0.93	PEM	23.0	Category 1	Yes	Sterling Run	100179120000 / 100179160000
WOH-005	39.08477	-83.90906	0.53	PEM	21.0	Category 1	Yes	Sterling Run	100179120000 / 100179160000
WOH-006	39.09267	-83.91300	0.64	PEM/ PFO	21.5	Category 1	No	Sterling Run	100188240000
WOH-007	39.08863	-83.88083	0.81	PEM	28.5	Category 1	Yes	Sterling Run	100176360000
	Total Acreage		**11.61**						

Notes:
PEM – Palustrine Emergent Wetland
PFO – Palustrine Forested Wetland
PSS – Palustrine Scrub Shrub
ORAM – Ohio Rapid Assessment Method

5.3 Waterbody

5.3.1 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.

All flowing waterbodies (streams and ditches, but not ponds) delineated were assessed using the HHEI as identified in OAC 3745-1-03. 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 though. Larger features are evaluated using the QHEI. The QHEI form works to describe 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 15 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.

5.3.2 Waterbody Survey Results

The waterbody delineation results are summarized in Table 5-2 at the end of this section. The waterbody features delineated were broken into three categories including ditches (DOH), streams (SOH), and ponds (POH).

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.

The OEPA's HHEI forms were completed for each stream and serve to record and score a variety of aspects about the feature. The HHEI forms score the types and percent composition of substrates, maximum pool depth, and average bankfull width. Additional descriptive information is recorded in the forms regarding flow regime, riparian width and quality, morphology, and modification. Stream channel modification is referenced in many of the descriptions below, as either 'naturalized' or 'modified'.

Naturalized features are those that have either never been modified or have historic signs of modification but appear to have recovered to a natural state. Modified features are those that appear to have recently been modified (such as through dredging or armoring of the banks) and may have little to no evidence of recovery. Scores are tallied for each feature, and result in a HHEI Category of Class I, II, or III as described in Table 5-3.

Table 5-3 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)

PHWH – Primary Headwater Stream

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 landuse, 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 none were observed during the field surveys. Often a waterbody may be able to provide physical habitat, but due to intensive landuse in the upland areas it may lack suitable water chemistry.

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.

A total of 42 waterbodies were delineated during the field studies, primarily identified as ditches (n=34) with four stream reaches and four ponds identified in the Project Area. Seventeen (17) of the waterbodies were identified as Class I streams according to the HHEI scoring matrix, with an additional 20 scoring as Class II. Only SOH-002 scored high enough on the HHEI score to be considered a Class III waterbody. The vast majority of the waterbodies were considered modified (n=38).

SOH-002 is a delineated portion of Sterling Run, which flows south through the Project, to the west of Moon Road. The stream was relatively wide with a top-of-bank width of approximately 40 feet and a bankfull width of 18 feet. Water depth was also estimated to be 3 feet or greater in some pooled areas. The depth and width led to the stream scoring moderately high on the HHEI, while the mature forest riparian buffer and mix of substrates led to it being identified as the only Class III waterbody in the Project. No fish were observed due to the high turbidity, but it was suspected that some smaller minnows (normally tolerant of turbid waters) would be present though mussels were unlikely and none were observed during survey. The vegetation along the banks and riparian buffer included a mix of trees and weedy species including: sugar maple (*Acer saccharum*), American elm (*Ulmus americana*), swamp white oak (*Quercus alba*), poison ivy (*Toxicodendron radicans*), and teasel (*Dipsacus fullonum*).

In summary, Cardno delineated 4 streams and 34 ditches. Of those, 3 streams and 13 ditches are anticipated to be jurisdictional based on their likely hydrologic connectivity to a potential Water of the U.S. Similar to wetlands, final verification of stream boundaries for regulatory purposes can only be completed through a JD review by the USACE or its duly appointed representative.

Details for each delineated waterbody can be found in the Wetland Delineation Report for Hillcrest Solar Farm, prepared by Cardno, dated June 2017.

Table 5-2 Waterbodies Delineated in the Project Area

Stream ID	County	Delineated Linear Feet	HHEI Score	QHEI Score	PHWH Class Designation	Flow Regime	Drainage Basin	Anticipated Jurisdictional?	Potential RTE Habitat	Mussels Observed	SRW	WWH	EWH	MWH	SSH	CWH	LRW	PWS	AWS	IWS	BW	PCR	SCR
DOH-001	Brown	3,237	17	n/a	Class I	Ephemeral	Sterling Run	N	Low	No													
DOH-002	Brown	3,395	54	n/a	Class II	Perennial	Sterling Run	Y	Low	No													
DOH-003	Brown	2,722	49	n/a	Class II	Intermittent	Sterling Run	Y	Low	No													
DOH-004	Brown	1,393	28	n/a	Class I	Ephemeral	Sterling Run	N	Low	No													
DOH-005	Brown	520	28	n/a	Class I	Ephemeral	Sterling Run	N	Low	No													
DOH-006	Brown	1,089	28	n/a	Class I	Ephemeral	Sterling Run	N	Low	No													
DOH-007	Brown	2,034	38	n/a	Class II	Perennial	Sterling Run	Y	Low	No													
DOH-008	Brown	3,564	38	n/a	Class II	Perennial	Sterling Run	Y	Low	No													
DOH-009	Brown	517	28	n/a	Class I	Ephemeral	Sterling Run	N	Low	No													
DOH-010	Brown	4,476	37	n/a	Class II	Intermittent	Sterling Run	Y	Low	No													
DOH-011	Brown	2,139	36	n/a	Class II	Intermittent	Sterling Run	Y	Low	No													
DOH-012	Brown	797	26	n/a	Class I	Ephemeral	Sterling Run	N	Low	No													
DOH-013	Brown	1,254	42	n/a	Class II	Perennial	Sterling Run	Y	Low	No													
DOH-014	Brown	1,062	42	n/a	Class II	Intermittent	Sterling Run	N	Low	No													
DOH-015	Brown	874	31	n/a	Class II	Ephemeral	Sterling Run	N	Low	No													
DOH-016	Brown	1,017	26	n/a	Class I	Ephemeral	Sterling Run/Flat Run-North Fork Whiteoak Creek	N	Low	No													
DOH-017	Brown	1,001	26	n/a	Class I	Ephemeral	Flat Run-North Fork Whiteoak Creek	N	Low	No													
DOH-018	Brown	1,369	26	n/a	Class I	Ephemeral	Sterling Run	N	Low	No													
DOH-019	Brown	638	36	n/a	Class II	Intermittent	Sterling Run	Y	Low	No													
DOH-020	Brown	5,330	53	n/a	Class II	Perennial	Sterling Run	Y	Low	No													
DOH-021	Brown	435	28	n/a	Class I	Ephemeral	Sterling Run	N	Low	No													
DOH-022	Brown	1,677	18	n/a	Class I	Ephemeral	Sterling Run	N	Low	No													
DOH-023	Brown	539	37	n/a	Class II	Intermittent	Sterling Run	N	Low	No													
DOH-024	Brown	896	26	n/a	Class I	Intermittent	Sterling Run	N	Low	No													
DOH-025	Brown	6,293	28	n/a	Class I	Intermittent	Sterling Run/Fivemile Creek-East Fork Little Miami River	N	Low	No													
DOH-026	Brown	1,313	28	n/a	Class I	Intermittent	Sterling Run	N	Low	No													
DOH-027	Brown	3,460		n/a	Class II	Perennial	Sterling Run	Y	Low	No													
DOH-028	Brown	568	28	n/a	Class I	Ephemeral	Fivemile Creek-East Fork Little Miami River	N	Low	No													
DOH-029	Brown	2,444	43	n/a	Class II	Perennial	Sterling Run	Y	Low	No	X				X	X			X				
DOH-030	Brown	1,659	37	n/a	Class II	Intermittent	Sterling Run	Y	Low	No													
DOH-031	Brown	4,657	52	n/a	Class II	Intermittent	Sterling Run	Y	Low	No													
DOH-032	Brown	3,474	54	n/a	Class II	Intermittent	Sterling Run	Y	Low	No													

Table 5-2 Waterbodies Delineated in the Project Area

Stream ID	County	Delineated Linear Feet	HHEI Score	QHEI Score	PHWH Class Designation	Flow Regime	Drainage Basin	Anticipated Jurisdictional?	Potential RTE Habitat	Mussels Observed	SRW	WWH	EWH	MWH	SSH	CWH	LRW	PWS	AWS	IWS	BW	PCR	SCR
DOH-033	Brown	2,479	48	n/a	Class II	Intermittent	Sterling Run	N	Low	No													
DOH-034	Brown	934	28	n/a	Class I	Intermittent	Sterling Run	N	Low	No													
POH-001	Brown	n/a	n/a	n/a	n/a	Perennial	Sterling Run	N	Low	No													
POH-002	Brown	n/a	n/a	n/a	n/a	Perennial	Sterling Run	N	Low	No													
POH-003	Brown	n/a	n/a	n/a	n/a	Perennial	Sterling Run	N	Low	No													
POH-004	Brown	n/a	n/a	n/a	n/a	Perennial	Sterling Run	N	Low	No													
SOH-001	Brown	2,309	49	49.5	Class II	Perennial	Sterling Run	Y	Moderate	No		X							X	X		X	
SOH-002	Brown	1,498	59	49.5	Class III	Perennial	Sterling Run	Y	Moderate	No		X							X	X		X	
SOH-003	Brown	107	28	n/a	Class I	Ephemeral	Sterling Run	N	Low	No													
SOH-004	Brown	955	38	n/a	Class II	Perennial	Sterling Run	Y	Low	No													
Total Linear Feet		**74,125**																					

Notes:
HHEI – Headwater Habitat Evaluation Index
n/a – No QHEI performed
PHWH – Primary Headwater System
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)

6 Estimated Project Impacts

Compared to the environmental impact of traditional energy sources, the production of solar power does not affect air quality, groundwater or surface water through air emissions or water discharges. Unlike fossil fuel and nuclear power sources, solar power consumes no fuel and emits no air pollution in operation. In order to build solar farm infrastructure, materials must be mined, manufactured, processed, and transported as with all conventional power plants.

6.1 Project Infrastructure Summary

Of the 2,083-acre Project Area, Cardno estimates that up to 1,855 acres (89% of the total Project Area) could be used ("Buildable Area"); however, only up to 1,100 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.

Hillcrest Solar Farm 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
- Panel strings up to 210 feet in length (approximately 109,952 strings total)
- Panel support piles less than 1 s.f. each, directly driven 4 to 8 feet below ground surface (up to 94,245 s.f. of piles, up to 2.16 acres total)
- 12 to 16 feet of open space between panel strings
- Up to 25 s.f. concrete slab per Inverter Pad (up to 90 inverter pads total, 2,250 s.f. or 0.05 acre)
- Up to 1,000 acres of solar array blocks (5 to 10 acres per block)

> Project Substation & Support Facilities:
- Up to 3 acre Project Substation
- Up to 6 SMSs (up to 15 s.f. each, 90 s.f. total)
- Security fencing and access gates
- Buried Gen-Tie line (up to 40' wide, 1000' feet in length, 0.92 acre total)
- Dead end structure (up to 0.36 acre total)

> Collection Lines:
- Up to 12.71 miles of buried cable, 20-foot wide temporary work area (15.32 acres)
- Buried 36 inches below grade (outside fence lines)
- All jurisdictional perennial streams will be avoided using HDD technology

> Access Roads:
- Up to 26.4 miles of access roads
    - Access roads will have a temporary impact width of up to 25 feet during construction (28.24 acres)
    - Following construction, gravel access roads will be maintained using a permanent up to 16-foot wide road for operations and maintenance (50.51 acres)

> Equipment Lay Down Areas:
- Up to 15 acres will be used for lay down areas; 5 to 7 areas, 0.5- to 5-acres lots each, for storage of construction equipment and supplies during construction
- Up to 5 acres will be maintained as permanent gravel-covered parking / lay down area.

Table 6-1 provides a summary of the reviewed and proposed Project infrastructure.

Table 6-1 Summary of Proposed Hillcrest Solar Project Permanent Infrastructure

Features	Maximum Values
Project Generation Capacity	**125 MW**
Project Area	**2,083 acres**
Available Buildable Area	**1,855 acres**
Project Construction Area	**1,100 acres**
Solar Arrays	**1,000 acres**
Solar Array Piles	**2.16 acres**
Project Substation	**3 acres**
Gravel-covered Parking / Laydown Area	**5 acres**
Supporting Facilities (Pyranometer Stations, Inverter Pads)	**0.05 acres**
Dead End Structure (Duke Energy's Hillcrest 138 kV Substation Parcel)	**0.36 acres**
Generation Tie Line (buried)	**1,000 feet**
Collection Lines (buried)	**12.71 miles**
Permanent Access Roads (gravel-covered)	**26.4 miles**

6.2 Natural Resource Impacts Summary

Overall, the Hillcrest Solar Farm will have limited environmental impacts. The Project is proposed to be primarily built on land that has already been impacted by land 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 1,000 acres). ORR has designed the Project to avoid and minimized impacts such as wetlands, waterbodies, woodlots, and aquatic and terrestrial wildlife species where possible. If the proposed Hillcrest Solar Farm were decommissioned, the landscape can be returned to its previous condition.

A summary of potential impacts to existing environmental features within the Project Area are presented in Tables 6-2 and 6-3. These anticipated impacts will likely be significantly lower for the finalized proposed infrastructure as these numbers are based on a maximum Available Buildable Project Area during construction (1,855 acres). 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 Hillcrest Solar Project, and Table E-2 - Anticipated Waterbody Crossing Methods & Impacts for the Hillcrest Solar Project.

Table 6-2 Summary of Proposed Hillcrest Solar Farm Impacts -- TEMPORARY

Impact Type	Upland Soil (acres)	Forested Uplands (Tree Clearing) (acres)	Wetland (acres)	Streams (acres)	Ditches (acres)	Ditches (linear feet)	Ponds (acres)
Access Roads	28.24	0	0.01	0	0.06	389.63	0
Collection Line	15.32	0	0	0	0.02	82.51	0
Equipment Lay Down Area	15.00	0	0	0	0	0	0
Substation	0	0	0	0	0	0	0
Array Pilings	0	0	0	0	0	0	0
Inverter Pads	0	0	0	0	0	0	0
Pyranometer	0	0	0	0	0	0	0
Generation Tie Line	0.92	0	0	0	0	0	0
Dead End Structure	0	0	0	0	0	0	0
Totals	***59.48***	***0***	***0.01***	***0***	***0.08***	***472.14***	***0***

Table 6-3 Summary of Proposed Hillcrest Solar Farm Impacts -- PERMANENT

Impact Type	Upland Soil (acres)	Forested Uplands (Tree Clearing) (acres)	Wetland (acres)	Streams (acres)	Ditches (acres)	Ditches (linear feet)	Ponds (acres)
Access Roads	50.51	0	0.01	0	0.11	649.36	0
Collection Line	0	0	0	0	0	0	0
Equipment Lay Down Area	5.00	0	0	0	0	0	0
Substation	3.00	0	0	0	0	0	0
Array Pilings	2.16	42.60	0	0	0	0	0
Inverter Pads	0.05	0	0	0	0	0	0
Pyranometer	0.00	0	0	0	0	0	0
Generation Tie Line	0	0	0	0	0	0	0
Dead End Structure	0.36	0	0	0	0	0	0
Totals	***61.08***	***42.60***	***0.01***	***0***	***0.11***	***649.36***	***0***

6.2.1 Land Use

The Project Area currently is primarily used as active agricultural lands (83%). The wooded areas of the Project Area occurred as isolated woodlots, windrows between crop areas and along roads (10%). The most significant impact will come from the conversion of agricultural land to provide for the solar panel

arrays. 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. Such a conversion is expected to have a negligible environmental impact since agriculture fields provide minimal habitat for floral and faunal communities. Also since the solar farm is elevated above the ground on a rack system vegetation will be maintained under the array for erosion control providing similar habitat as agricultural fields.

6.2.2 Uplands

Solar farms require significant areas of land for the solar panel arrays, and associated infrastructure. This Project has been designed to locate as much of the infrastructure as possible on uplands, minimizing impacts to wetlands and waterbodies. Impacts to upland soils and tree clearing are discussed below.

6.2.2.1 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 (28.24 acres) and permanent (50.51 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 94,245 piles will total 2.16 acres, spread across the 1,000 acres of panel arrays. Additionally support infrastructure, such as pyranometer stations (90 s.f.), inverter pads (0.05 acres), a permanent equipment storage area (5 acres) and a Project Substation (3 acres) are all included as maximum permanent upland soil impacts.

A generation tie line will be installed to connect the Project Substation to the Duke Energy Hillcrest 138 kV substation parcel. This gen-tie line will require a temporary work space of up to 40 feet wide by 1,000 feet in length, for a total temporary impact area of up to 0.92 acre. The gen-tie line will connect to a dead end structure with up to 0.36 acre permanent footprint, located within the Duke substation parcel.

6.2.2.2 Forested Uplands/Tree clearing

Forested areas within the Project Area will be preserved where possible, however, ORR anticipates the need to clear select windrows and edges of woodlots in order to construct and operate the Project. Approximately 35.1 acres of windrows and 7.5 acres of woodlot are anticipated to be cleared, for a total of 42.60 acres of tree clearing. The windrows within the Project area provide minimal habitat and were used as historical property boundaries.

ORR is committed to minimizing the tree clearing where possible, and observing to seasonal restrictions on tree clearing to protect Indiana bat (e.g., cutting trees only between November and March), or as conditions specify. 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.

6.2.3 Wetlands & Waterbodies

Cardno delineated a total of six wetlands during field surveys, for a total of 11.61 acres of wetland within the Project Area. Wetland WOH-001 accounted for over 8 acres, 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 (all were Category 1).

Several waterbodies were delineated within the Project Area, primarily agricultural ditches, a few stream reaches and a few ponds. The waterbodies identified were expected to be highly impacted by the surrounding land use. Although they 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.

ORR is currently reviewing the proposed Project infrastructure to minimize potential impacts to identified environmental features and habitats. Through careful Project design and avoidance measures, ORR anticipates limited impacts to a single low quality wetland (WOH-001, non-jurisdictional, Class 1) due to an access road. Impacts are estimated to be 0.01 acres (593 s.f.) of temporary impact, and 0.01 acres (466 s.f.) of permanent impact. Avoidance measures would include pre-construction field preparation such as flagging and signage of regulated resources, environmental training for construction crews, and the use of environmental monitors during construction as determined necessary. In the field, micro-siting of solar arrays, roads and associated infrastructure will aid in further minimizing or avoiding impacts to resources.

The installation of the collection lines will require crossing both streams and ditches within the Project Area. ORR proposes to utilize HDD to allow for the installation of the line under two Category II surface water features (SOH-001 and SOH-004) in an effort to avoid all impacts to these perennial streams. No other perennial streams are anticipated to be crossed by the collection line installation. A detailed frac out contingency plan for stream crossings to be completed via HDD is attached in Appendix F.

Any portion of a collection line crossing an ephemeral or intermittent ditch will be crossed via open cut method. Currently seven crossings (up to 82.51 linear feet) are anticipated. Three of the seven ditches (DOH-007, DOH-010, and DOH-029) that are proposed for open cut will be co-located with the access road culvert crossing, thus minimizing the temporary impacts to the ditch. The other four crossings (DOH-003, DOH-014, DOH-019, and DOH-025) using open cut will involve traditional excavation of the ditch for the collection line. If the ditch 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. It is anticipated each crossing will take approximately 48 hours or less for all activities (i.e., trenching, installing the line, restoring to pre-construction contours). ORR is committed to observing any potential temporal restrictions that may apply to these ditches.

Final array and layout designs are not finalized, but based on preliminary work up to 26.4 miles of new permanent gravel roads will be installed for construction, operation, and maintenance of the Project. Currently, it is anticipated that there will be no impacts to delineated stream reaches due to access roads. Construction of the Project access roads will likely require up to 30 ditch crossings for a total of 389.63 linear feet (18 individual ditches, some crossed multiple times). Each ditch crossing will utilize a standard culvert with rock fill to create stable road crossing. ORR will design these crossing to allow adequate flow and not affect the flow of water within the Project Area. All crossing will be approved by the Brown County Soil & Water Conservation District prior to construction. Where feasible ORR would use existing farm road crossings to minimize crossing impacts.

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

Project Area waterbodies will not be used during or for construction of the Project; water will be trucked to the Project Area. To prevent adverse effects from construction-related stormwater runoff, ORR 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, ORR 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 sediment and erosion controls (including inspection protocols) will be provided in ORR construction drawings (currently under development).

6.2.4 Aquatic & 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 publically 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, red fox, common woodland and grassland songbirds, and ducks.

The Project Area and ¼-mile buffer are not known to provide significant habitat for sensitive bird, bat, or freshwater mussel species. Due to this lack of adequate habitat in the immediate Project Area, it is likely many individuals would opt for higher quality habitat nearby such as Grant Lake Wildlife Area or East Fork State Park for roosting, foraging and breeding.

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 substation and all of the PV panels will be located 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.

6.2.5 Threatened and Endangered Species

No State- or Federal-listed 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 species.

As described above in Section 4.2, previous correspondence with the ODNR and review of the online tools indicated potential occurrence of 8 Federally-listed and 33 State-listed threatened or endangered species within the Project Area. 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 Grant Lake Wildlife Area or East Fork State Park for roosting, foraging and breeding.

ORR 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.

6.2.6 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 of the refuse 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.

7 References

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Hillcrest Solar Farm

APPENDIX A

PROJECT AREA FIGURES

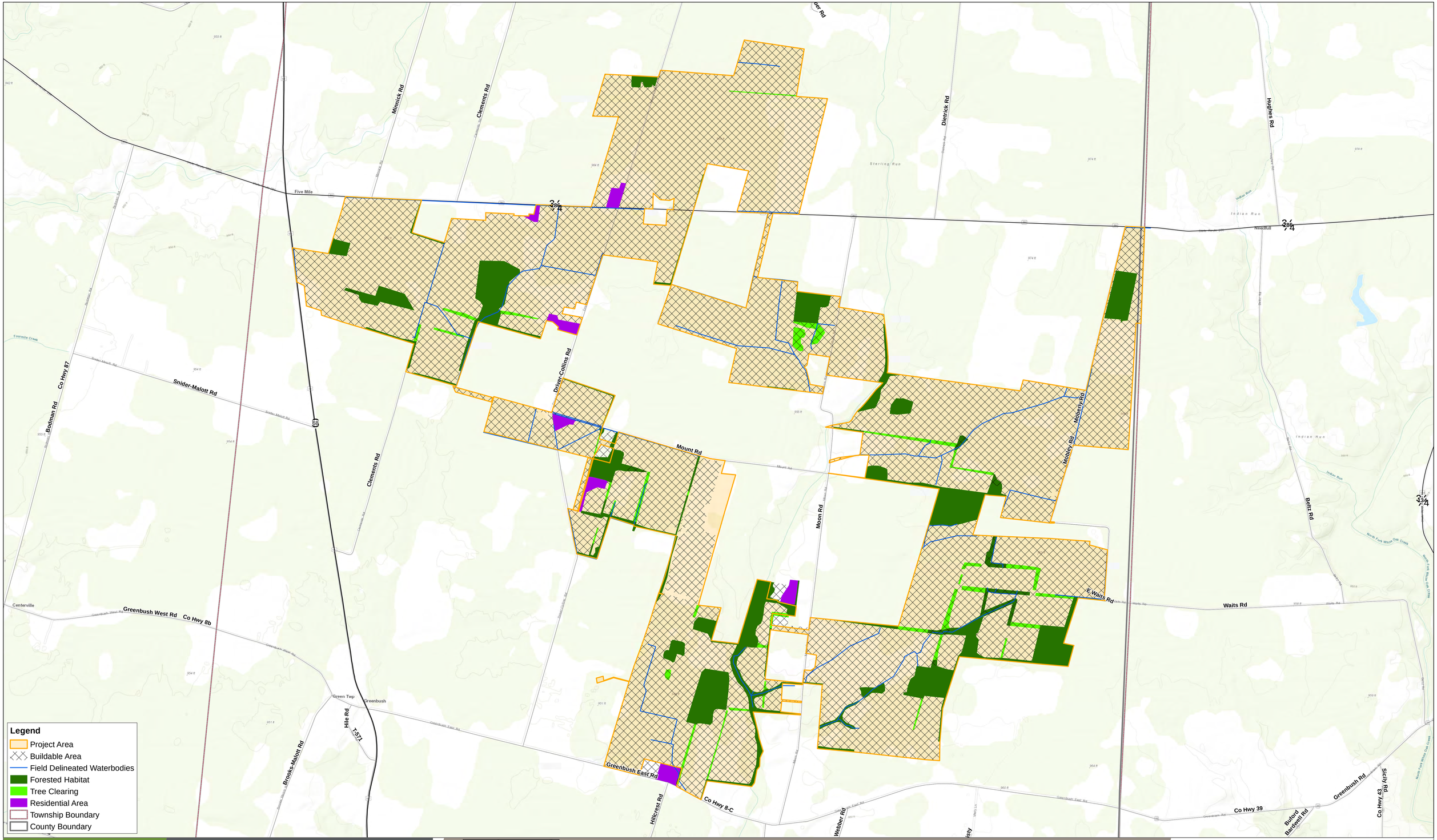

Figure 1 - Buildable Area

Hillcrest Solar Farm
Brown County, Ohio

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Date Created: 6/15/2017 Date Revised: 6/15/2017 File Path: T:\sharegis\gisrt\Hillcrest Solar Farm\MXD\Ecological Review\Figure 6 - Buildable Area.mxd
GIS Analyst: Sarah Jenniges

Minnick Rd
Clements Rd
Dietrick Rd
Hughes Rd
Snider-Malott Rd
Co Hwy 67
Bodman Rd
Clements Rd
Dolph Collins Rd
Mount Rd
Moon Rd
Moberly Rd
Moberly Rd
Beltz Rd
E Waits Rd
Waits Rd
Greenbush West Rd
Co Hwy 8b
Hillcrest Rd
T-571
Brooks-Marlott Rd
Greenbush East Rd
Co Hwy 8-C
Hillcrest Rd
Webber Rd
Co Hwy 39
Buford Bentonville Rd
Greenbush Rd
Co Hwy 43
Sicily Rd

Legend

- Project Area
- Township Boundary
- County Boundary
- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land (Rock/Sand/Clay)
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

N

Data Source(s): Open Road (2017)
County Boundaries, Railroads:
ESRI Data and Maps (2014)
Township and City Boundaries
Ohio DOT (2010)
Land Use: National Land Cover
Database (2011, 2014)
Roads: U.S. Census Bureau Tiger
Files (2016)

0 1,000 2,000 3,000 4,000 Feet
0 250 500 750 1,000 1,250 Meters

Figure 2 - Land Use

Hillcrest Solar Farm
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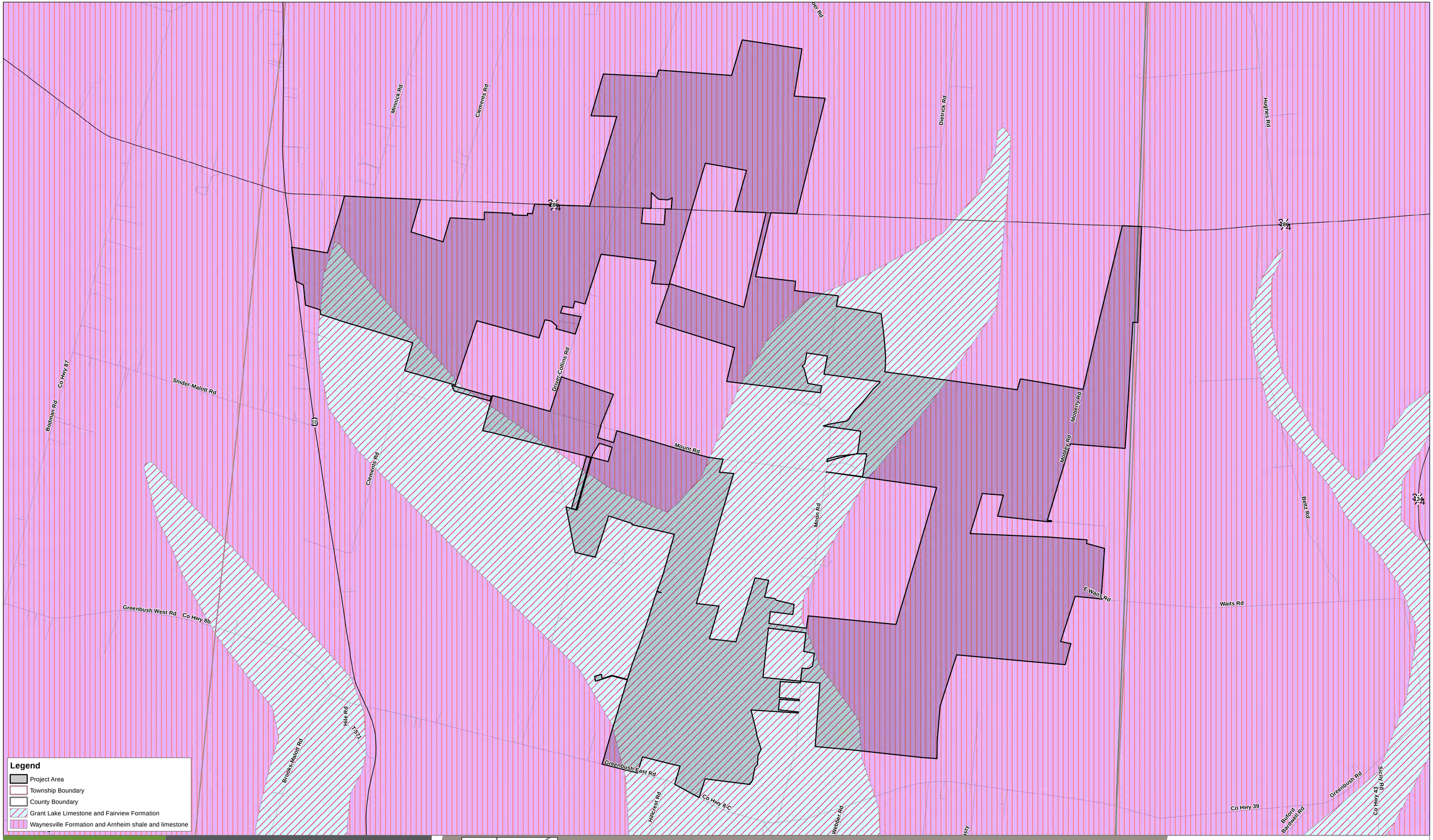
GIS Analyst: Sarah.Jenniges



Data Source(s): Open Road (2017)
County Boundaries, Railroads: ESRI Data and Maps (2014)
Township and City Boundaries Ohio DOT (2010)
Geology: Ohio DNR (2007)
Roads: U.S. Census Bureau Tiger Files (2016)

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0 1,000 2,000 3,000 4,000 Feet
0 250 500 750 1,000 1,250 Meters

Figure 3 - Bedrock Geology

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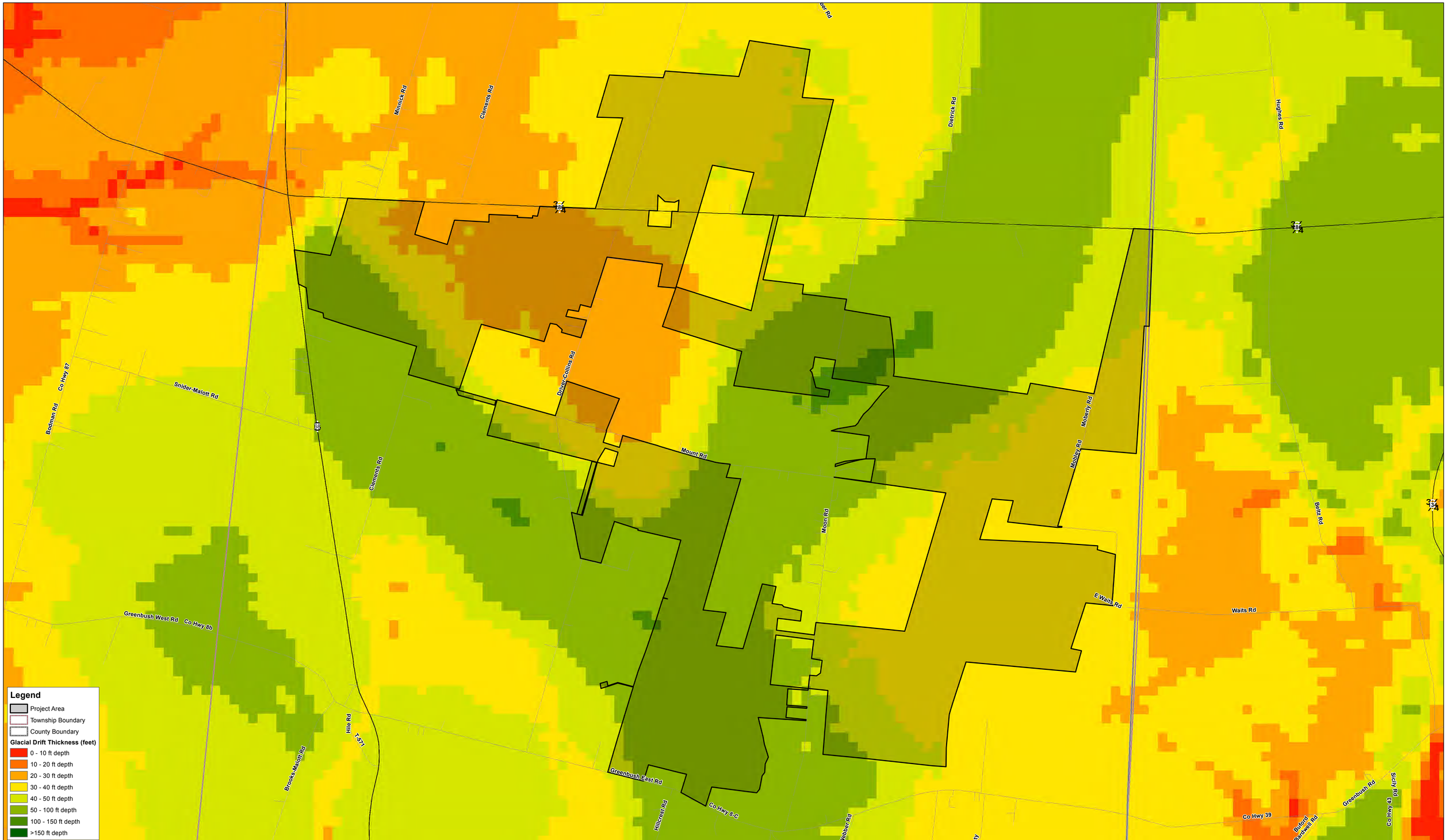
GIS Analyst: Sarah.Jenniges



Data Source(s): Open Road (2017)
County Boundaries, Railroads: ESRI Data and Maps (2014)
Township and City Boundaries Ohio DOT (2010)
Glacial Drift: Ohio Division of Geological Survey (2004)
Roads: U.S. Census Bureau Tiger Files (2016)

0 1,000 2,000 3,000 4,000 Feet
0 250 500 750 1,000 1,250 Meters

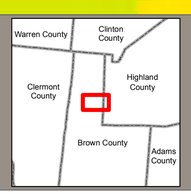


Figure 4- Glacial Drift

Hillcrest Solar Farm
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GIS Analyst: Sarah.Jenniges

East Fork State Park

Grant Lake Wildlife Area

Legend
- Project Area
- Hotspot
- Important Bird Area

Data Source(s): Open Road (2017) County Boundaries, Railroads: ESRI Data and Maps (2014) Township and City Boundaries Ohio DOT (2010) Geology: Ohio DNR (2007) Roads: U.S. Census Bureau Tiger Files (2016)

0 0.5 1 1.5 2 2.5 Miles
0 0.5 1 1.5 2 2.5 3 3.5 4 Kilometers

Indiana Ohio Kentucky

Figure 5 - Regional Wildlife Areas

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Date Created: 6/15/2017 Date Revised: 6/15/2017 File Path: T:\Shared\GIS\Hillcrest Solar Farm\MXD\Ecological Review\Figure 7 - Regional Wildlife Areas and BBS Routes.mxd
GIS Analyst: Sarah.Jenniges

Summary: Application - Exhibit H-01 Ecological Report electronically filed by Mr. Michael J. Settineri on behalf of Hillcrest Solar I, LLC