BEFORE
THE OHIO POWER SITING BOARD

In the Matter of the Application of Icebreaker Windpower Inc., for a Certificate to Construct a Wind-Powered Electric Generation Facility in Cuyahoga County, Ohio.	))))	Case No. 16-1871-EL-BGN

ICEBREAKER WINDPOWER INC.'S RESPONSES TO THE SECOND SET OF INTERROGATORIES FROM THE STAFF OF THE OHIO POWER SITING BOARD

On February 1, 2017, as supplemented, Icebreaker Windpower, Inc. ("Applicant") filed an application ("Application") with the Ohio Power Siting Board ("OPSB") proposing to construct a wind-powered electric generation facility in Lake Erie off the shore of Cleveland, in Cuyahoga County, Ohio ("Project").

On September 13, 2017, the Staff of the OPSB ("OPSB Staff") provided the Applicant with OPSB Staff's Second Set of Interrogatories. Now comes the Applicant providing the following responses to the Second Set of Interrogatories from the OPSB Staff.

1. **With respect to the proposed staging area, will it need to be reinforced in any way prior to use for the project? If so, describe what would need to be done, how long it would take, if it would require permits, and who would fund the reinforcements.**

Response: As stated in the Application, the proposed staging area is located at the Port of Cleveland ("Port"). An initial structural assessment of the staging area has been performed and the conclusion is that the Project-specific loads will be within the capacity of the Port staging area. Consequently, no reinforcement of the staging area is indicated at this time. However, prior to the start of construction, a final structural assessment will be performed by the Applicant, in cooperation with the Port, to verify the initial findings. Steps will be taken to ensure that the Project-specific loads can be accommodated by the Port staging area.

2. Will the proposed substation be taller than the existing CPP substation? If so, provide details. (Refer to page 3-77 of the draft EA)

Response: The proposed substation will not be taller than the existing Cleveland Public Power ("CPP") substation. In other words, the highest elevation of the proposed substation is lower than the highest elevation of the existing structures located within the CPP Lake Road Substation. Therefore, as stated in the Draft Environmental Assessment ("EA"), which was prepared for the Project by the U.S. Department of Energy ("USDOE") and posted on August 18, 2017, and is attached hereto as **Attachment A** (Note: Only the draft of the narrative portion of the EA is attached. To view the Appendices go to https://energy.gov/nepa/downloads/ea-2045-draft-environmental-assessment.), the proposed substation would have no greater effect on aviation facilities than what currently exists with the Lake Road Substation.

3. Describe any best management practices that would be employed at the proposed substation site to control for erosion and sedimentation.

Response: The Project substation would utilize urban surroundings, minimizing the overall disturbance of construction activities to less than 0.1 acre. A Stormwater Pollution Prevention Plan ("SWPP") is not required for Project substation construction due to the small acreage and limited amount of disturbance at the substation site. SWPPs usually contain specific measures for best management practices ("BMPs"), and are required for the National Pollutant Discharge Elimination System ("NPDES") general permit construction stormwater permits. Although a SWPP is not required, the Applicant is considering the following BMPs: silt fencing, fugitive dust control, and/or stabilized construction entrances. These techniques are commonly utilized in urban development projects.

4. How does the Applicant expect deliveries to occur to the proposed substation site? Would these be primarily by truck?

<u>Response</u>: Yes, delivery to the substation site would be by truck primarily, if not exclusively.

5. Describe any discussions that the Applicant has had with the City of Cleveland Water regarding the potential project, and what communications are expected in the future. (Refer to page 3-26 of the draft EA)

<u>Response</u>: The Applicant and its aquatics/fisheries expert Ed Verhamme from LimnoTech met with two Cleveland Water Department (Cleveland Water) officials (Scott Moegling and Maggie Rodgers) on August 24, 2017, at the Applicant's offices. Agreement was reached at the meeting regarding steps that will be taken by the Applicant to avoid any adverse impacts of sediment and contaminants on drinking water as a result of Project construction, and more specifically as a result of the approximate one week in duration cable-laying operation from the turbines to the shore. On September 22, 2017, the Cleveland Water Commissioner, Alex Margevicius, sent the Applicant a letter summarizing the agreement and Cleveland Water's conclusion that the Project poses low risk to drinking water ("Cleveland Water letter"). The Cleveland Water letter is attached hereto as **Attachment B** and has been sent to the federal agencies (USDOE, U.S. Army Corps of Engineers ("USACE"), U.S. Coast Guard ("USCG") for inclusion in the EA and Section 404 permitting process. It will also be submitted with the Applicant's Section 401 permit application to the Ohio Environmental Protection Agency for a Water Quality Certificate.

The Cleveland Water letter described the discussion between the participants pertaining to the construction of the wind turbines and the "potential, if unlikely, impacts on raw water quality" for two of Cleveland Water's four plants. While Cleveland Water agreed that the potential is low that there are areas of toxic material or areas of open lake placement for dredging materials that exist in the construction corridor, Cleveland Water listed the following four items the Applicant agreed to follow to ensure the safety of raw water:

- Provide Cleveland Water a minimum of three-day's notice before commencing construction of the export cable.
- Communicate with Cleveland Water on a daily basis during the cable laying.
- Not place cables in any area of open lake placement.
- Monitor for turbidity during construction activities and provide turbidity sensors for the Morgan plant buoy/sonde installation.

6. What is a typical annual maintenance schedule for the turbines?

Response: The scheduled maintenance is performed on a yearly basis. This is typically done on the anniversary of when the wind turbine generators ("WTGs") have been put into operation, with a variance of +/- 3 months. MHI Vestas Offshore Wind ("MVOW") always strives to perform such scheduled maintenance in low wind speed periods to ensure minimal production loss and provide safe working conditions for the service technicians. The scheduled maintenance takes several days to complete for each WTG. The service technician team includes 2 to 3 technicians. The length of the scheduled maintenance depends on the number of technicians performing the scheduled maintenance and the exact scope of work, which can vary from year to year. The scheduled maintenance can include various activities, such as inspections, checks, tests, adjustments, refills (of fluids), replacement (of fluids or parts), measurements, setting, and cleaning relevant to components in the tower, nacelle, and hub.

7. Provide details on any designated truck routes that would be used during construction and/or maintenance activities. (Refer to page 2-37 of the draft EA).

Response: The Applicant will be transporting the turbines components and most of the equipment by barge. Therefore, equipment transported by truck will be reduced and no large trucks will be required on the roads and bridges. As stated in the Application, the main transportation route to the Project area will be Interstate 90 and US Route 20/State Route 2. Construction traffic bound for the substation will likely use Exit 175 as the primary route, while traffic bound for the operations and maintenance ("O&M") area will most likely use the West 45th Street exits from US Route 20/State Route 2. (See Application Narrative at 131).

The final designated truck routes have not been determined; the Applicant will provide the OPSB the designated routes for any truck traffic and the final traffic plan prior to the preconstruction meeting.

8. Is the CPP parcel listed as a brownfield, and if so, are there particular steps that need to be completed in order to install the new substation at the site? If so, describe. (Refer to page 3-58 of the draft EA).

Response: The Draft EA will be updated to reflect the fact that the former CPP site referred to in the Draft EA is not the same site as the Project's substation. The address for the Project's substation is 5251 North Marginal Road, which is on the north side of the highway. The former CPP site, which is the site referenced on page 3-58 of the Draft EA is located at 5200 South Marginal Road, which is on the south side of the highway. The 5200 South Marginal Road site is the brownfield and this site has nothing to do with the proposed Project in this Application.

9. The applicant has proposed the use of ice cones on the turbine towers. Provide examples of other freshwater infrastructure where such cones have been utilized.

Response: **Attachments C-1 through C-6** reflect visuals of ice cones that have been used on other structures in freshwater.

As described in **Attachment C-7**, ice cones can be upward or downward sloping; the Applicant's will be upward sloping.

10. Following up on the Applicant's responses to Staff's initial set of questions:

a) Provide a copy of the final NRA that was referenced in response to question 6a.

Response: The Navigational Risk Assessment ("NRA") was provided as Exhibit R to the Application and was dated January 2017. The final NRA, which is dated July 2017, was included as Appendix R to the Draft EA. Attached to these responses, as **Attachment D**, is the final NRA that was included in the Draft EA. **Attachment D** supersedes and replaces Exhibit R, which was filed with the Application on February 1, 2017.

b) In response to question 6e, the Applicant refers to a one week construction period. Clarify if that is for the HDD portion, or the entirety of the electric cable installation.

Response: The export cable will take a total of 2 weeks to lay, conditions permitting. One week of this will be needed for the portion of the cable from the shore to approximately 5 miles out, which corresponds to the area most heavily used by boaters and closest to the water intake structures. This 2-week time period does not include the horizontal directional drilling ("HDD"). See response to question 5, above, regarding discussions with Cleveland Water related to this portion of the cable-laying operation.

The HDD process is separate from the electric cable installation and will be used to install the conduit under the Harbor and Breakwater to bring the cable onshore. The HDD portion of the construction is projected to take approximately 40 days and it will have no impact on users of Lake Erie.

c) **In response to question 6f, it refers to a wind speed of 27.5 miles per second. Staff assumes this is meters per second. Please confirm.**

Response: Yes, it should have read 27.5 meters per second.

d) **Following up on question 6f, if the US Coast Guard had a rescue helicopter mission near the turbines, they could contact the control center – which is to be staffed 24 hours a day – and an emergency shutdown of the turbines could occur within seconds, correct?**

Response: In the typical search and rescue situation, the turbine would be stopped under standard protocol in under 10 seconds.

e) **In response to question 10, provide a copy of any subsequent correspondence from DOC that indicates their concerns have been satisfied.**

Response: **Attachment E** to this response is the report dated September 11, 2017, from Jessica Schultz with the National Oceanic and Atmospheric Administration ("NOAA"). This report reflects that the Project will have low impact to the Cleveland Hopkins International Airport ("KCLE") radar.

f) **The response to question 2 refers to testing and commissioning of the facility. Provide details as to what transpires during these stages.**

Response: Testing and commissioning applies to all of the major elements of the Project: turbines, foundations, cable, and the substation. Each subsystem undergoes tests of features and functions of the given subsystem. These tests consist of very specific tasks and expected outcomes that are defined and developed by the manufacturer/engineer of the given subsystem. The objective of the subsystem tests is to ensure that each subsystem is performing as designed before integrating the subsystems to form the overall operating project. The integration of the subsystems occurs during the commissioning activities. The interfaces between the subsystems are enabled and verified to perform according to design. The final step of the commissioning stage is to place the entire system into actual operation. At this point, the overall project is fully operational.

Wind Turbine Generators

Testing of WTGs can be divided into 3 categories: factory tests; site acceptance tests; and performance tests. Tests are performed at various stages: 1) before the start of construction; 2) during construction; 3) during commissioning; and 4) when construction of the wind farm is completed and producing power, during the defect liability period.

Factory Acceptance Tests ("FATs"), are performed during the manufacturing of the WTGs and the other main equipment of the wind farm (such as the substation main transformer). The most usual tests are:

- Towers (dimensional inspection, coating, non-destructive reports, etc.)
- Electrical components (generator, transformer, converter system, etc.)
- Mechanical components (gear box, yaw and pitch systems, etc.)

Site acceptance tests occur at the staging area (Port of Cleveland) where the Project components arrive, much like an incoming receiving inspection, and then once installed offshore. A very long list of items is checked at this point. Some of the key ones are run tests with the WTG connected and producing power, verification of protection systems, tests of power measurements, plus many mechanical tests. Basically, you want the turbine to work and produce many hours in a row (200, 300 or more) without faults. There must be sufficient wind available to perform the test.

There is also a separate commissioning for the main transformer, the substation, protection systems, power measure equipment, medium voltage switchgear, and the cables.

Tests on completions are for the full wind farm. The whole system has to work and generate power without failures for many hours. Among other things you want to confirm are that the main transformer can deliver all the power without overheating, abnormal losses, etc. During this phase, the Supervisory Control and Data Acquisition ("SCADA") system is assessed as well.

Performance tests are the last tests when the project is up and running. This group includes tests to measure availability, power curve, and acoustic noise level. "Availability" of the whole wind farm is assessed. Availability means that the wind farm (and each and every wind turbine) is operating above 95 percent of the time.

Commissioning of WTGs is a comprehensive and systematic process to verify that the turbine systems perform as designed to meet the owner's requirements. Commissioning during the construction and warranty phases is intended to achieve the following specific objectives to verify and document that: 1) equipment is installed and started per the manufacturer's recommendations and the technical specifications requirements; 2) equipment and systems receive complete operational checkout by installing contractors; and 3) equipment and system perform as expected.

The "commissioning" of a wind turbine is a set of activities performed to confirm that the wind turbine has been correctly installed and is ready for energy production. You normally need to have completed the grid connection to do the commissioning.

The various parties (i.e., developer, turbine manufacturer, construction contractor, etc.) are assigned very specific responsibilities during the testing and commissioning phases by contract. After systems have been commissioned to the satisfaction of the owner, architect/engineer, contractor, and equipment manufacturers, the systems will be considered commissioned and ready for operation.

Cable

The steps to testing and commissioning a medium voltage cable include many steps, which are set forth below. The resource for this information is the Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems (NETA 2009).

1. Visual and Mechanical Inspection

   a. Compare cable data with drawings and specifications.

   b. Inspect exposed sections of cables for physical damage.

   c. Inspect bolted electrical connections for high resistance using one or more of the following methods:

      i. Use of a low-resistance ohmmeter in accordance with manufacturer's specification.

      ii. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data

      iii. Perform a thermographic survey. (NOTE: Remove all necessary covers and use appropriate caution, safety devices, and personal protective equipment.)

   d. Inspect compression-applied connectors for correct cable match and indentation.

   e. Inspect shield grounding, cable supports, and terminations.

   f. Verify that visible cable bends meet or exceed Insulated Cable Engineers Association ("ICEA") and manufacturer's minimum published bending radius.

   g. Inspect fireproofing in common cable areas.

   h. If cables are terminated through window-type current transformers, inspect to verify that neutral and ground conductors are correctly placed and that shields are correctly terminated for operation of protective devices.

i. Inspect for correct identification and arrangements.

j. Inspect cable jacket and insulation condition.

2. Electrical Tests

a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter, if applicable, in accordance with Section 1.1.

b. Perform an insulation-resistance test individually on each conductor with all other conductors and shields grounded. Apply voltage in accordance with manufacturer's published data.

c. Perform a shield-continuity test on each power cable.

d. In accordance with ICEA, International Electrotechnical Commission, Institute of Electrical and Electronics Engineers, and other power cable consensus standards, testing can be performed by means of direct current, power frequency alternating current, or very low frequency alternating current. These sources may be used to perform insulation-withstand tests, and baseline diagnostic tests such as partial discharge analysis, and power factor or dissipation factor. The selection shall be made after an evaluation of the available test methods and a review of the installed cable system.

Some of the available test methods are listed below:

i. Dielectric Withstand:

- Direct current ("DC") dielectric withstand voltage
- Very low frequency ("VLF") dielectric withstand voltage
- Power frequency (50/60 hertz ['Hz"]) dielectric withstand voltage

ii. Baseline Diagnostic Tests:

- Power factor/ dissipation factor (tan delta):
    - Power frequency (50/60 Hz)
    - VLF
- DC insulation resistance

- Off-line partial discharge:
  - Power frequency (50/60 Hz)
  - VLF

3. Test Values

a. Test Values – Visual and Mechanical

i. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.

ii. Bolt-torque levels should be in accordance with manufacturer's published data.

iii. Results of the thermographic survey.
(NOTE: Remove all necessary covers prior to thermographic inspection. Use appropriate caution, safety devices, and personal protective equipment.)

iv. The minimum bend radius to which insulated cables may be bent for permanent training shall be in accordance with manufacturers' specifications.

b. Test Values – Electrical

i. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.

ii. Insulation-resistance values shall be in accordance with manufacturer's published data. Values of insulation resistance less than this table or manufacturer's recommendations should be investigated.

iii. Shielding shall exhibit continuity. Investigate resistance values in excess of ten ohms per 1000 feet of cable.

iv. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.

v. Based on the test methodology chosen, refer to applicable standards or manufacturer's literature for acceptable values.

Substation

The following are the testing and commissioning steps contained in the University of Michigan's ("U of M") School of Architecture, Engineering, and Construction. These are generic standards that would be applicable to substations universally.

Unit substation Energization Requirements Throughout Construction Period
Substation Room

TASK	REQUIREMENT
1.	Substation room is clean and shall remain so throughout the remainder of construction. Room is free of dirt, debris, and stored materials.
2.	Equipment protected from dirt, dust, water, and physical damage at all times.
3.	Equipment protected from moisture with internal heat sources per manufacturer's instructions.
TASK	**REQUIREMENT**
4.	Electrical contractor notified Project manager substation room is complete and secure per contract documents.
5.	Substation room dry and free of water infiltration.
6.	Masonry and drywall work complete.
7.	Fireproofing of steel complete.
8.	Fire stopping of floor, wall, ceiling, and duct bank penetrations complete.
9.	Painting of floor and walls complete.
10.	Ventilation system complete and operational including clean filters (or temporary ventilation provided).
11.	Sprinkler system complete, passed pressure testing, and operational.
12.	Ductwork and piping not serving room are routed outside of room or are segregated from room.
13.	Fire wrapping and labeling of primary cables complete.

14.	Lighting complete, levels are per National Electric Code ("NEC"), fed from emergency circuits, and switched.
15.	Emergency lighting battery pack units complete.
16.	Receptacles complete and fed from emergency circuits.
17.	Fire alarm system complete (or temporary fire detection and sprinkler flow switch provided).
18.	MOSCAD complete or temporary U of M Division of Public Safety and Security notification system provided (for monitoring of the room smoke detectors and water flow switches via fire alarm system).
19.	Building Automation Systems Direct Digital Control ("DDC") inputs and outputs complete (or temporary DDC monitoring and controls provided if required).
20.	IT data outlets complete (or temporary data communications provided if required).
21.	Proper egress door placement as required by NEC.
22.	Egress doors swing outward, are equipped with panic hardware and door sweeps, and lead to a path of egress.
23.	Doors contain NEC required signage ("DANGER - HIGH VOLTAGE - KEEP OUT!").
24.	Substation room complete and secured utilizing a U-M XW-7 lock core
25.	NEC working space around primary gear and transformers (5'-0" min. front and rear, 2'-0" min. sides, 6'-6" min. AFF).
26.	NEC working space around secondary gear (3'-6" min. front and rear, 2'-0" min. sides, 6'-6" min. AFF).
27.	If room is below grade, floor drain provided adjacent to wall with floor sloped towards it, complete and operational.
28.	If room is below grade, floor drain cleanout and backwater check valve provided outside, complete and operational.
29.	If room is below grade, water detector provided adjacent to wall and floor drain, and connected to DDC.

30.	Wood and glass framed copies of as-built one line diagram and riser diagram provided on front wall.
31.	Type ABC fire extinguishers provided at each exit door.

Housekeeping Pad
Grounding

TASK	REQUIREMENT
32.	Housekeeping pad level within 1/8" overall, proper thickness, conforms to footprint of equipment, extends no more than 4"from equipment, and not in egress path.
33.	Leveling channels installed (if required).
34.	Equipment anchored to pad.

TASK	REQUIREMENT
35.	Ground grid has been tested and results accepted.
36.	Substation room ground bus bar complete.
37.	Exothermic weld or non-reversible connections at room ground bus bar completed.
38.	Grounding electrode conductors sized per NEC and attached in substation and to room ground bus bar.
39.	Grounding electrode conductors connected to building steel, water pipe, ground grid, foundation steel, duct bank ground conductors and other available electrodes.
40.	Bonding of primary duct ends and cable trays complete.
41.	Bonding of mechanical equipment and piping complete.

Substation Overall Assembly

TASK	REQUIREMENT
42.	Shop drawings and O&M manuals submitted, reviewed, and approved by UPE Primary Systems Group ("PSG") and Engineer, Commissioning Authority, and by A/E (project engineer).

43.	Final short circuit, protective device coordination and preliminary arc flash study, and protective device settings table approved by A/E and submitted to contractor and Commissioning Authority.
44.	Substation complies with approved shop drawings.
45.	Assembly complete and front aligned.
46.	Assembly free of damage.
47.	Mimic bus provided as specified and complete.
48.	Proper phasing from section to section (primary / transformer/secondary)
49.	Manufacturer and Contractor installed bus bar bolts torqued to manufacturer's recommendations (Contractor to mark each bolt with felt marker after checking torque).
50.	Barriers provide separation between sections (where required).
51.	Substation equipment is clean inside and outside (including top).
52.	Cubicles clean on inside (Contractor to mark with tape).
53.	Breaker lifting hoist complete and tested for lift and travel.
54.	Kirk Key system tested for proper operation.
55.	Extra Kirk Keys turned over to Commissioning Authority.
56.	Covers are in place and secured with full complement of bolts.
57.	Primary, transformer and secondary sections UL labeled and primary section labeled as service entrance equipment.
58.	Fire pump tap section has barriers separating it from other substation sections and has proper signage.

Substation Primary Sections

TASK	REQUIREMENT
59.	Primary switches nameplate data complete, legible, and on front of equipment.

60.	Cables are installed, terminated and supported where required.
61.	Phasing is correct (A-B-C from front-to-back, left-to-right, top-to-bottom).
62.	Primary terminations inspected.
63.	Exposed bus taped or covered.
64.	Primary switches cleaned.
65.	Primary fuses installed and match size specified by A/E and reviewed by UPE Primary Systems Engineer.
66.	Spare primary fuses provided (typically in rear compartment of fused primary switch or in cabinet on wall).
67.	Spare fuses match fuses in primary switch.
68.	Primary equipment tested by Independent Testing Agency and reports approved by A/E and reviewed by UPE Primary Systems Engineer, and submitted to Commissioning Authority.
69.	Primary cable tested by Independent Testing Agency and reports approved by UPE Primary Systems Engineer, and submitted to Commissioning Authority.

Substation Transformer Sections

TASK	REQUIREMENT
70.	Transformer name plate data complete, legible, and on front of equipment.
71.	Bonding jumper installed from ground bus to neutral and verified separated in remainder of distribution system.
72.	Shipping bolts adjusted to comply with manufacturer's instructions.
73.	Transformers cleaned.
74.	Transformer temperature monitor mounted in specified case, tested and calibrated.
75.	Cooling fans operational.
76.	Transformer tested by Independent Testing Agency and reports approved by UPE Primary Systems Engineer, and submitted to Commissioning Authority.

Substation Secondary Section

TASK	REQUIREMENT
77.	Secondary nameplates data complete, legible, and on front of equipment.
78.	Phasing is correct (A-B-C from front-to-back, left-to-right, and top-to-bottom).
79.	Breakers and cubicles cleaned.
80.	Secondary equipment and cables tested by Independent Testing Agency and reports approved by A/E and submitted to Commissioning Authority.
81.	Independent Testing Agency labels installed on every breaker indicating the breaker has met the testing requirements and trip settings have been set.
82.	Breaker trip units set and tested by Independent Testing Agency to values provided by A/E and reports approved by A/E and submitted to Commissioning Authority.
83.	Contractor has installed breakers and verified settings after accepting delivery from testing agency. Breakers rack in and out smoothly, and can be operated.
84.	Current transformers (“CTs”) located in secondary section with proper ratios and nameplates visible.
85.	CT wiring and associated connections completed and continuity tested.
86.	Kilowatt hour (“kWh”) meter mounted in specified case.
87.	KWh meter, ammeter, voltmeter, switches, potential transformers, CTs and CT shorting bars installed, connected, operational and calibrated.
88.	Neutral conductors terminated on neutral bus and grounding conductors terminated on ground bus with no interconnection.

Substation Startup

TASK	REQUIREMENT
89.	Protective device settings and coordination study submitted by A/E to U-M UPE Primary Systems Engineer and Commissioning Authority. Study shall include final short circuit and preliminary arc flash reports.
90.	Contractor furnished and install arc flash labels.
91.	Commissioning Authority verified fuses and equipment settings are correct.

92.	Electrical contractor verified that substation is ready for energization and notified project manager.
93.	Factory test reports submitted to Commissioning Authority.
94.	O&M manual submitted and approved UPE Primary Systems Engineer.
95.	Training plan submitted and training scheduled on equipment being energized. Training shall not occur within the days that UPE high voltage is preparing for energization.
96.	Field testing of unit substation completed (contractor).
97.	Field tests of unit substation approved by A/E.
98.	Certification from vendor field service representative received.
99.	Approved test results submitted to U-M UPE Primary Systems Engineer.
100.	Operation of transfer controls and interlocks per controls sequences of operation.
101.	If entire substation will not be energized at this time, proper lock out / tag out procedures have been implemented and signage installed to prevent unintended
102.	U-M Construction Management AEC Electrical inspection approval received.
103.	U-M Commissioning Authority approval received.
104.	U-M UPE approval received.
105.	Project Manager submitted a "Work Control Startup Request" a minimum of 10 days in advance.
106.	Signed "Service Request Form" submitted by Project Manager to U-M UPE EOE Manager a minimum of 10 days in advance.
107.	Start-up notification given to Commissioning Authority 10 days in advance of scheduled start-up.
108.	Substation temporary grounds removed.
109.	Electrical Contractor's Lockout/Tagout devices removed in compliance with Contractor's and UPE's Lockout /Tagout program.
110.	Control and operation of 15kV loop switches become the responsibility of U-M UPE High Voltage electricians.

111.	After substation is energized, the room shall not be used for material storage or coffee breaks. The room shall be kept locked and shall be accessible only to qualified
	Shading indicates items from UPE unit substation energization checklist.

g) Applicant estimated PJM's SIS would be released approximately September 30, 2017. Please forward to Staff as soon as possible thereafter.

Response: We have no update at this time. We are still waiting for an update from PJM Interconnection, LLC.

11. Provide any other project updates that have not been captured by the OPSB application and supplements filed to date.

Response:

a) Studies and analyses: Various studies and analyses have been completed subsequent to the filing of the OPSB permit application. These include: the Draft EA, which was posted to the Federal Register on August 18, 2017, and is attached hereto as **Attachment A**; and various studies, which were attached as Appendices to the Draft EA, which were not attached to the OPSB Application. The new studies attached to the EA include a Sediment Quality Memo (Appendix G to the EA) and the Biological Assessment (Appendix M to the EA). In addition, the NRA (Appendix R to the EA) is attached hereto as **Attachment D** and referred to in response to question 10(a) above. To view the full list of Appendices to the Draft EA go to https://energy.gov/nepa/downloads/ea-2045-draft-environmental-assessment.

The EA was prepared by CH2M for the USDOE, USACE and USCG. An Informational Open House was held on September 6, 2017, at which time the public had the opportunity to review posters laying out the conclusions of the Draft EA. The Draft EA concludes that the Icebreaker Wind Project will have no significant adverse environmental impacts, and that most impacts will be short term. The EA recognized but did not analyze the many positive environmental and economic benefits of adding clean energy, with zero air and climate emissions, to the grid. Public comments can be submitted to the USDOE until October 10, 2017.

b) Additional approvals: The Applicant has received additional approvals and permits since the OPSB Application was submitted, including from the International Joint Commission (June 30, 2017) (See **Attachment F**) and from the USACE under Section 408 (September 13, 2017) (See **Attachment G**). In addition, the US Fish and Wildlife Service has completed its Endangered Species Act section 7 consultation with the USDOE pursuant to the federal National Environmental Protection Act process, and has determined that the project is "not likely to adversely affect" any threatened or endangered species (September 14, 2017) (See **Attachment H**). As noted in response to question 9(e) above, and attached hereto as **Attachment E**, NOAA has determined that the project does not pose any risk to its radar.

c) The Draft EA and Section 404 permit application, which is attached hereto as **Attachment I**, contain a potential alternative method of Mono Bucket ("MB") installation that provides for use of two separate heavy lift vessels, one for the MB and the other for the turbine (See **Attachment A**, Draft EA, at 2-9; **Attachment I** at 9-11).

d) The Draft EA and Section 404 permit application contain updated drawings of the HDD process and videos showing both the HDD installation process and the jet plow cable-laying process (See **Attachment A** Draft EA at 2-14 through 2-16, Figures 2-11 and 2-12; **Attachment I** at 10-16, Appendices A-B).

e) The Inadvertent Return Contingency Plan includes updates to the containment and remediation measures. This was included in the Section 404 permit application (See **Attachment I** at 22-23, Appendix D).

f) The Coastal Zone Consistency filing was submitted with the Section 404 Application, and has been sent to the Ohio Department of Natural Resources ("ODNR") for review.

g) The Applicant filed its first quarterly reports with ODNR, pursuant to the fisheries/aquatic resources and bird/bat Memorandum of Understanding, on September 15, 2017. Discussions with ODNR are ongoing on topics relating to pre- and post-construction monitoring for birds and bats, particularly with regard to use of vessel based radar pre-construction, aerial bird surveys, post-collision monitoring options, and completion of the bat acoustic monitoring.

Respectfully submitted,

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CERTIFICATE OF SERVICE

The Ohio Power Siting Board's e-filing system will electronically serve notice of the filing of this document on the parties referenced in the service list of the docket card who have electronically subscribed to this case. In addition, the undersigned certifies that a copy of the foregoing document is also being served upon the person below via electronic mail this 2nd day of October, 2017.

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Icebreaker Windpower, Inc.
Case No. 16-1871-EL-BGN
Data Responses to Staff's 2nd Set of Interrogatories
October 2, 2017

Attachment A
Narrative Draft Environmental Assessment

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DOE/EA-2045

Draft
Environmental Assessment
LEEDCo Project Icebreaker
Lake Erie, City of Cleveland, Cuyahoga County, Ohio

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BUILDING STRONG

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August 2017

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SUMMARY

DOE Proposed Action: Expenditure of federal funding to support the development, including design, construction, and commissioning of an offshore wind advanced technology demonstration project.

Type of Document: Draft Environmental Assessment (EA)

Lead Agency: U.S. Department of Energy (DOE)

Cooperating Agencies: U.S. Army Corps of Engineers (USACE), Buffalo District
U.S. Coast Guard (USCG)

Project Location: Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Comment Opportunities: Comments on this Draft EA are accepted through October 10, 2017.

For Further Information: U.S. Department of Energy
Golden Field Office
National Environmental Policy Act (NEPA) Division
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Golden, CO 80401

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Summary:

Lake Erie Energy Development Corporation's (LEEDCo's) Project Icebreaker (also known as Icebreaker Wind) was competitively selected for a U.S. Department of Energy (DOE) financial assistance award under Funding Opportunity Announcement *U.S. Offshore Wind: Advanced Technology Demonstration Projects (*Number DE-FOA-0000410). DOE is proposing to provide funding to LEEDCo to support the development of the demonstration-scale offshore wind project that would be located approximately 8 miles off the shore of Cleveland, Ohio in Lake Erie. This Draft Environmental Assessment (EA) evaluates the potential environmental impacts of providing funding to LEEDCo to support the development of the offshore wind advanced technology demonstration project (the Proposed Action), and evaluates the impacts that could occur if DOE did not provide funding (No-Action Alternative). The Proposed Project would consist of six wind turbine generators erected on foundations constructed on the Lake Erie lakebed that would generate approximately 21 megawatts (MW) of electricity. Inter-array cables (connecting the wind turbines) and an export cable (transmitting electricity generated by the wind turbines to the shore) would be buried in the lakebed, and the export cable would be brought ashore entirely under the Cleveland Harbor and the Cleveland Harbor breakwater to a new electrical substation located at the existing Lake Road Substation. The energy generated by the Proposed Project would deliver power to a single point of interconnection on the existing Cleveland Public Power electric grid – 138 kilovolt (kV) Lake Road Substation.

ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
AIS	Automatic Identification System
APE	Area of Potential Effect
ATON	Aids to Navigation
AWOIS	Automated Wreck and Obstruction Information System
BOEM	Bureau of Ocean Energy Management
BP	before present
CAA	Clean Air Act
CD	chart datum
CDF	confined disposal facility
CEI	Cleveland Electric Illuminating Co.
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CPP	Cleveland Public Power
dB	decibel
dBA	decibel (A-weighted scale)
DO	dissolved oxygen
DOC	U.S. Department of Commerce
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
DP	dynamically positioned
DSM	digital surface model
EA	Environmental Assessment
EDR	Environmental Design & Research
EERE	Energy Efficiency and Renewable Energy
EIS	Environmental Impact Statement
EMF	electromagnetic field
EPA	U.S. Environmental Protection Agency
EPR	ethylene propylene rubber
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FOA	Funding Opportunity Announcement
FONSI	Finding of No Significant Impact
FR	Federal Register
GHG	greenhouse gas
GLT	Great Lakes Towing
GPS	global positioning system
HDD	horizontal directional drilling
HDPE	high density polyethylene
Hz	hertz
I-	Interstate
IBA	Important Bird Area
IRAC	Interdepartment Radio Advisory Committee
JEDI	Job and Economic Development Impact
kg	kilogram
km	kilometer
kV	kilovolt

LCOE	levelized cost of energy
LEC	Lake Erie Connector
LEEDCo	Lake Erie Energy Development Corporation
LiDAR	Light Detection and Ranging
μPa	micropascals
μT	micro tesla units
m/s	meters per second
MB	Mono Bucket
mg/L	milligrams per liter
MHz	megahertz
MOU	Memorandum of Understanding
MP/FW	monopile with a friction wheel
mph	miles per hour
MW	megawatts
MWh	megawatt-hours
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NEXRAD	next-generation radar
NHL	National Historic Landmark
NOAA	National Oceanic and Atmospheric Administration
NO_X	oxides of nitrogen
NPS	National Park Service
NREL	National Renewable Energy Lab
NRHP	National Register of Historic Places
NSPS	New Source Performance Standard
NTIA	National Telecommunications and Information Administration
O&M	Operations and Maintenance
OAC	Ohio Administrative Code
OAI	Ohio Archaeological Inventory
ODNR	Ohio Department of Natural Resources
ODOT	Ohio Department of Transportation
OEPA	Ohio Environmental Protection Agency
OHI	Ohio Historic Inventory
OPSB	Ohio Power Siting Board
ORC	Ohio Revised Code
OSHA	U.S. Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
the Port	Port of Cleveland
Proposed Action	Expenditure of federal funding to support the development, including design, construction, and commissioning of the offshore wind advanced technology demonstration project
Proposed Project	demonstration-scale offshore wind project in Lake Erie of six wind turbine generators and the necessary electrical transmission facilities to connect the wind turbine generators to a new electrical substation, located in Cleveland, Ohio, for interconnection to the regional power grid
ROV	remotely operated vehicle
SPCC	spill prevention, containment and countermeasure
SWAP	Source Water Assessment and Protection
TSS	total suspended solids
USACE	U.S. Army Corps of Engineers

USC	U.S. Code
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
USS	United States Ship
VHF	very high frequency
VIA	Visual Impact Assessment
WEST	Western EcoSystems Technology, Inc.
WNS	white-nose syndrome
XLPE	cross-linked polyethylene

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SECTION 1 INTRODUCTION

1.1 National Environmental Policy Act

The National Environmental Policy Act (NEPA; 42 U.S. Code [USC] 4321 et seq.), the Council on Environmental Quality's (CEQ's) NEPA regulations (40 Code of Federal Regulations [CFR], 1500 to 1508), and the U.S. Department of Energy's (DOE's) NEPA-implementing procedures (10 CFR Part 1021) require that DOE consider the potential environmental impacts of a proposed action. This requirement applies to DOE's decisions about whether to provide federal funding through financial assistance agreements.

In compliance with these regulations, this Draft Environmental Assessment (EA):

- Examines the potential environmental impacts of the Proposed Action and the No-Action Alternative;
- Identifies unavoidable adverse environmental impacts of the Proposed Action;
- Describes the relationship between local short-term uses of the human environment and the maintenance and enhancement of long-term productivity; and
- Characterizes any irreversible and irretrievable commitments of resources that would be involved should DOE decide to implement its Proposed Action.

DOE must meet these requirements before making a final decision to proceed with any proposed federal action that could cause adverse impacts to human health or the environment. This Draft EA provides DOE and other decision makers the information needed to make an informed decision about the Proposed Action. The Draft EA evaluates the potential individual and cumulative impacts of the Proposed Action. An evaluation of a No Action Alternative is required under the DOE NEPA implementing regulations and is evaluated in this Draft EA.

1.2 Background

The Office of Energy Efficiency and Renewable Energy (EERE) leads DOE's efforts to develop solutions for clean-energy technologies that support a strong and prosperous America powered by clean, affordable, and secure energy. On February 7, 2011, DOE released the National Offshore Wind Strategy, in partnership with the U.S. Department of the Interior (DOI). Subsequently, in September 2016, DOE and DOI developed a new National Offshore Wind Strategy. The 2016 Strategy includes and addresses three critical objectives in pursuit of overcoming barriers to commercial offshore wind development in the U.S.:

- Reducing the costs and technical risks associated with domestic offshore wind development;
- Supporting stewardship of U.S. waters by providing regulatory certainty and understanding and mitigating environmental risks of offshore wind development; and
- Increasing understanding of the benefits and costs of offshore wind energy.

In May 2016, the Lake Erie Energy Development Corporation's (LEEDCo's) Icebreaker Project was one of three projects that DOE identified from its offshore wind portfolio that had demonstrated significant progress toward being successfully completed. The LEEDCo Project was competitively selected for a DOE financial assistance award under the DOE EERE Golden Field Office fiscal year 2012 funding opportunity announcement *U.S. Offshore Wind: Advanced Technology Demonstration Projects* under Funding Opportunity Announcement (FOA) Number DE-FOA-0000410 (DOE, 2012).

The primary goals of the Advanced Technology Demonstration Projects are to:

- Install innovative offshore wind systems in U.S. waters in the most rapid and responsible manner possible; and
- Expedite the development and deployment of innovative offshore wind energy systems with a credible potential for lowering the levelized cost of energy (LCOE).

By providing funding, technical assistance, and government coordination to accelerate deployment of these demonstration projects, DOE can help eliminate uncertainties, mitigate risks, and support the private sector in creating a robust U.S. Offshore Wind Energy Industry. DOE is using projects selected under this FOA to assess progress towards these national-scale goals.

DOE is proposing to provide funding to LEEDCo to support the development of a demonstration-scale offshore wind project that would be located approximately 8 miles off the shore of Cleveland, Ohio in Lake Erie. This demonstration-scale offshore wind project would consist of six wind turbine generators that would generate approximately 21 megawatts (MW) of electricity and the necessary electrical transmission facilities (i.e., underwater and underground cable or electric collection lines) to connect the wind turbine generators to a new electrical substation, located in Cleveland, Ohio, for interconnection to the regional power grid (Proposed Project). The electrical energy generated from the Proposed Project would be sold to Cleveland Public Power and into the PJM[1] Interconnection wholesale market.

DOE has prepared this Draft EA to evaluate the potential environmental impacts of providing funding to LEEDCo to support the development, including design, construction, and commissioning of the offshore wind advanced technology demonstration project (the Proposed Action). The operation, maintenance, and eventual decommissioning of the Proposed Project is considered a connected action under 40 CFR 1508.25 and will be analyzed in this EA as part of the Proposed Action. This Draft EA also evaluates the impacts that could occur if DOE did not provide funding (No-Action Alternative), under which scenario DOE assumes the Proposed Project would not proceed. Although this Proposed Project could proceed if DOE decided not to provide funding, the DOE has assumed, for the purposes of comparison in this Draft EA, that the Proposed Project would not proceed without its funding. If the Proposed Project proceeded without DOE funding, the potential impacts would be essentially identical to those under the DOE Proposed Action (that is, providing funding that enables the Proposed Project to proceed).

1.3 Cooperating Agencies

There are two cooperating agencies involved in the preparation of this draft EA: the U.S. Army Corps of Engineers (USACE) and the U.S. Coast Guard (USCG). The USACE is a cooperating agency because of their regulatory and permitting authority under Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act. The USCG is a cooperating agency because of their responsibility and authority related to navigation and safety in the waters of Lake Erie.

[1] PJM is a regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of 13 states, including Ohio, and the District of Columbia.

1.3.1 USACE Regulatory Authorities

The USACE has regulatory and permitting authority under Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403) and Section 404 of the Clean Water Act (33 USC 1344). Section 10 pertains to authorization of structures or work in or affecting navigable waters of the U.S. Section 404 regulates discharges of dredged or fill material into waters of the U.S., including wetlands. The Proposed Project would require Section 10 and Section 404 permits, and an application for these permits will be submitted to the USACE.

Based on these authorities, USACE is working as a cooperating federal agency with the DOE and the USCG in the federal permitting process. USACE will also continue to work with interested and involved local, state, and federal agencies throughout the permit process.

In addition to the Section 10 and 404 regulatory and permitting authority described above, Section 14 of the Rivers and Harbors Act of 1899, as amended, and codified in 33 USC 408 (Section 408) requires permission for any alterations to, or temporary or permanent occupation or use of, USACE federally authorized civil works project. Specifically, the portion of the Proposed Project that is proposed to be located beneath the Cleveland Harbor Navigation Channel and breakwater is subject to Section 408 review.

1.3.2 USCG Regulatory Authorities

The USCG has regulatory responsibilities under the Ports and Waterways Safety Act of 1972 to conduct studies to ensure safe access routes for vessel traffic in U.S. waters. This requirement is further detailed in the USCG Navigation and Inspection Circular No. 02-07, *Guidance on the Coast Guard's Roles and Responsibilities for Offshore Renewable Energy Installations* (USCG, 2007). This circular advises the USCG to review and evaluate the potential impacts of the Proposed Project with respect to both vessel navigation and USCG missions. The USCG will follow these guidelines and continue to assist the DOE and the USACE as a cooperating agency in the federal permitting process for the Proposed Project.

1.4 Purpose and Need

1.4.1 DOE Purpose and Need

Through the *U.S. Offshore Wind: Advanced Technology Demonstration Projects* FOA, DOE is providing support for regionally diverse advanced technology demonstration projects through collaborative partnerships to support DOE's and DOI's National Offshore Wind Strategy. The purpose of the Advanced Technology Demonstration Projects FOA is to verify innovative designs and technology developments and validate full performance and cost under real operating and market conditions. The Proposed Action would fulfill DOE's goals of installing innovative offshore wind systems in U.S. waters in the most rapid and responsible manner possible and expedite the development and deployment of innovative offshore wind energy systems with a credible potential for lowering the LCOE.

Offshore wind energy can help the nation reduce its greenhouse gas emissions, diversify its energy supply, provide cost-competitive electricity to key coastal regions, and stimulate revitalization of key sectors of the economy. However, if the nation is to realize these benefits, key challenges to the development and deployment of offshore wind technology must be overcome, including the relatively high current cost of energy, technical challenges surrounding installation and grid interconnection, and the untested permitting or approval processes. Accordingly, there is a need to reduce the cost of energy through technology development to ensure competitiveness with other electrical generation sources; and to reduce deployment timelines and uncertainties limiting U.S. offshore wind project development.

1.4.2 USACE Purpose and Need

For purposes of NEPA analysis, USACE considers and expresses the Proposed Project's underlying purpose and need from a public interest perspective when appropriate, but generally focuses on LEEDCo's purpose and need statement. CEQ regulations at 40 CFR 1502.13 stipulate that the purpose and need statement "shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action." The USACE exercises independent judgment in defining the purpose and need for the Proposed Project from both LEEDCo's and the public's perspectives.

The project **purpose**, as described by LEEDCo, and defined by the USACE is as follows:

- The construction of a freshwater offshore wind energy project, in order to demonstrate the technical feasibility of wind energy in Lake Erie; and
- The production of wind-powered electricity that would maximize energy production from local wind resources, in order to deliver clean, renewable electricity to the Ohio bulk power transmission system.

The Proposed Project would help meet the following LEEDCo-described and USACE-defined **needs**:

- Serve the needs of electric utilities and their customers;
- Help reduce air pollution in an area that historically has been in non-attainment for 2.5-micron particulate matter, lead, and ozone;
- Reduce greenhouse gas emissions; and
- Create local jobs and spur economic development.

As part of its review of a Department of the Army permit application, USACE is required to evaluate the LEEDCo proposal with regard to the U.S. Environmental Protection Agency (EPA) Guidelines for Specification of Disposal Sites for Dredged or Fill Material ("EPA Guidelines") at 40 CFR 230.

The USACE has determined that the **basic project purpose** for the LEEDCo proposal is: "energy generation." The overall project purpose is used by the USACE to evaluate whether there are less environmentally damaging practicable alternatives available. The Clean Water Act 404(b)(1) guidelines state that an alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purpose (40 CFR 230.10(a)(2)). This evaluation applies to all Waters of the U.S., not just special aquatic sites.

Determination of the overall project purpose is the USACE's responsibility; however, LEEDCo's needs and the type of project being proposed are considered by the USACE in reaching this determination. The **overall project purpose** is defined by the USACE as: "the development of a small-scale off-shore wind energy demonstration project in Lake Erie." This definition is specific enough to define LEEDCo's needs, but not so restrictive as to constrain the range of alternatives that must be considered under the EPA Guidelines.

1.4.3 USCG Purpose and Need

The USCG is responsible for maritime safety, security, and environmental stewardship in U.S. ports and waterways. USCG's purpose and need is to review and analyze potential impacts of the Proposed Project with respect to navigational safety and possible impacts on USCG missions and to ensure that the Proposed Project would not impede the maritime transportation system on Lake Erie, while facilitating new energy generation possibilities with the development of an offshore wind energy demonstration project.

1.5 Public and Agency Involvement

NEPA requirements help ensure that environmental information is made available to the public during the decision-making process and prior to actions being taken. The premise of NEPA is that the quality of decisions will be enhanced if proponents provide information to the public and involve the public in the planning process.

DOE, along with the USACE and USCG, held a public information and Draft EA scoping meeting in Lakewood, Ohio on September 28, 2016. The public comment period for scoping of the Draft EA remained open until October 21, 2016. A comment response matrix and a copy of agency comments received during the public scoping period is attached in Appendix A. All comments were considered in the preparation of the Draft EA. In addition, this Draft EA will be made available for public comment prior to issuance of a Final EA. Any public comments received will be considered during the preparation of the Final EA.

Public input and agency consultation has also been completed as part of the design and permitting process for the Proposed Project and is described in Section 2.5 of this Draft EA.

SECTION 2 PROPOSED ACTION AND ALTERNATIVES

2.1 Proposed Action

DOE is proposing to authorize the expenditure of federal funding by LEEDCo to support the development, including design, construction, and commissioning of the offshore wind advanced technology demonstration project (the Proposed Action) as described in the following section. The operation, maintenance, and eventual decommissioning of the Proposed Project is considered a connected action under 40 CFR 1508.25 and will be analyzed in this EA as part of the Proposed Action. DOE has authorized LEEDCo to use federal funding for preliminary activities, which include Draft EA preparation, information gathering, site analysis, design simulations, permitting, and environmental surveys. Such activities are associated with the Proposed Action and do not significantly impact the environment nor do they represent an irreversible or irretrievable commitment by DOE in advance of its completion of the EA and subsequent decision to issue a Finding of No Significant Impact (FONSI) or to recommend the preparation of an Environmental Impact Statement (EIS).

2.2 Project Icebreaker - Proposed Project

2.2.1 Description of the Proposed Project

The Proposed Project would consist of the construction, operation, maintenance, and eventual decommissioning of a 21 MW (approximate) offshore wind advanced technology demonstration project, consisting of six wind turbine generators, submerged electric collection cables, and a substation (Figure 2-1)[2]. The energy generated by the Proposed Project would deliver power to a single point of interconnection on the existing Cleveland Public Power (CPP) electric grid – 138 kilovolt (kV) Lake Road Substation (Figure 2-2).

The turbines would be erected on foundations constructed on the Lake Erie lakebed, on leased submerged state lands approximately 8 miles off the coast of the City of Cleveland, in Cuyahoga County, Ohio. These rights were obtained through a Submerged Lands Lease with the State of Ohio. The onshore components, including an overhead cable, underground concrete duct bank, underground cable, and new substation (collectively, Proposed Substation) would be in Cleveland, Ohio. Construction would be supported by the temporary use of the Port of Cleveland (the Port) to stage, pre-assemble, and test the turbine components and potentially to stage and assemble the foundation components, completed foundations, and submerged electric collection cables.

[2] Figure 2-1 shows seven potential wind turbine generator sites. The Proposed Project would include six wind turbine generators. The seventh site is an alternate site.

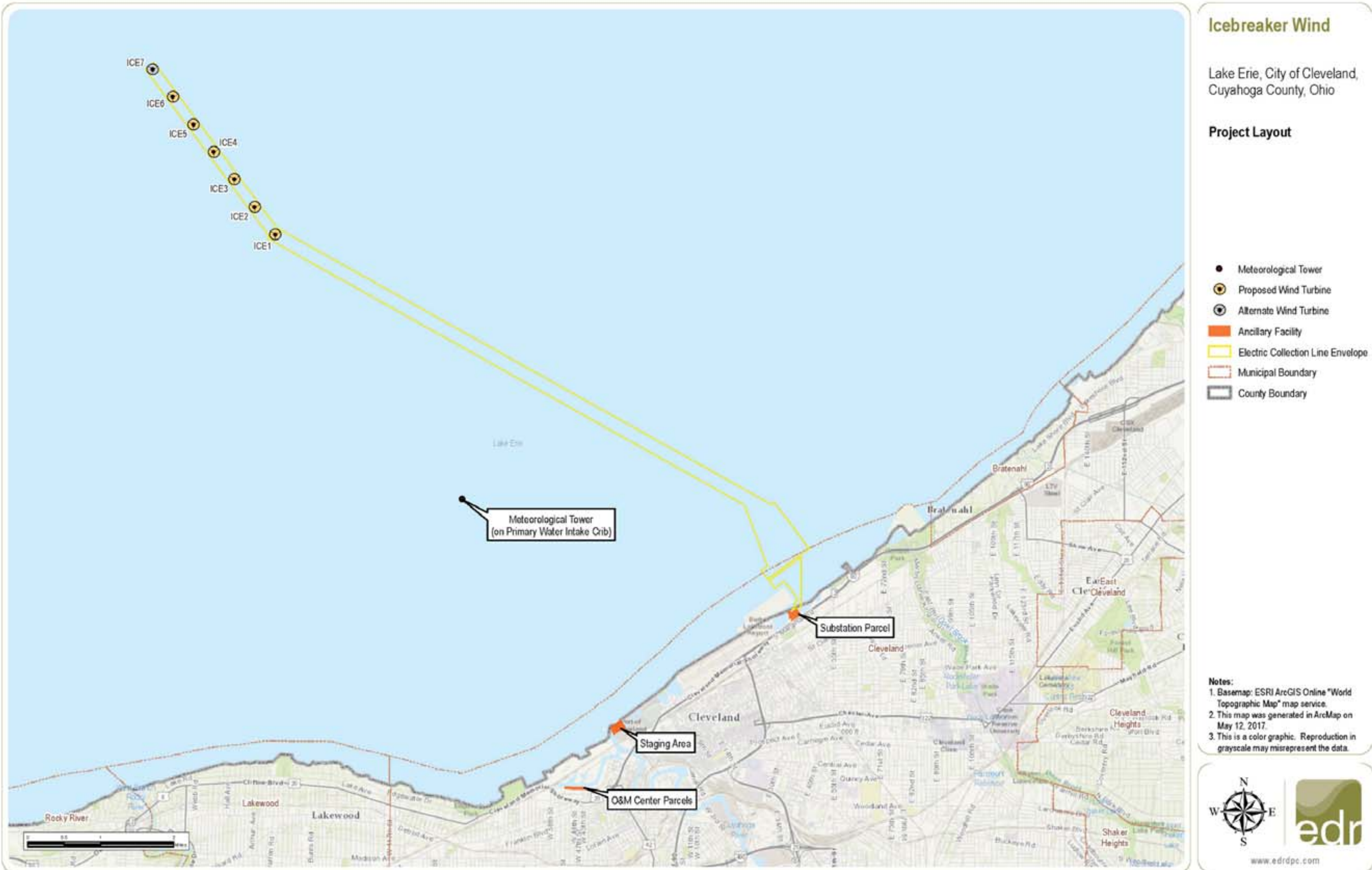


Figure 2-1. Proposed Project Icebreaker Layout

Figure 2-2. Proposed Substation Location

Each turbine would have a name plate capacity of approximately 3.5 MW for a total generating capacity of approximately 21 MW. The blade rotor diameter would be approximately 413 feet. The turbine array would be arranged in a single row generally oriented southeast to northwest. Spacing between the turbines would be approximately 2,480 feet. Each of the wind turbines would be supported by a Mono Bucket (MB) foundation. The MB foundation would be comprised of three sections: a steel skirt embedded in the lakebed, a lid section, and a shaft that resembles the elements of a standard offshore wind monopile above the mudline. The Proposed Project would expect to operate for approximately 8,200 hours annually, and have an approximate capacity factor of 41.4 percent, generating approximately 75,000 megawatt-hours (MWh) of electricity each year.

The inter-array cables that would connect the wind turbines together electrically would be linked to the export cable to transmit electricity generated by the wind turbines to the shore at a landfall in Cleveland, Ohio and then continue underground to the Proposed Substation. The Proposed Substation would be connected to the existing 138 kV system at the Lake Road Substation with an overhead cable and then transitioned to an underground concrete duct bank (Figure 2-2).

The total lake area considered as the Proposed Project Area includes the proposed turbine sites and the cable route. The area of the proposed turbine sites is approximately 4.2 acres. The area of the proposed cable route is approximately 135 acres, which consists of a 100-foot wide band along the approximately 12.1-mile cable route. The turbines and inter-array cables would be in water depths of approximately 57 to 61 feet chart datum (CD). The export cable would be in water depths of approximately 60 to no shallower than 30 feet CD and buried at least 12 feet below both the breakwater and the authorized dredge depth of the Outer Harbor Navigation Channel.

2.2.2 Wind Turbine and Foundation Design

2.2.2.1 Wind Turbine Design

The Proposed Project would consist of six Mitsubishi Heavy Industries Vestas Offshore Wind - Vestas 3.45 MW offshore wind turbines. Each wind turbine would consist of three major components: 1) the tower, 2) the nacelle, and 3) the rotor with blades. Descriptions of the major turbine components are provided as follows and illustrated in Figure 2-3. Preliminary analysis indicates that the turbines would operate for approximately 8,200 hours annually, and have an approximate capacity factor of 41.4 percent. Accounting for the total generating capacity of approximately 21 MW, anticipated operating times, and turbine capacity factors, the Proposed Project would generate approximately 75,000 MWh of electricity each year.

Table 2-1 and Figure 2-3 present the dimensions of the V126-3.45 MW in feet and meters. Hub height is the height to the center of the rotor, as measured from the chart datum water level, while total turbine height (tip height) is the height of the entire turbine, as measured from the chart datum water level to the tip of the blade when rotated to the highest position.

Table 2-1. Approximate Turbine Dimensions

Turbine Model	Hub Height	Rotor Diameter	Blade Length	Total (Tip) Height
V126-3.45 MW™ IEC IIA	83 meters (272 feet)	126 meters (413 feet)	62.9 meters (206 feet)	146 meters (479 feet)

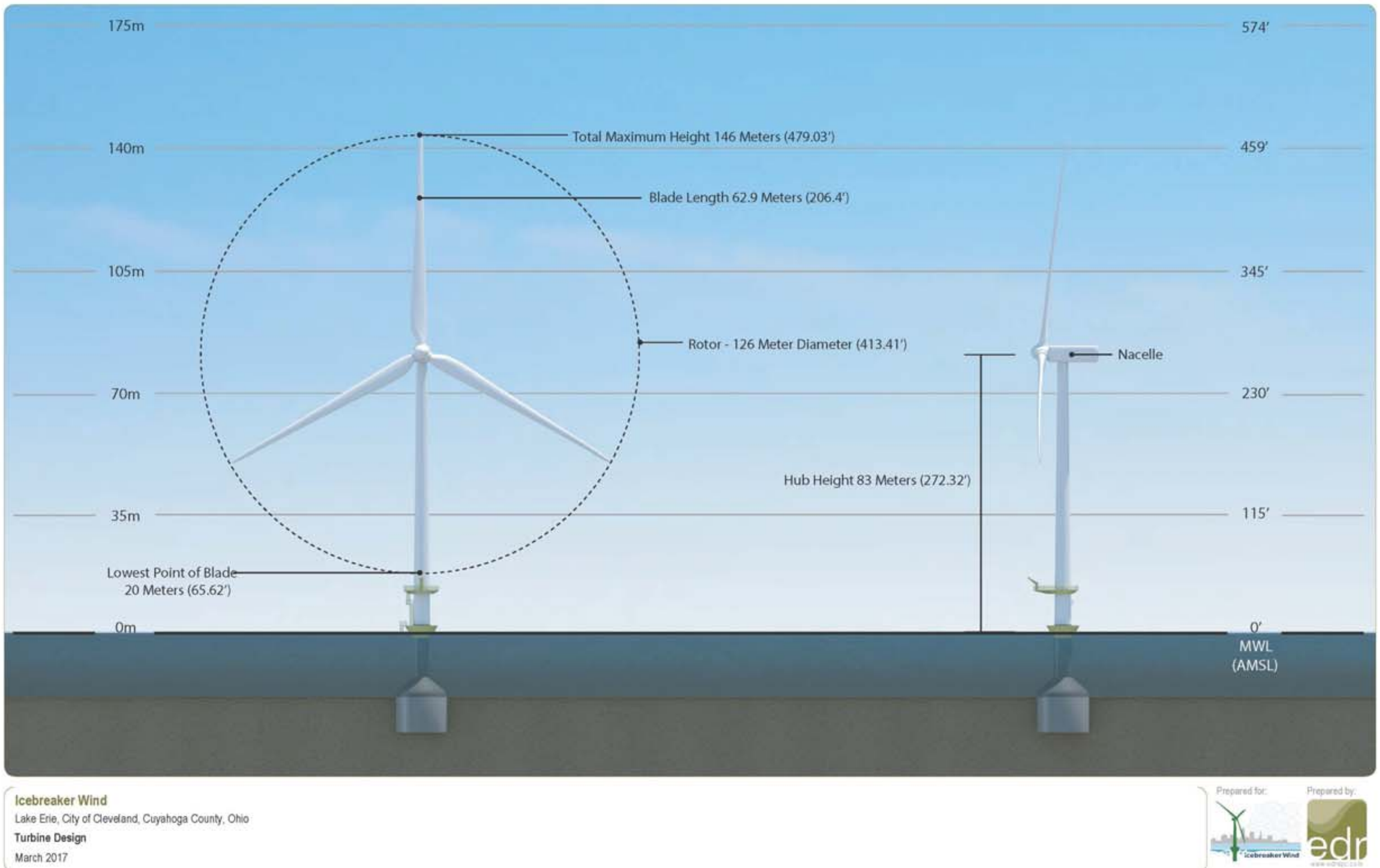


Figure 2-3. Turbine Design

The towers are tubular conical steel structures manufactured in multiple sections. Each tower would have an access door in the base section and internal lighting, along with an internal ladder and/or mechanical lifts to access the nacelle. Most of each turbine, including the blades, would be painted a light gray (RAL 7035) color consistent with the Federal Aviation Administration (FAA) and USCG guidance. The portion of the tower between the low water datum and the platform would be painted yellow.

The main mechanical components of the wind turbine would be housed in the nacelle. These components include the drive train, gearbox, and generator. The nacelle would be housed in a steel reinforced fiberglass shell that protects internal machinery from the environment and dampens sound. The housing is designed to allow for adequate ventilation to cool internal machinery and prevent excess moisture. The nacelle would be equipped with external anemometers and wind vanes that signal wind speed and direction information to an electronic controller. The nacelle would be mounted on a yaw ring bearing that would allow it to rotate ("yaw") into the wind to maximize wind capture and energy production. One red flashing FAA light (upward facing) would be mounted on the nacelle of each turbine and would flash synchronously. In addition, synchronously flashing amber marine navigation lights, visible up to 5 nautical miles, would be mounted on the platforms of turbines 1 and 6. The flashing pattern for these amber marine navigation lights would be determined in consultation with the USCG. On turbine platforms 2 through 5, the amber lights would have a visibility of 4 nautical miles, and a flash rate of 20 flashes per minute. Two lights would be installed on each of the six turbine platforms to provide visibility 360 degrees around the turbines. In addition to the marine navigation lights, fog horns with visibility detectors would be installed on the platforms of turbines 1 and 6. The signal on turbine 1 would sound at 670 megahertz (MHz) once every 30 seconds and at turbine 6 the signal would sound at 670 MHz twice every 30 seconds. These would provide audible notice to vessels up to 2 nautical miles away.

A rotor assembly would be mounted to the nacelle to operate upwind of the tower. Each rotor would consist of three composite blades that would be 206 feet (62.9 meters) in length, which would yield a rotor diameter of approximately 413 feet (126 meters). The blades would be painted a light gray (RAL 7035) color consistent with FAA and USCG guidance. The rotor would attach to the drive train at the front of the nacelle. Hydraulic motors within the rotor hub would rotate each blade according to wind conditions, which would enable the turbine to operate efficiently at varying wind speeds as well as varying rotor speeds. The wind turbines would begin generating energy at wind speeds of 3 meters per second (m/s) (6.7 miles per hour [mph]) and cut out at maximum wind speeds of 27.5 m/s (61.5 mph). LEEDCo has agreed to feather the turbine blades up to the manufacturer's cut in speed during certain periods of the year to reduce the risk of bat collisions (see Section 3.4.2.5).

The turbine would be designed for three levels of containment to minimize risk of any fluid discharges (oil, hydraulic, cooling, etc.). Each primary system, i.e. gearbox, would be a sealed system with multiple sensors that monitor fluid performance and containment, with each of these inspected at regular maintenance intervals, a minimum of once per year. The secondary system would be in the nacelle itself, where fluid containment reservoirs would be designed to capture any leaks from a primary system failure. If both primary and secondary containment fails, the bottom of the tower would have a reservoir to contain any fluids originating from the nacelle.

2.2.2.2 Foundation Design

LEEDCo proposes to use the MB as the turbine foundation. The MB combines the benefits of a gravity base, a monopile, and a suction bucket. In essence, it is a suction-installed caisson or an "all-in-one" steel foundation system designed to support offshore wind turbines. The MB foundation is comprised of three sections: a steel skirt that would be embedded in the lakebed, a lid section, and a shaft that, above the mudline, resembles the elements of a standard offshore wind monopile (Figure 2-4).

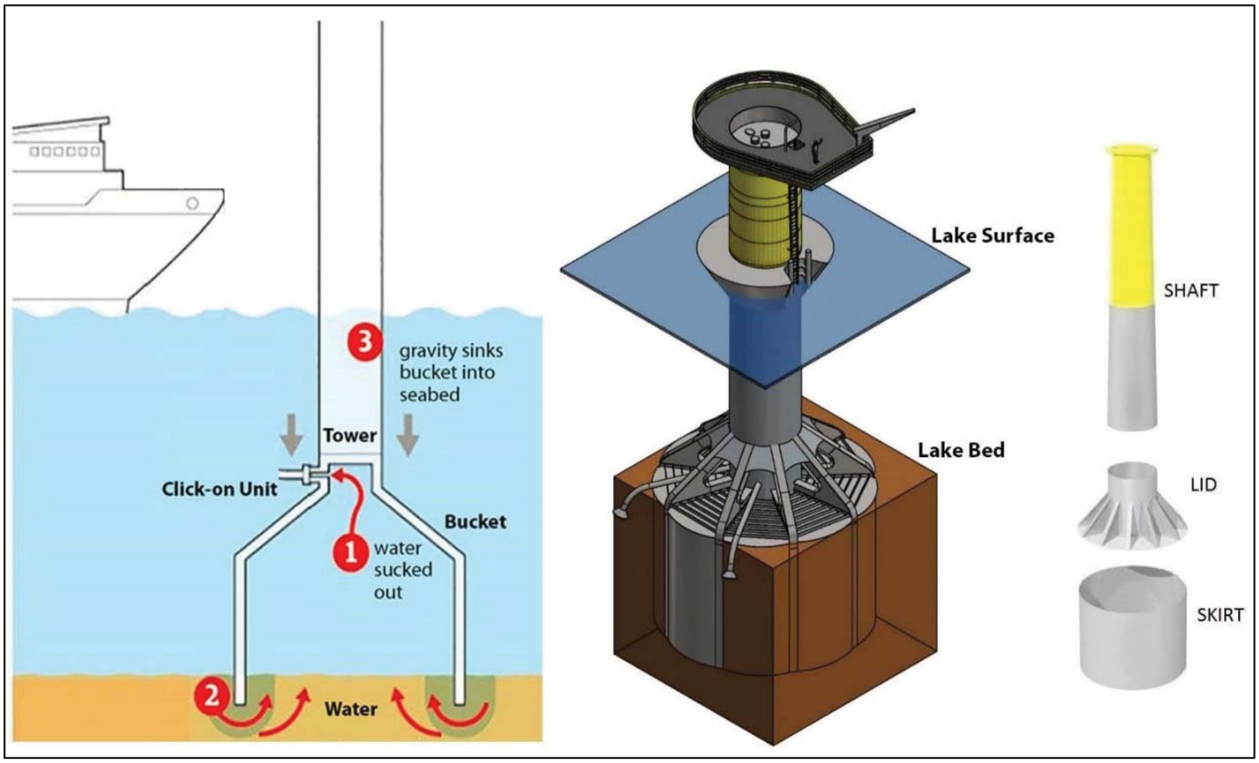


Figure 2-4. Mono Bucket General Arrangement

The design criteria consider factors such as 50-year weather extremes, average wind speed, wind gusts, turbulence intensity, waves, and ice loads. The first turbine erected on a MB foundation, a 3 MW Vestas V90 turbine, began operation in the North Sea in 2002. This bucket remains operational to this day and the dynamic load performance has been monitored continuously for 15 years, resulting in a deep understanding of dynamic and cyclic loading (Universal Foundation, 2012). Three MB installations in the North Sea have withstood sustained waves greater than 70 feet, far more than extreme wave heights of 15 to 20 feet recorded in Lake Erie (National Oceanic Atmospheric Administration [NOAA], 2016a).

Preliminary designs of the MB foundation have been completed (Figure 2-5), and approximate dimensions are listed below in Table 2-2. The portion of the foundation above the water line would be painted yellow.

Table 2-2. Approximate Foundation Dimensions

Foundation	Bucket Diameter	Shaft Diameter	Foundation Overall Height
Mono Bucket	17.0 meters (55.8 feet)	4.5 meters (14.8 feet)	36.9 meters (121 feet)

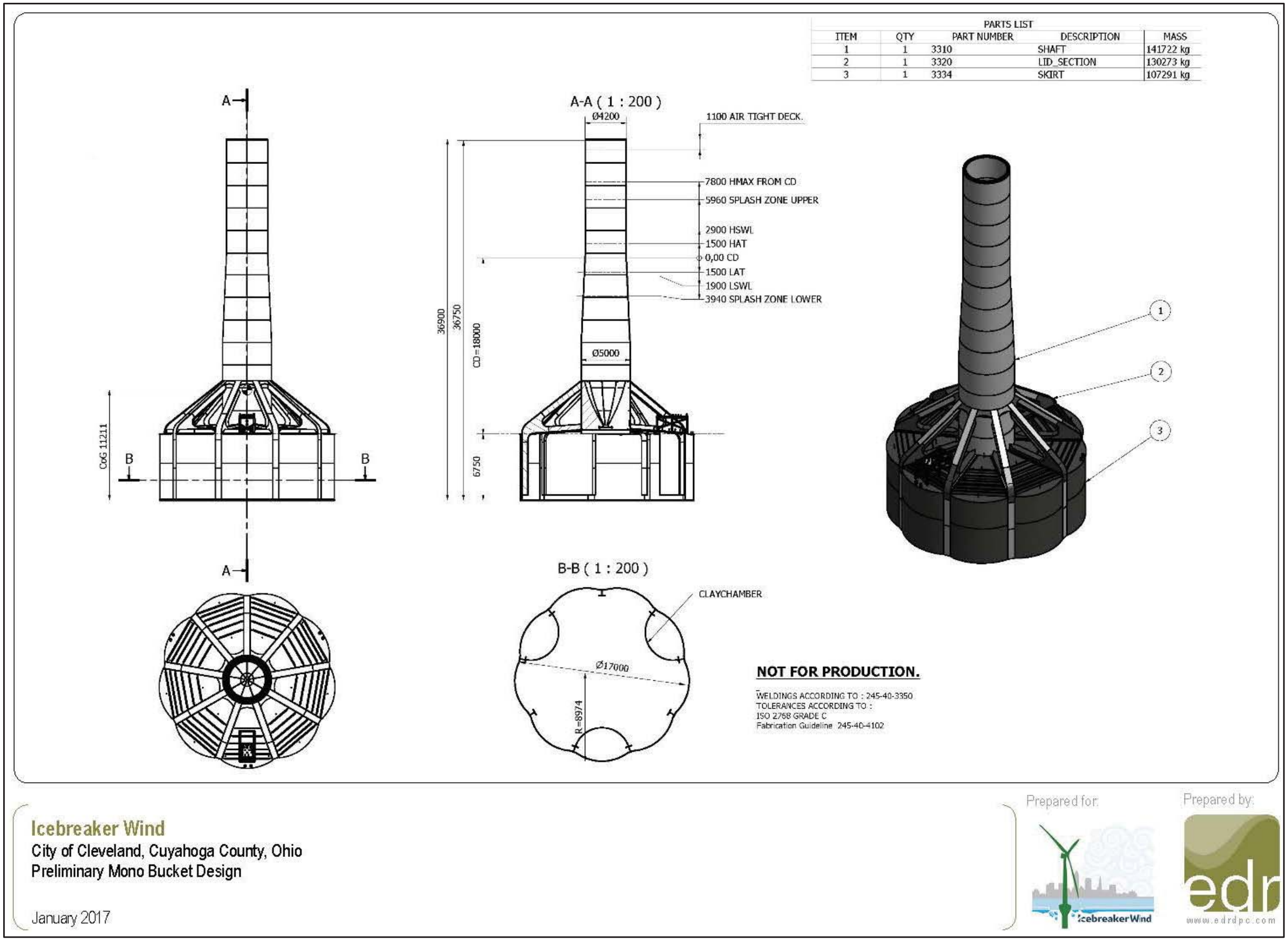


Figure 2-5. Preliminary Mono Bucket Design

2.2.3 Installation of Turbines and Foundations

LEEDCo proposes to use the Port as the quayside staging area for the Proposed Project. Four U.S. fabricators have been qualified and short-listed to compete for the fabrication contract. The selection would be based on a final competitive bid process, and therefore, the final assembly and delivery logistics vary based on each of the fabricators. Foundation components would either be fabricated complete and shipped complete via barge directly to the installation site or fabricated and shipped via truck and/or barge to the Port, where they would undergo final assembly prior to being towed to the installation site.

Prior to any installation work, a full mobilization of all vessels would be conducted, including installation of necessary grillage (structural load distribution elements to avoid excessive local loads on the vessels) and sea-fastening (structural elements providing horizontal and uplift support of a component during transport operations).

A heavy lift crane vessel would be used to perform the lifting operations related to the foundation and turbine installation process. One of the two vessel configurations described below would be selected. In every case, the MB foundations and all turbine components would be transported to the site on a feeder barge that would be towed to the site.

- Configuration A: A jack-up vessel would perform the heavy lift operations for both the foundation and turbine installation. A crane would be deployed on the vessel. A tug boat would be used if the vessel is not self-powered. The jack-up vessel would be a barge or hull outfitted with three to six legs that could be raised and lowered. The legs would be lowered to the lakebed and the vessel would be jacked-up via the legs to stabilize the vessel during lift operations. Each leg may have a pad on the bottom of the leg that contacts the lakebed. The maximum pad dimension anticipated is 34 feet by 18 feet (612 square feet). Assuming six pads, the maximum area that would contact the lakebed is just under 4,000 square feet.
- Configuration B: In this scenario, a non-jack-up vessel would perform the foundation heavy lift operations while a jack-up vessel would perform the turbine installation heavy lift operations. The configuration and specifications of each of the two vessels would be optimized for its specific purpose. The turbine jack-up vessel would be as described in Configuration A and would function in the same manner. The non-jack-up foundation vessel would be self-powered and would not include legs. The vessel would maintain position via anchors or dynamic positioning (DP). DP vessels maintain their position with the use of thrusters instead of anchors. A DP vessel would eliminate the need for anchor placement and would not make direct contact with the lake bottom.

2.2.3.1 Mono Bucket Foundation Installation

Following the positioning and mooring of the feeder barge, a pumping assembly that includes all the pumps, valves, and piping necessary to control the suction process (Click-on Unit) would be temporarily attached to the lid of the bucket. An umbilical cord would connect the Click-on Unit to the power and control system located on the deck of the heavy lift crane vessel.

The MB would be lifted off the barge and lowered to 1 meter (3.3 feet) above the lakebed. At that position, the MB descent would be halted to allow the water column to stabilize and then it would be lowered until it contacts the lakebed. Once the bucket is on the lakebed, it is expected that it would self-penetrate 3 to 6 feet because of its weight (500 to 600 tons). At this point, the installation would be controlled by technicians in the control room of the heavy life crane vessel via remote operation of the Click-on Unit.

To achieve penetration, water would be pumped out of the bucket through an exhaust port on the Click-on Unit into the adjacent water. The water pumped out of the bucket through the exhaust port would be released back into the lake. The exhaust port would be directed toward the lid of the bucket so that any water and the vast majority of the associated sediment would be deposited on the bucket lid (Figure 2-6).

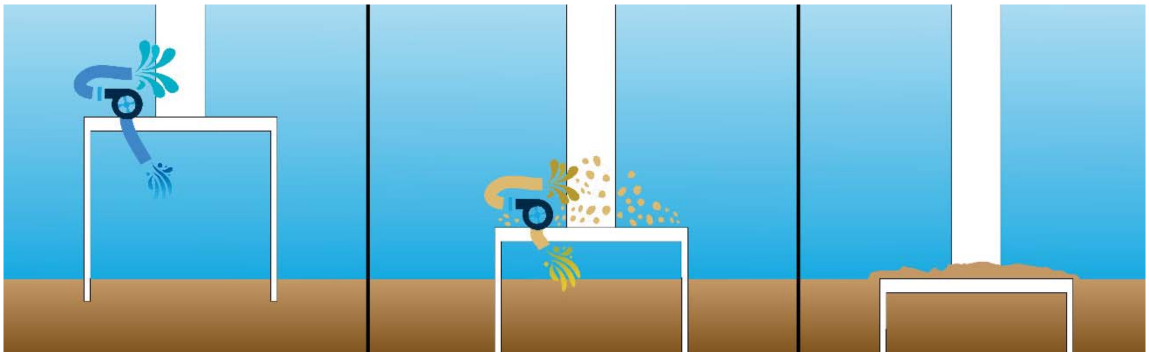


Figure 2-6. Sediment Deposition on to MB Foundation Lid

As the water is pumped out of the bucket, the pressure inside the bucket would decrease, which would pull the skirt into the lakebed at a rate of approximately 60 inches per hour. The entire process would be controlled by technicians on the heavy lift crane vessel. After the bucket reaches the desired depth and with the desired verticality, the process would be complete. The Click-on Unit would be detached remotely and lifted to the surface and onto the deck of the heavy lift crane vessel.

During the installation process, approximately 4,000 cubic yards of water would be extracted from inside the foundation bucket and released back into the lake. Sediment from the top 0.1 to 0.3 meter (0.3 to 1.0 foot) of the lakebed could be sucked into the pump and mixed with the discharge water during the last approximately 1 meter (3 feet) of the penetration process. Water and the vast majority of suspended sediment removed during the MB installation would be pumped from the inside of the bucket back on to the lid of the MB. The quantity of sediment that would be pumped out may vary by location and the particular composition of the sediment at each of the six turbine sites. Finer grained sediments would become more easily entrained in the discharge water when compared to coarser grained sediments. The amount of sediment that could become entrained in the discharge water and released from the exhaust port is anticipated to be up to 75 cubic meters (98 cubic yards). The vast majority of the sediment would return to the lakebed on top of the MB lid, with a small amount possibly falling beyond the lid's diameter (Figure 2-6). This fallback of sediment onto the lid would reconstitute portions of the benthic habitat that would be lost because of the installation of the MB.

The entire operation would be monitored by remotely operated vehicles (ROVs) and no divers would be required. However, divers would be on standby in case the need arises (e.g., ROVs stop working, water clarity is too low to see with ROVs).

Because the foundation uses suction technology, no lakebed preparation would be necessary (dredging, leveling, or drilling) for installation. The foundation installation would not require any pile driving.

To maintain verticality within specifications (0.5 degrees) as the bucket penetrates the lakebed, two control mechanisms are available, water jets and clay chambers. The water jets are small water nozzles embedded in the wall of the bucket along the bottom of the skirt. The nozzles would be installed in the center of the 1-inch thick skirt and segregated into three 120-degree control zones. The water jets could be activated zone by zone and allow short pulses of water to flow through the nozzles if necessary. When the water jets are activated, the water flowing from the nozzles would loosen/lubricate the lakebed under the nozzles, thereby allowing the bucket to penetrate more readily in that zone. The other control mechanism would be a series of three independently controlled small clay chambers equidistant around the skirt. Suction or pressure could be applied to each chamber independently by the technicians controlling the installation process using remote operation of the Click-on Unit. This mechanism would allow for raising or lowering each zone of the skirt independently to adjust the verticality of the foundation during the entire penetration process.

2.2.3.2 Turbine Installation

It is anticipated that the turbine components, including nacelle, blades, and tower, would be transported to the Port by barge. Installation of the turbines would occur after all the MB foundations and the electric collection lines are installed (Figure 2-7). The installation vessel would locate at the site and position at the respective proposed turbine site ready for turbine erection. A load-out crane in the Port would load turbine tower sections onto the feeder barge, which would then transit to the installation site (Figure 2-8). The tower sections would be picked off the feeder barge and then installed using the crane mounted on the heavy lift crane vessel (Figure 2-9). Assembly work inside the towers, including but not limited to bolting the tower sections together, assembling the ladders, and running the cables up the tower, would begin as the feeder barge returns to Port for the nacelle and blades. Once the feeder barge returns to the site, the nacelle and blades would be installed using the heavy lift crane. Once the turbine installation is complete, the heavy lift crane vessel would reposition to the next turbine location while the feeder barge returns to Port to repeat the process for tower and turbine installation. The heavy lift crane vessel and the feeder barge would use a tow tug to transit between the Port and proposed turbine sites. If a DP vessel is used, a tow tug is not required.

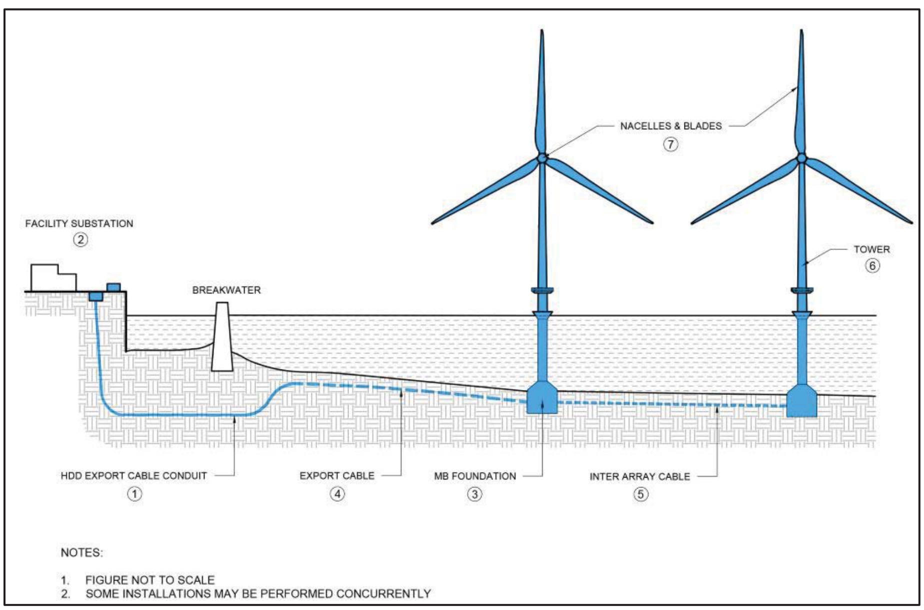


Figure 2-7. Project Component Installation Sequence[3]

[3] Blue components are new-build Project components. Numbers under each component represent order of installation.

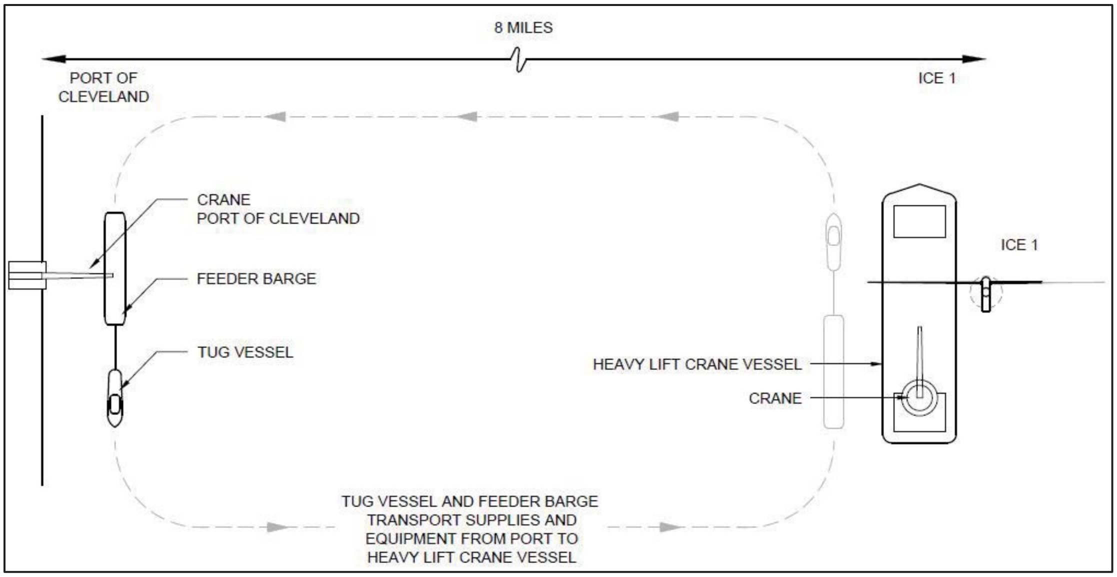


Figure 2-8. Installation Vessel Plan View

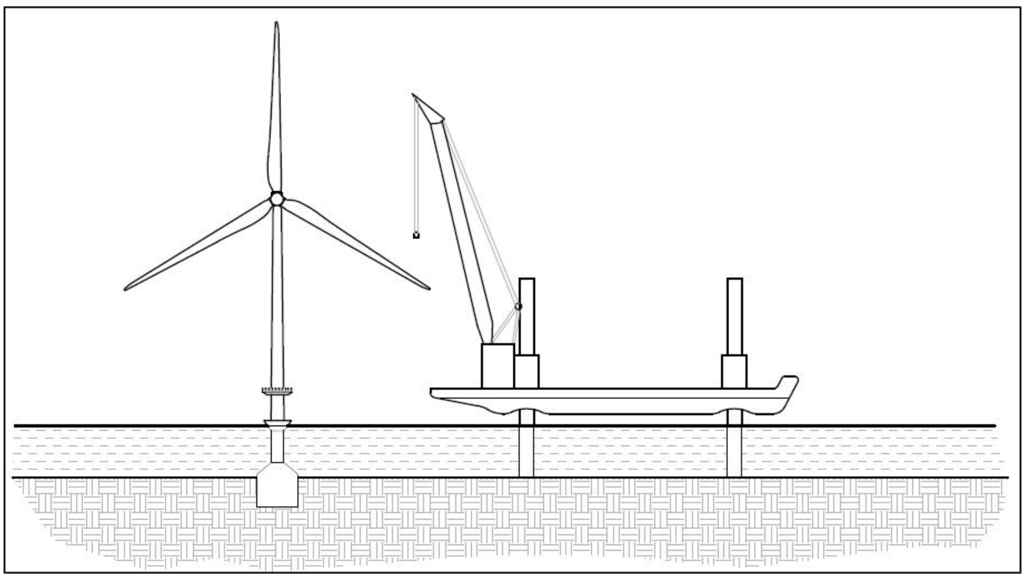


Figure 2-9. Turbine and Heavy Lift Crane Vessel

2.2.4 Submerged Electric Collection Cable Route and Installation

There would be two cable components for the Proposed Project: the inter-array cables, which would connect the wind turbines together electrically; and the export cable, which would transmit the electricity generated by all wind turbines (wind project output) to the shore. The proposed cables would be 34.5 kV alternating current cables and would be composed of a three-core copper conductor with cross-linked polyethylene (XLPE) or ethylene propylene rubber (EPR) insulation (insulation would be dependent on manufacturer). Optical fibers for data transmission would be embedded between the cores. The cables would be a single armored underwater power cables, with an approximate overall diameter of 11.3 centimeters (4.45 inches) (Figure 2-10).

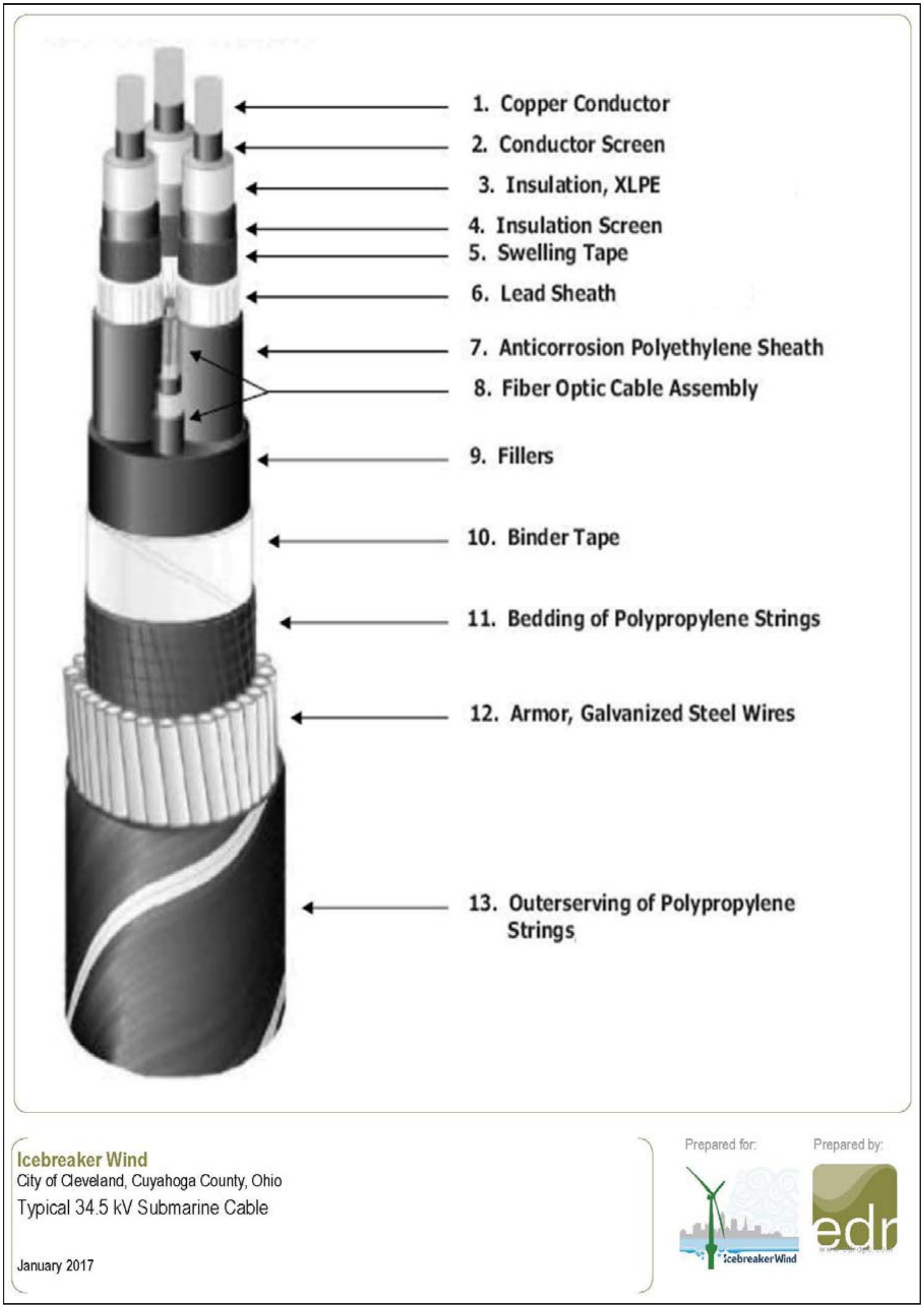


Figure 2-10. Typical 34.5 kV Submarine Cable

Full geotechnical and geophysical surveys were conducted in August through October 2016 along the cable corridor envelope. The final route would be located within the envelope surveyed during the 2016 survey. The geophysical survey indicated that the cable route was clear of debris and any cultural resources in October 2016. If any large debris happened to settle in the cable route envelope prior to installation, it would be removed with a grapnel hook towed behind a small work boat. Cable installation operations would be monitored by divers and/or a mid-class ROV.

The portion of the export cable connected to the shore would be installed before laying the remainder of the export cable. The export cable would be brought ashore entirely under the Cleveland Harbor and the Cleveland Harbor breakwater through a duct installed using horizontal directional drilling (HDD) (Figure 2-11). HDD is a method of trenchless technology commonly used in the installation of various utility pipelines and conduits. It is a common way of getting utility lines from one point to another by directionally boring under obstacles or environmentally sensitive areas. The launch pit for the HDD would be located either at the Lake Road Substation or on a barge on the north side of the Cleveland Harbor breakwater. The final determination would be made by the installer for the electric collection line (not yet selected). Following drilling of the initial pilot hole, the "bottom hole assembly" (the drill bit and the non-magnetic drill pipe encasing the survey instrument at the end of the drill string) would be lifted to the deck of a work barge and removed. At this point, the hole would be "pre-reamed" to approximately 12 inches larger than the outside diameter of the proposed high density polyethylene (HDPE) conduit (i.e., to approximately 28 to 30 inches in diameter). The driller would most likely do this by progressing the reamer (a 30-inch diameter cutter) through the drilled hole from the onshore end towards the offshore "exit." By going in that direction, most of the pre-ream cuttings and drilling fluid would be transmitted back to the surface at the onshore drill site, rather than being emitted at the "exit." The HDPE conduit would be prefabricated in a single string prior to it being pulled back through the drilled and reamed hole. The driller anticipates the HDPE string being towed out to the exit point where, on the deck of the barge, it would be attached to the drill pipe by way of a pull-head at the front of the HDPE pipe, along with a swivel and a reamer. That assembly would be lowered overboard and the onshore drilling rig would then pull the HDPE pipe through the drilled and reamed hole and into the drilling pit onshore. The exit would be capped off until the start of the cable installation operations (Figure 2-12). A messenger wire would be placed in the bore to pull the export cable ashore using a pull-in winch.

Drilling operations use drilling muds to stabilize the bore hole and to lubricate the drilling process. The process is designed to minimize or avoid the possibility of drilling mud discharging into the lake. An Inadvertent Return Contingency Plan is discussed in more detail in Section 2.7.4. The drilling mud (a clay-based compound such as Bentonite) would be National Sanitary Foundation approved for drinking water applications, such as water wells.

Once the export cable is connected to shore, the remainder of the cables would be installed from north of the breakwater to the first MB using a deck barge with cable installation and burial equipment mobilized on board the deck. The proposed installation technique for the cable is bury-while-lay (typically referred to as simultaneous lay burial). This technique buries the cable by using either a cable plow or jetting tool. A plow is a tool that typically sits on skids (skis) and is pulled by a vessel. The plow's share cuts into the sediment forming a trench into which the cable is laid. Alternatively, a jetting tool equipped with high-pressure water jets would accomplish the burial process by fluidizing the sediments within a narrow trench into which the cable is lowered. The inter-array and export cables are proposed to be buried approximately 1 to 1.5 meters (3.3 to 5 feet) below the lakebed; although, in some areas, they may be buried deeper. The sediments that are disturbed by either process would subsequently settle back onto the lakebed, providing a degree of back-fill. See Section 3.2 for additional details on sediment suspension. Figure 2-13 depicts the cable interface with the MB and lakebed.

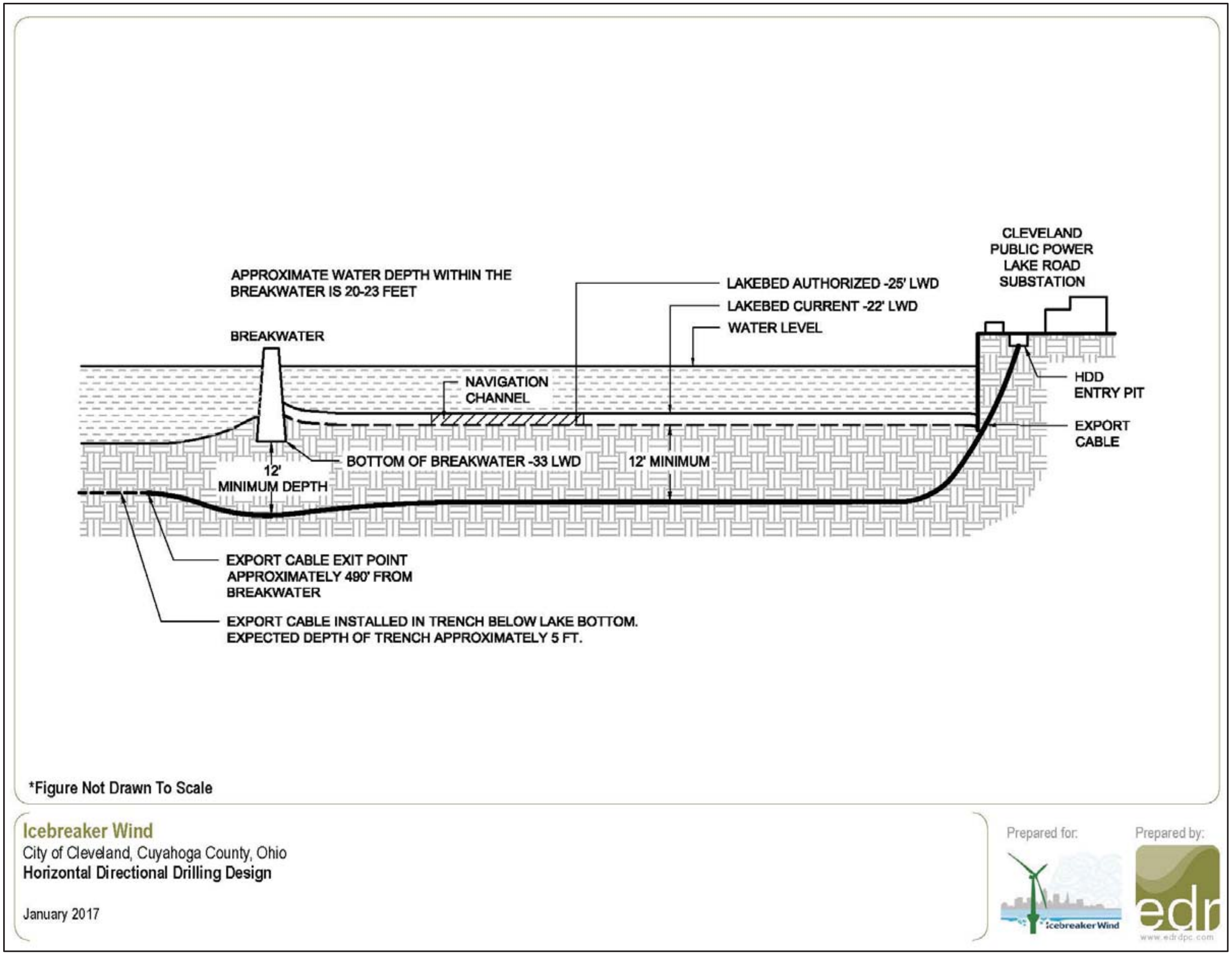


Figure 2-11. Horizontal Directional Drilling Design

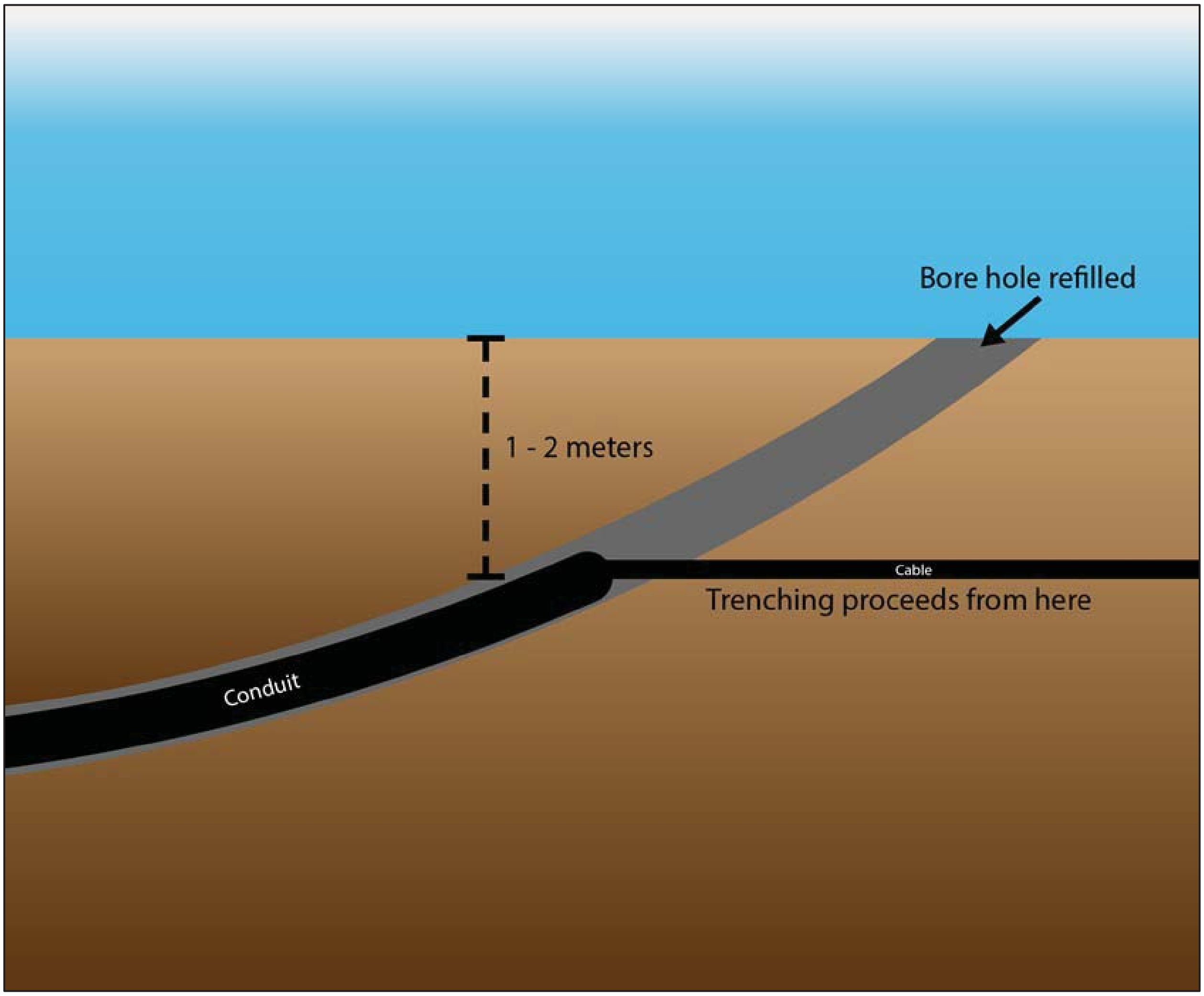


Figure 2-12. Connection Between HDD and the Export Cable

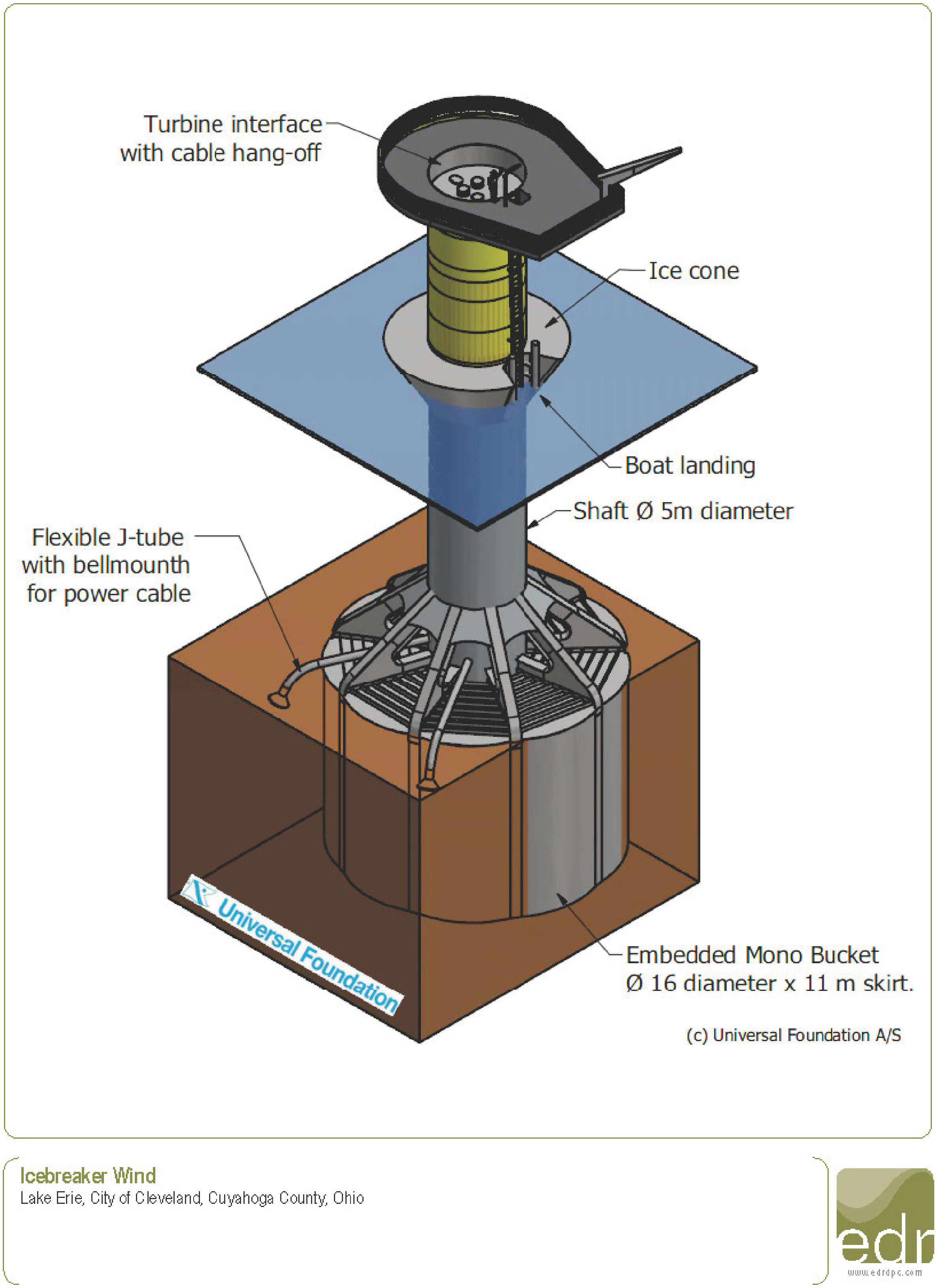


Figure 2-13. Mono Bucket and Cable Lakebed Interface

2.2.5 Substation and Associated Electric Transmission

The Proposed Substation would be constructed on the CPP site adjacent to the existing Lake Road Substation. The area surrounding the Lake Road Substation is developed, consisting almost entirely of unpaved, but previously disturbed, outdoor storage space, with no significant ecological resources. The layout plan includes a fenced area of approximately 88 feet by 110 feet that would enclose the Proposed Substation and its bus structures, switch gear, the step-up transformer, and a 14-foot by 37-foot building for control equipment (Appendix B). None of the work discussed under this section of the Draft EA would occur below the ordinary high water elevation of Lake Erie. The ordinary high water line is the shoreward extent of USACE jurisdiction.

The entire Proposed Substation area would be excavated to a depth of approximately 3 feet for the installation of the Proposed Substation grounding grid. All unused excavated backfill would be removed from the site for appropriate disposal upon completion of the Proposed Project. Compacted backfill would be placed over the ground grid with a final 18-inch layer of coarse aggregate as the final Proposed Substation surface. Bus support structures, overhead line dead-end structure, and the control house would be placed upon drilled caisson foundations with elevated piers.

A transformer would be placed upon a slab foundation with an oil containment system piped to an underground oil/water separator located within the boundaries of the Proposed Substation. During construction, major equipment, including transformer and control house, would be delivered by truck and placed on foundations using an overhead crane.

The final color of all equipment would be American National Standards Institute (ANSI) 70 gray. Bus support structures and dead-end H-Frame would be gray galvanized steel.

The Proposed Substation would be connected to the existing 138 kV system at the Lake Road Substation with an overhead cable and then transitioned to an underground concrete duct bank (Figure 2-2). The transition from the duct bank to the termination structures would be through a pre-cast concrete pulling pit. The underground line would be a 3-phase, 138 kV circuit, utilizing a 1,000 thousand circular mil (kcmil) EPR- or XLPE-insulated, shielded, copper conductor. The circuit would run approximately 150 feet in a concrete encased conduit from an above grade termination structure at the Proposed Substation to an above grade termination structure at the Lake Road Substation. The termination structures would be placed upon slab foundations and all structures would be gray galvanized steel.

2.2.6 Construction Laydown Areas

LEEDCo would temporarily utilize space at the Port to stage, pre-assemble, and test the turbine components. The Port may also be used to stage and assemble the MB foundation components and completed foundations if a fabricator is selected that would require final assembly at the Port. The Port may also be used to stage the inter-array and export cables. However, similar to the case with the MB foundations, based on specific plans and capabilities of the selected cable supply and installation contractor, it may not be necessary to stage the cables at the Port. The site within the Port that would be utilized by LEEDCo is anticipated to be approximately 12 acres. The site currently consists of large paved and unpaved staging areas adjacent (with access) to the quayside for load-out. Site preparation would be limited to minor and temporary installation of security fencing, temporary office trailers, and secured storage areas. The materials would consist of conventional gray chain link fencing. Cranes and other material handling equipment such as fork lifts would be mobilized to the site to support the unloading of components and materials and to facilitate storage in the staging area, movement around the staging area, and load-out onto feeder barges for transport to the turbine installation sites.

Following the completion of construction, the material handling equipment would be demobilized and returned to the supplier, the chain link fencing would be disassembled and returned to the supplier, and the office trailers would be returned to the supplier.

2.2.7 Construction Sequence

Construction is proposed to begin in the spring and be completed by the fall of the same year. LEEDCo anticipates that construction activities would proceed in the following approximate sequence although some turbine/foundation and cable laying installation activities could occur concurrently:

- Install HDD conduit for export cable
- Construct Proposed Substation
- Mobilize floating equipment including feeder barges and heavy lift crane vessel
- Transport MB foundation to site
- Install MBs
- Install export cable
- Install inter-array cables
- Transport towers
- Install towers
- Transport nacelles and blades
- Install nacelles and blades
- Commission turbines
- Commission landside power into grid

2.2.8 Operations and Maintenance

Upon completion of the construction activities, LEEDCo would conduct several weeks of commissioning activities that would include testing the turbines as well as the offshore and onshore transmission systems. It is anticipated that the Proposed Project would begin operations approximately in November of the year of construction and continue until the end of the 25-year expected operational life of the facility.

Operation of the turbines would require continuous remote (i.e., shore-based) monitoring and control, scheduled onsite maintenance, and unscheduled responses to faults or damage each of which are described below.

Remote Monitoring

A control center capable of remotely monitoring and controlling the Proposed Project would be staffed 24 hours a day. The control center would be staffed by trained personnel and contain charts indicating global positioning system (GPS) position and identification numbers of all Project components, which would also be provided to the USCG. All turbines would be equipped with control mechanisms that would allow the operations center personnel to fix and maintain the position of the blades.

Scheduled Maintenance

Each turbine would undergo scheduled maintenance and inspection as well as a full annual maintenance program as prescribed by the turbine manufacturer. This work would be performed by personnel qualified by the manufacturer. Routine and preventative wind turbine maintenance activities would be scheduled at 6-month intervals with specific maintenance tasks scheduled for each interval. Maintenance would be done by removing the turbine from service and having two to three wind technicians climb the tower to spend a full day carrying out maintenance activities. Consumables such as various greases used to keep the mechanical components operating and oil filters for gearboxes and hydraulic systems would be used for routine maintenance tasks. Surplus lubricants and grease-soaked rags would be removed and disposed of as required by applicable regulations.

Additionally, inspections of the underwater structures and lakebed would be performed periodically throughout the life of the Proposed Project.

Unscheduled Maintenance

The major components of modern wind turbines are designed to operate for up to 30 years. However, wind turbines are large and complex electromechanical devices with rotating equipment and many components. Thus, at times, turbines would require repair, most often for small components such as switches, fans, or sensors. Such repairs generally take the turbine out of service for a short period until the component is replaced. These repairs can usually be carried out by a single technician visiting the turbine for several hours. Events involving the replacement of a major component such as a gearbox or rotor are not routine. If they do occur, the use of large equipment, sometimes as large as that used to install the turbines, may be required. Typically, only a small percentage of turbines would need to be accessed with large equipment during their operating life.

The management of the maintenance program and reporting requirements would be addressed by the operations team. This work would include, but would not be limited to:

- Remote monitoring and supervising the wind turbines and associated equipment 24 hours a day, 7 days a week using the wind power supervisory control and data acquisition system;
- Initiating any required corrective action;
- Managing the inventory of spare parts, including performing any maintenance of these spare parts;
- Scheduling and logistics planning of maintenance activities; and
- Performing daily communication with the facility operator.

As access to the turbines could only be achieved by vessel, lake conditions would dictate when service may be performed. Heavy annual work would be scheduled to occur during summer months when conditions for accessing the turbines are typically suitable (waves less than 5 feet). Access may be required during winter months when there may be ice covering the lake in the vicinity of the Proposed Project site and between the Proposed Project site and the shore. The fleet of tugs routinely operating in the Cleveland area has the capability to break ice on the Lake. One of these tugs would be utilized to clear a path for a crew transfer vessel in ice cover conditions. The USCG also provides ice breaking services in Lake Erie to maintain commerce. If the ice cover exceeds that which the local tugs can handle, the USCG would, depending on availability, be utilized to clear a path for the crew transfer vessel.

Service crews would board a crew transfer vessel based in the Cleveland area. Personnel would gain access to the turbines by the ladder system incorporated into each foundation. Tools and light parts would be lifted onto the structure using a small crane system provided on the structure working deck. Annual maintenance for each turbine would be expected to require 5 to 8 days of onsite work. Turbines would be returned to normal operation at the end of each service day.

No oils or other waste would be intentionally discharged during service events. Appropriate measures would be implemented to provide for containment and collection of hazardous material spills (oil, fuels, hydraulic fluids, and lubricants) should they occur. It is not expected that any painting would be necessary during the life of the turbines, other than to repair damage. The original coating system on the towers is designed to last the lifetime of the structure.

2.2.8.1 Maintenance of Submerged Electric Collection Cables

During operations, it is possible that the depth of cover for the inter-array or export cables may change over time. In such circumstances, re-jetting or external protection such as concrete mattresses, may become necessary to maintain an appropriate level of protection for the cables. If there are faults on the cables or external damage during operations, repairs may become necessary. Depending on the location of the cable repair, the cables may either be repaired or replaced, which in either case would require removal and reburial using similar tools and methods to those used during the original installation.

2.2.8.2 Operation and Maintenance Center

LEEDCo proposes to lease space in an existing building from Great Lakes Towing (GLT), located on Division Road approximately 0.37 mile from the Cleveland outer harbor on the Old River (a portion of the Cuyahoga River), to serve as the Operations and Maintenance (O&M) Center for the Proposed Project. The entire GLT property site is approximately 6.3 acres. However, only a small portion of an existing GLT building would be leased by LEEDCo. It is anticipated that the area to be leased would not exceed 0.5 acre in size. The lease would include a small space for storage of spare parts, and a condition for LEEDCo to share space with GLT for access to water and locker room/bathroom facilities. LEEDCo does not anticipate making any modifications to the existing building (Figure 2-14).

Figure 2-14. Great Lakes Towing Building Proposed for Use as O&M Center

2.2.9 Decommissioning

LEEDCo would complete decommissioning of the Proposed Project, or individual wind turbines, within 12 months after the end of the useful life of the Proposed Project or individual wind turbines. Unless good cause is shown by LEEDCo, the Proposed Project or individual turbines would be presumed to have reached the end of its or their useful life if no electricity is generated for a continuous period of 12 months, or if the Ohio Power Siting Board (OPSB) deems the Proposed Project or a turbine to be in a state of disrepair warranting decommissioning. A decommissioning plan is subject to approval from the OPSB. The final decommissioning plan would be provided to OPSB at least 30 days prior to the preconstruction conference, and would include a description of the engineering techniques and equipment to be used in decommissioning, along with a detailed timetable for accomplishing each major step.

Decommissioning would consist of dis-assembling the turbines by reversing the installation process. An appropriate vessel with sufficient crane capacity would be mobilized to the site. The blades would be removed one at a time. Then the turbine would be de-energized and disconnected from the transmission cable. The Proposed Substation would be de-energized and disconnected and isolated from the grid interconnection. Then the nacelles would be removed, followed by the tower sections.

After the Proposed Substation is completely de-energized, the export cable would be cut at or slightly below the lakebed thereby separating the buried portion of the cable from the portion that runs up the foundation. Once the turbines are completely removed from the foundation and the inter-array cables are cut, the MB foundations would be de-installed by reversing the suction process utilized during the installation. Pressure would be applied to the bucket and water would be pumped into the bucket. The pressure inside the bucket would lift the bucket out of the sediment. Once the bucket disengages from the sediment, the MB foundation would be lifted with the crane onto a feeder barge. The portion of the cable that remains attached to the MB would be transported with the MB.

All the turbine and foundation components would be transported to quayside and proper disposal of the components would occur. The materials would be recycled where possible, and those that could not be recycled would be disposed of properly. The export cable and inter-array cables would be rendered inactive and remain buried. Finally, the onshore Proposed Substation components would be de-installed and recycled where possible; those that could not be recycled would be disposed of properly.

2.3 No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funds by LEEDCo in support of the Proposed Project. Any potential beneficial or adverse effects to the physical, natural, or socioeconomic resources would not be realized.

2.4 Alternatives Considered During Planning and Design

2.4.1 Selection of the Proposed Project Location

In 2009, a Feasibility Study was completed for the Great Lakes Wind Energy Task Force (juwi GmbH, 2009)[4]. The Feasibility Study compared nine potential project areas with respect to important siting criteria including: shipping channels, water depth, distance to possible onshore interconnection locations, wind

[4] The Task Force issued a request for proposals and selected juwi GmbH from Germany to conduct the analysis.

resource, the Cleveland Lakefront Audubon Ohio Important Bird Area (IBA), air navigation and radar, and the locations of lakebed factors such as dumping sites, artificial reefs and shoals, water intakes and sewer outfalls, shipwrecks, and the Cargill Salt Mine. The location of these sites is illustrated in Figure 2-15 and in juwi GmbH (2009).

After completion of the Feasibility Study, the Ohio Department of Natural Resources (ODNR) Office of Coastal Management released its 2009 Wind Turbine Placement Favorability Analysis (Favorability Analysis). The Favorability Analysis incorporated much of the same data used in the Feasibility Study, including shipping lanes and navigable waterways, bird and fish habitat, commercial and sport fishery efforts, shipwrecks, restricted areas, industry, and utilities. The resulting Favorability Map (see Appendix C) identified more extensive limiting factors closer to shore and only minimal limiting factors further offshore. In response to the Favorability Analysis, LEEDCo revised its assessment of potential project areas. LEEDCo considered the following factors when choosing the Proposed Project area:

- Existing uses – Existing uses of the area, including air navigation and civilian and military radar facilities; weather forecasting; commercial and recreational maritime uses, such as sailing race courses, fishing grounds, and shipping channels; reefs and shoals; dumping grounds; military practice ranges; sub-lake salt mine; distance to shipwrecks, water intake and sewer outfall pipes; the ODNR Favorability Analysis; the Feasibility Study; and existing submerged lands leases.
- Wind resources – An evaluation of wind resources from the meteorological tower installed on the Cleveland Water Intake Crib, combined with output from mesoscale models for the region, was conducted to evaluate average wind speed and the resulting turbine class for each potential location. Wind resources were determined to be favorable at the Proposed Project Area.
- Environmental conditions – Assessments of avian and bat risk, aquatic ecology, geology, water depth, and effects of icing, wind, and waves have been performed by Cuyahoga County, Case Western Reserve University, Germanischer Lloyd, LEEDCo, and ODNR since 2008. This included avian and bat risk assessments completed in 2008, 2013, and 2016. Aquatic monitoring and risk assessments were conducted in 2016 and 2017.
- Conceptual turbine foundation design – Evaluations of geology, foundations, and turbine designs were conducted to determine the suitability of the MB foundation for Lake Erie and the Proposed Project Area.
- Interconnection and offshore cabling – Evaluations of onshore grid interconnection capacity and proximity and offshore cabling options were performed to determine location and feasibility of an interconnection point.

Figure 2-16 indicates the study areas evaluated for potential project location after review of the Feasibility Study, Favorability Analysis, and factors above, along with the proposed final turbine locations at a 1:75,000 scale. A constraint map of the Proposed Project Area showing shipping lanes, the breakwater, water intakes, and existing electric transmission lines is included as Figure 2-17. Because the Proposed Project Area is located approximately 8 to 10 miles offshore, turbine setbacks from residences, property lines, and public rights-of-way are not applicable siting constraints for the wind generators, and are not illustrated in Figure 2-17.

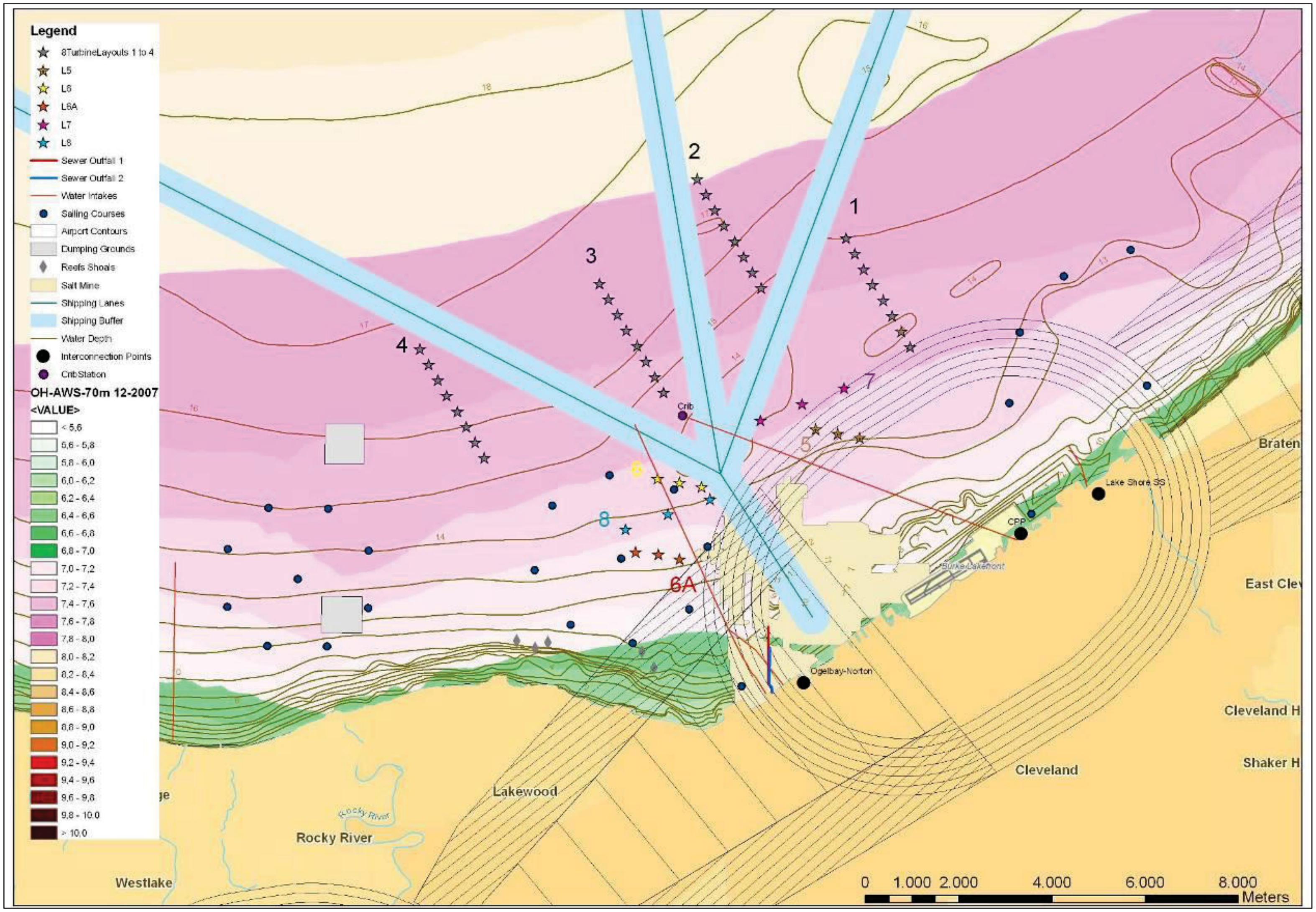


Figure 2-15. Potential Project Areas Evaluated in the 2009 Feasibility Study

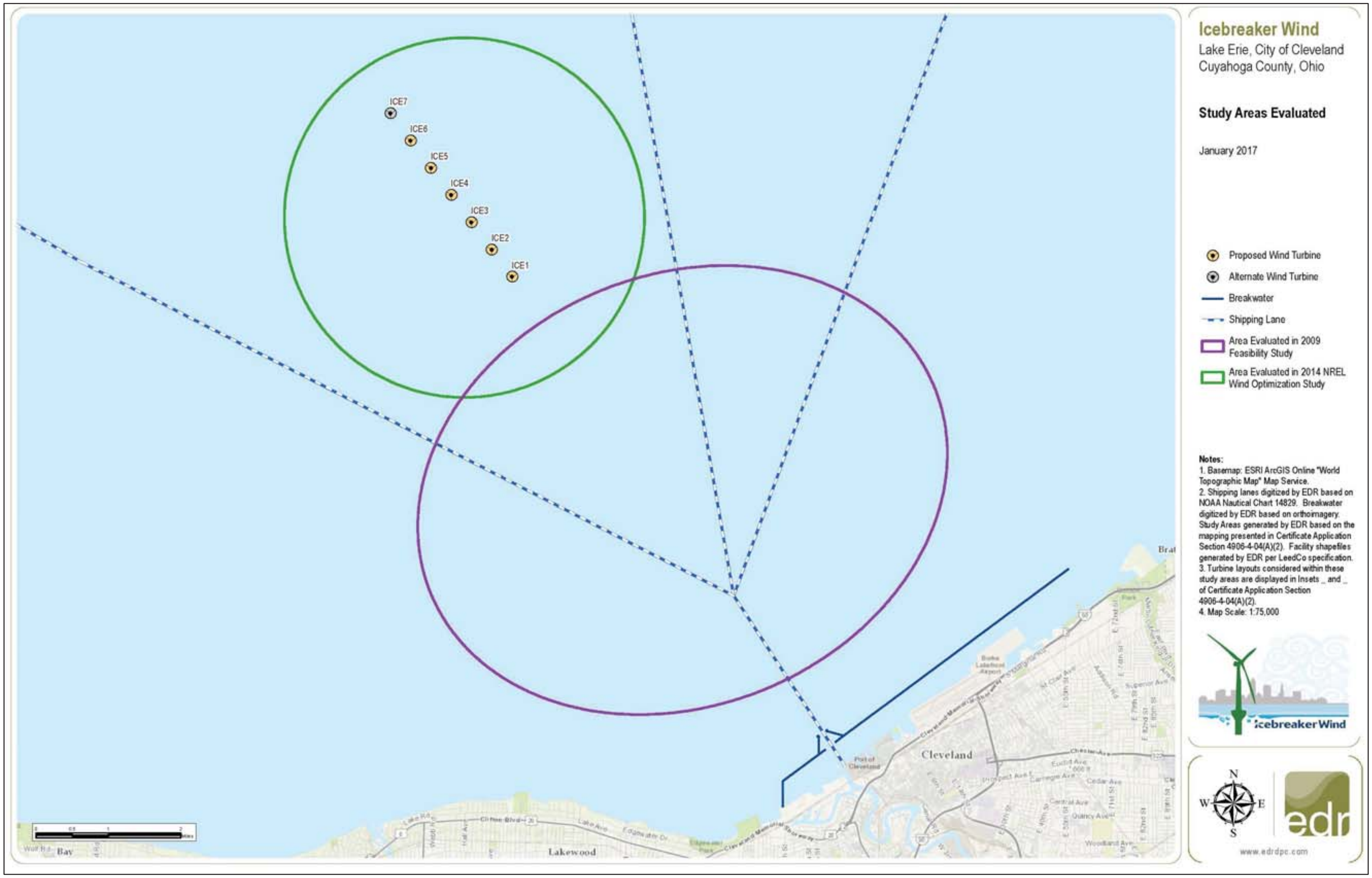


Figure 2-16. Study Areas Evaluated and Final Proposed Layout

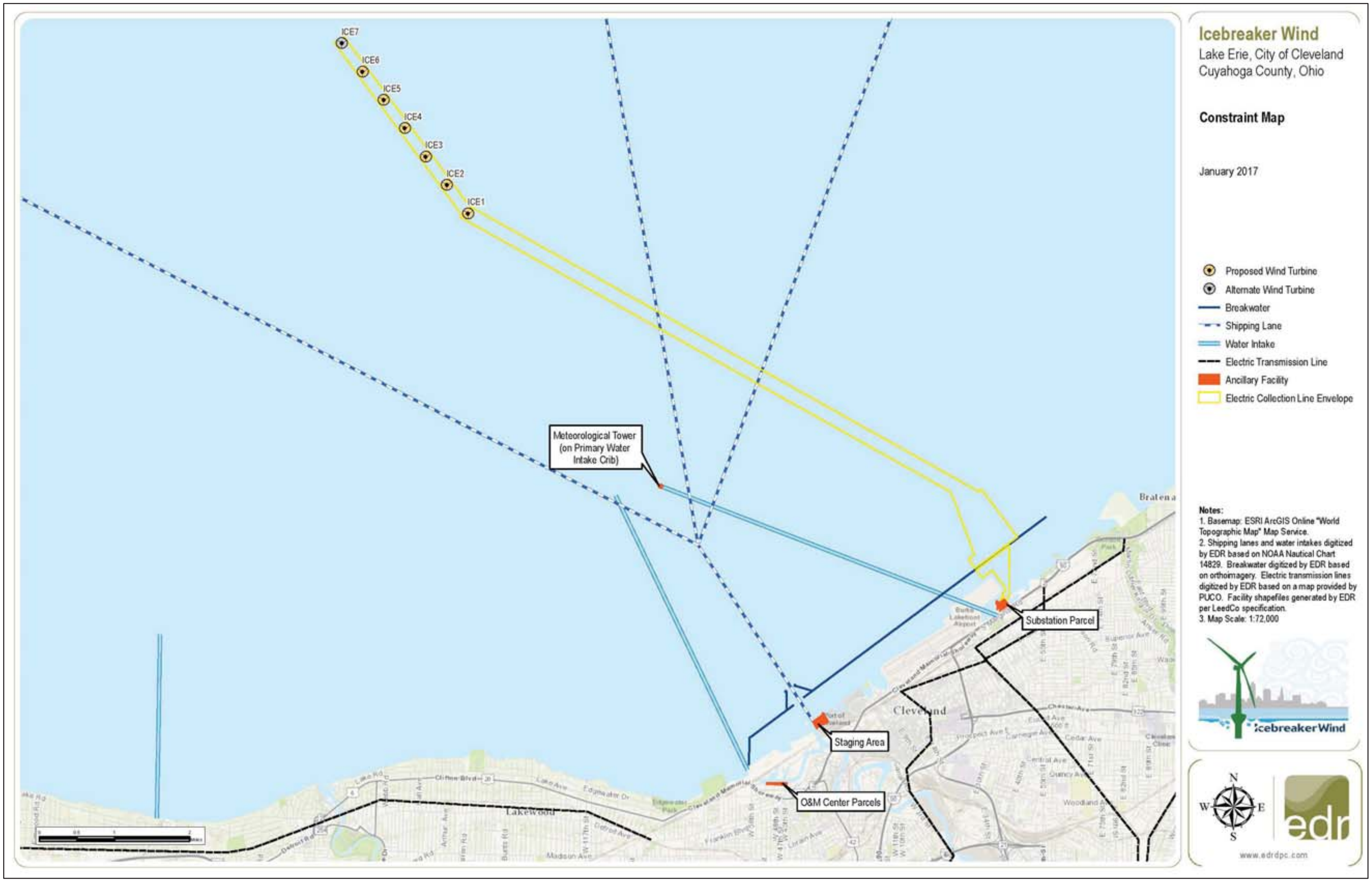


Figure 2-17. Constraint Map

2.4.2 Selection of Proposed Turbine Layout

A wind turbine layout optimization study was conducted by the National Renewable Energy Lab (NREL) for the Proposed Project to evaluate its energy output and performance under a variety of layouts. Factors used to compare layouts included net energy production, turbine net capacity factor, and wake losses. Environmental and cost factors were not analyzed. Potential layouts studied included 11 linear layouts varying between five and nine turbines, two 2-row layouts, a 3-row layout, and an optimized layout designed by OpenWind Enterprise (see Figure 2-18). Based, in part, on the NREL study, a six-turbine linear array layout was selected as the final proposed layout (Figure 2-16).[5]

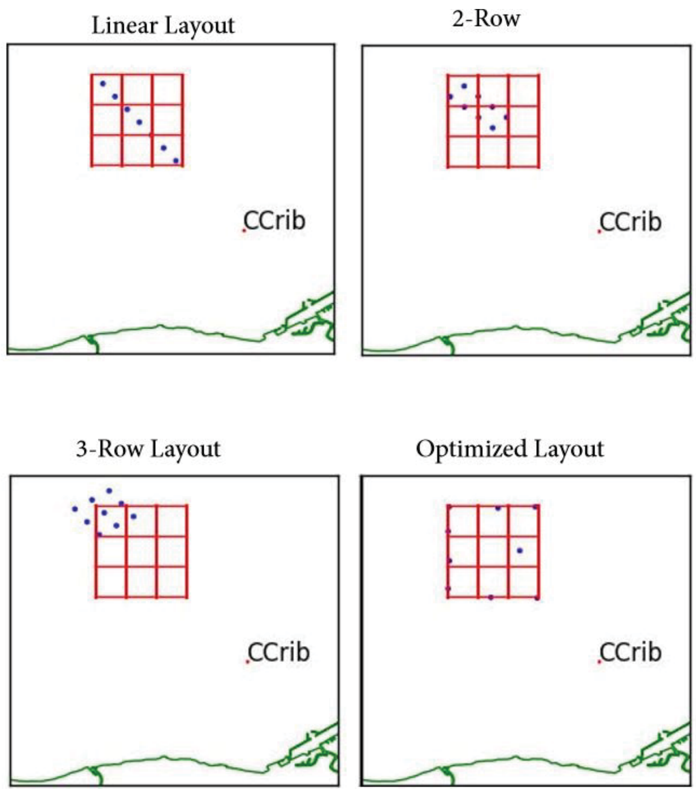


Figure 2-18. Typical Layouts Analyzed by NREL Wind Optimized Study

2.4.3 Selection of Proposed Turbine Foundation Design

In 2013, after an examination of four potential foundation types (circular cell, tripod pile, gravity base, and monopile with a friction wheel [MP/FW]) and their performance in loose glacial till sediments common to Lake Erie, specifically at the Proposed Project Area, a MP/FW foundation concept was chosen by LEEDCo. Subsequently, a fifth foundation type, the MB suction pile, was also considered. A comparative analysis between the MP/FW and MB suction pile was completed in 2015 to determine the most suitable foundation design for the Proposed Project.

The selection of the proposed foundation considered all aspects of both technologies. While the MP/FW uses well-proven technology, its large size and pile driving equipment makes installation challenging,

[5] Seven turbine sites were initially investigated as depicted on Figure 2-16. The six turbine sites (ICE1 – ICE6) exhibiting the most optimal geotechnical characteristics were selected for the final proposed layout.

requiring three offshore lifts. The MB technology requires the use of one offshore lift and does not require any pile driving. Therefore, the installation costs are significantly lower (33 percent) for the MB technology. While both foundations meet the technical performance requirements for Lake Erie's sediment and winter weather conditions, the MB is lighter, quicker to install, and can be fabricated competitively in the U.S. By eliminating pile driving and reducing sediment disturbance, the MB foundation lessens environmental impacts when compared with conventional foundations. Given these advantages, the MB was selected as the proposed foundation.

2.4.4 Selection of Proposed Substation Location

Three potential interconnection locations were evaluated by LEEDCo: Cleveland Electric Illuminating Co. (CEI) Lakeshore Substation, CEI Oglebay-Norton Tap, and Lake Road Substation. Feasibility, cost of required equipment, and anticipated impact were elements considered. The Lake Road Substation was chosen as the proposed location as it was the closest potential interconnection location to the Proposed Project Area, thereby reducing cabling distance and cost. This site would also require minimal upgrades to existing infrastructure and would have sufficient land to construct necessary equipment for the Proposed Substation.

2.4.5 Selection of Proposed Cable Route

LEEDCo retained an engineering firm to develop a preliminary design for the submerged electric collection cable system, including the layout of the buried cable system, shore crossing, and installation. Six potential cable routes were identified. To connect the export cable to the Proposed Substation, the cable route would need to cross or go around the breakwater, then cross the harbor to the Lake Road Substation. A confined disposal facility (CDF) is located within the harbor along the direct path to the Lake Road Substation. Six different cable route options for crossing the breakwater, CDF, and harbor were identified. A comparative analysis was conducted to assess the benefits and risks of five of the options (Appendix D). Subsequently, further analysis was performed to assess a variant of one of the options resulting in a total of six options that were assessed.

Criteria considered included cable length, suitability of HDD, potential damage from third parties, environmental aspects, thermal bottleneck potential, permitting considerations, potential Port and City of Cleveland development plans, and USACE dredging of the navigational channel near the shore crossing. The proposed option would route the cable in a conduit installed using HDD from the Lake Road Substation, under the harbor, around the east side of the CDF, and then under the breakwater to the open water just north of the breakwater. The remainder of the cable route from north of the breakwater to the first proposed turbine site would be similar for all six options identified: direct path from north of the breakwater to the first proposed turbine site. That portion of the cable would be buried in the lakebed. An in-depth geotechnical and geophysical survey for the entire proposed cable route was performed in October 2016.

2.5 Public Input Summary

2.5.1 DOE Notice of Scoping and Notification of Public Scoping Meeting

A Notice of Scoping and Notification of Public Scoping Meeting was issued on September 14, 2016 to request public input on the scope of the Draft EA for the Proposed Project (see Appendix A). The Notice stated that DOE, USACE, and USCG would hold a public scoping meeting on September 28, 2016 and that they welcomed input on the proposed scope of the EA. The Notice requested that all comments be provided on or before October 21, 2016.

A postcard with a summary of the scoping notice, including notice of the scoping meeting, and a link to additional online information was mailed to approximately 5,200 recipients, which includes individuals or organizations who have expressed an interest in the project. Notice of scoping and of the scoping meeting was published in the federal register and published in the Cleveland Plain Dealer. Notice was also distributed by email to the DOE Wind and Water list serve distribution list. The public meeting was held on September 28, 2016, as described in the Notice.

2.5.2 Comments Received during the DOE Public Scoping Period

A total of 95 comments were received from the public during the public scoping period. Agency comments were received from NOAA Great Lakes Environmental Research Laboratory; U.S. Fish and Wildlife Service (USFWS) Ecological Services Office, Columbus, Ohio; and EPA, Region 5. A copy of agency comments received during the public scoping period, as well as a comment response matrix summarizing public comments received is attached in Appendix A.

2.5.3 USACE Public Input

On September 20, 2016, the USACE Buffalo District Public Affairs Office posted a Notice of Public Scoping Meeting for Project Icebreaker on the Great Lakes Information Network announcement service, and various Buffalo District social media sites. The Buffalo District Public Affairs Office also forwarded the announcement to various USACE media contacts in the Cleveland area.

Once the DOE, as the lead federal agency, issues a notice that the Draft EA is available for public comment, USACE would concurrently issue a one-page notice announcing the availability of the Draft EA. The USACE public comment period is 30 days. The USACE one-page notice would refer the reader to the Draft EA for details and would request input from federal and state agencies, adjacent property owners, and the public.

2.5.4 US Coast Guard Public Input

The USCG released the Notice of Scoping and the Notification of Public Scoping Meeting using the USCG 9th District Public Affairs' Twitter and Facebook accounts on September 16, 2016. Additionally, the USCG communicated directly with Lake Carriers Association and Interlake Steamship Company concerning the Proposed Project to provide additional time for comments.

2.5.5 LEEDCo Community Outreach

Since 2006, LEEDCo has participated in over 400 meetings and presentations about the Proposed Project to share information with local stakeholders and local communities. In 2013, LEEDCo made 15,000 face-to-face contacts across Northeast Ohio to determine public opinion and willingness to buy electricity generated from an offshore wind project, even at a higher price.

2.6 Permitting

2.6.1 USACE Permitting

The USACE has regulatory and permitting authority under Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act. Section 10 pertains to authorization of structures or work in or affecting navigable Waters of the U.S. Section 404 regulates discharges of dredged or fill material into Waters of the U.S., including wetlands.

The decision to approve or deny Sections 10 and 404 permit requests is based on an evaluation of the probable impact, including cumulative impacts, of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefits which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered, including the cumulative effects thereof. A summary of how each of these public interest review factors was considered in the Draft EA is presented as follows.

The USACE will seek comments from the public; federal, state and local agencies and officials; Indian Tribes; and other interested parties in order to consider and evaluate the impacts of the Proposed Project.

In addition to Sections 10 and 404, Section 408 permission must also be granted for any alterations to, or temporary or permanent occupation or use of, USACE, federally authorized, civil works projects.

LEEDCo will apply for a USACE Section 10/404 Permit for the installation of the offshore wind turbines and electric collection line. USACE received a Section 408 application from LEEDCo on February 6, 2017 for alterations to, or temporary or permanent occupation or use of, USACE, federally authorized, civil work projects.

Public Interest Review Factors (33 CFR 320.4(a)(1))

The USACE general regulatory policies for evaluating permit applications require that a decision to issue a permit be based on an evaluation of the probable impacts, including cumulative impacts, of the proposed activity and its intended use on the public interest (33 CFR 320.4). Appropriate evaluation of the potential impacts that the proposed activity may have on the public interest requires a careful examination of all relevant factors in each case. USACE's decision to authorize a proposal and its associated conditions are determined by the outcome of this general examination. In compliance with these regulations, this Draft EA addresses the following public interest review factors: conservation of natural resources, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shore erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, and considerations of property ownership. Each public interest review factor is listed below with a conclusion or reference to where it is evaluated in the Draft EA.

a. Conservation of Natural Resources

The Proposed Project would not result in the conservation of additional land or the use of lands conserved for other purposes. The proposed wind turbine generators, submerged electric collection cables, and substation do not cross any conservation lands. The offshore portions of the Proposed Project do not traverse any sanctuaries or other such conservation areas. Therefore, this public interest review factor was not evaluated further in the Draft EA.

b. Economics

The affected environment and environmental impacts related to socioeconomics are described in Section 3.13 of the Draft EA.

c. Aesthetics

The affected environment and environmental impacts related to aesthetics are described in Section 3.11 of the Draft EA.

d. General Environmental Concerns

1. Noise

The affected environment and environmental impacts related to noise are described in Section 3.12 of the Draft EA.

2. **Air**

The affected environment and environmental impacts related to air are described in Section 3.6 of the Draft EA.

e. Wetlands

The affected environment and environmental impacts related to wetlands are described in Section 3.1.5 of the Draft EA.

f. Historic Properties

The affected environment and environmental impacts related to historic properties are described in Section 3.10 of the Draft EA.

g. Fish and Wildlife Values

1. Benthos

The affected environment related to benthos is described in Section 3.4.1.1 of the Draft EA. The environmental impacts related to benthos are described in Section 3.4.2.1 of the Draft EA.

3. Fish Resources

The affected environment related to fish resources is described in Section 3.4.1.2 of the Draft EA. The environmental impacts related to fish resources are described in Section 3.4.2.2 of the Draft EA.

4. Terrestrial Amphibians, Reptiles, and Mammals

The affected environment and environmental impacts related to terrestrial amphibians, reptiles, and mammals are described in Section 3.1.4 of the Draft EA.

5. Birds and Bats

The affected environment related to birds and bats is described in Section 3.4.1.3 of the Draft EA. The environmental impacts related to birds and bats are described in Section 3.4.2.3 of the Draft EA.

h. Flood Hazards

The affected environment and environmental impacts related to flood hazards are described in Section 3.1.7 of the Draft EA.

i. Floodplain Values

The affected environment and environmental impacts related to floodplains are described in Section 3.1.7 of the Draft EA.

j. Land Use

The affected environment and environmental impacts related to land use are described in Section 3.1.8 of the Draft EA.

k. Navigation

1. Lake Navigation

The affected environment related to lake-based navigation is described in Section 3.9.1.1 of the Draft EA. The environmental impacts related to lake-based navigation are described in Section 3.9.2.1 of the Draft EA.

2. Aviation

The affected environment related to aviation is described in Section 3.9.1.2 of the Draft EA. The environmental impacts related to aviation are described in Section 3.9.2.2 of the Draft EA.

l. Shore Erosion and Accretion

The affected environment and environmental impacts related to shore erosion and accretion are described in Section 3.1.6 of the Draft EA.

m. Recreation

The affected environment and environmental impacts related to recreation are described in Sections 3.8 and 3.9 of the Draft EA.

n. Water Supply and Conservation

The affected environment related to water supply and conservation is described in Section 3.3.1.2 of the Draft EA. The environmental impacts related to water supply and conservation are described in Section 3.3.2.2 of the Draft EA.

o. Water Quality

The affected environment related to water quality is described in Section 3.3.1.1 of the Draft EA. The environmental impacts related to water quality are described in Section 3.3.2.1 of the Draft EA.

p. Energy Needs

The Proposed Project would consist of the construction, operations, maintenance, and eventual decommissioning of an approximate 20.7 MW offshore wind advanced technology demonstration project, consisting of six wind turbine generators, submerged electric collection cables, and a substation. The energy generated by the Proposed Project would deliver power to a single point of interconnection on the existing

CPP electric grid, the 138 kV Lake Road Substation. Additional Proposed Project details, description, and layout are provided in Section 2.2 and Appendix B of the Draft EA.

q. Safety

1. Waste Management

The affected environment related to waste management is described in Section 3.5.1.1 of the Draft EA. The environmental impacts related to waste management are described in Section 3.5.2 of the Draft EA.

2. Hazardous Materials

The affected environment related to hazardous materials is described in Section 3.5.1.2 of the Draft EA. The environmental impacts related to hazardous materials are described in Section 3.5.2 of the Draft EA.

3. Public Health and Safety

The affected environment related to public health is described in Section 3.5.1.3. The environmental impacts related to public health and safety are described in Section 3.5.2 of the Draft EA.

r. Food and Fiber Production

The Proposed Project would have no effect on food and fiber production. Potential effects on commercial fishing are discussed in Section 3.13.2.5 of the Draft EA. This public interest review factor was not evaluated further in the Draft EA.

s. Mineral Needs

The Proposed Project would have no effect on mineral needs. Therefore, this public interest review factor was not evaluated further in the Draft EA.

t. Considerations of Property Ownership

As stated in the USACE regulatory guidance, authorization of work or structures by a USACE permit does not convey any property rights, either in real estate or material, or any exclusive privileges (33 CFR 320.4(g)(6)). The proposed turbines would be erected on foundations placed on the Lake Erie lakebed, on leased submerged state lands off the coast of the City of Cleveland, in Cuyahoga County, Ohio. These rights were obtained through a Submerged Lands Lease with the State of Ohio. The onshore components, including a proposed overhead cable, underground concrete duct bank, underground cable, and new substation would also be located in Cleveland, Ohio. Construction would be supported by the temporary use of the Port of Cleveland to stage, pre-assemble, and test the turbine components and potentially to stage and assemble the foundation components, completed foundations, and export cable.

2.6.2 Ohio Environmental Permitting

2.6.2.1 Ohio Department of Natural Resources

The ODNR is the lead agency in administering the Ohio Coastal Management Program. A summary of the Proposed Project's consistency with the Ohio Coastal Management Program and a signed Consistency Certification Statement will be included as a part of the Section 10/404 permit application. The USACE will forward the Section 10/404 permit application to ODNR and coordinate with ODNR for its review of the coastal zone consistency.

2.6.2.2 Ohio Environmental Protection Agency

LEEDCo will submit a Section 401 application once the Section 10 and 404 permit application public notice is issued. The Ohio Environmental Protection Agency (OEPA) is responsible for evaluating the application for a Section 401 Water Quality Certification. Pre-application meetings with the OEPA were held on March 1 and May 5, 2017.

2.6.2.3 Ohio Power Siting Board

LEEDCo must obtain a Certificate of Environmental Compatibility and Public Need from the OPSB under state law, pursuant to Chapter 4906-4 of the Ohio Administrative Code (OAC). LEEDCo filed its permit application with the OPSB on February 1, 2017. The Application was assigned Case No. 16-1871-EL-BGN. Ninety days prior to its filing, on November 3, 2016, LEEDCo held a public information meeting to present information and answer questions on the Proposed Project. On April 3, 2017, the OPSB notified LEEDCo that it would require two Memoranda of Understanding (MOUs) between LEEDCo and the ODNR. One MOU relates to pre-, during, and post-construction monitoring and analyses for potential project impacts on fisheries and aquatic resources, while the second relates to potential impacts on birds and bats. The MOUs were submitted on July 20, 2017. On July 25, 2017, the Application was determined complete by OPSB. Next, the OPSB staff will issue notice, set an intervention deadline, conduct discovery, issue a staff report, hold a public hearing in the Proposed Project vicinity, hold adjudicatory hearings at OPSB offices, and then issue a decision. A decision is expected during the fourth quarter of 2017.

2.6.3 Permits and Authorizations

Table 2-3 summarizes the various permits, licenses, and authorizations required for the Proposed Project and their status.

Table 2-3. Permit Table

Permits	Agency	Project Phase	Submitted	Status
Certificate of Environmental Compatibility and Public Need	OPSB	Construction and Operation	February 1, 2017	Pending
Section 10 of the Rivers and Harbors Act	USACE	Construction and Operation	Submission pending	
Section 404 of the Clean Water Act	USACE	Construction	Submission pending	
Coastal Zone Consistency	ODNR	Construction and Operation	Submission pending	
401 Water Quality Certification	OEPA	Construction	Submission pending	
Section 408 Permit to Alter, Impact, or Encroach upon a Federal Navigation Project	USACE	Construction and Operation	February 3, 2017	Pending

Table 2-3. Permit Table

Permits	Agency	Project Phase	Submitted	Status
FAA Determination of No Hazard	FAA	Operation	July 22, 2017	Received - February 22, 2017
Permit for Private Aid to Navigation	USCG	Operation	Submission pending	

2.7 Applicant Committed Measures

LEEDCo has made commitments, listed below by resource area, to avoid or minimize potential impacts that were identified during the development of the Proposed Project and preparation of the Draft EA. These commitments, and any additional measures identified through permitting or Memoranda of Understanding, would be incorporated and binding through the DOE financial assistance award. The measures below were not necessarily included to decrease the level of impact below significant (i.e., the impacts may have been less than significant with or without the measures), but the measures would be required as a condition of the DOE financial assistance award to further reduce the likelihood of impacts and to ensure the Proposed Project is carried out in an environmentally responsible manner.

2.7.1 Aquatic Resources

LEEDCo has reached agreement with the ODNR on an aquatic and fish sampling plan that lays out testing and analyses that will be conducted before, during and post-construction. A MOU between the agency and LEEDCo was signed June 15, 2017 and filed with the OPSB July 20, 2017 (link to MOU: http://dis.puc.state.oh.us/TiffToPDf/A1001001A17G20B35707J00358.pdf).

2.7.2 Birds and Bats

LEEDCo has had discussions with ODNR and the USFWS to develop a sampling plan that lays out testing and analyses that will be conducted before, during and post-construction for birds and bats. A MOU between the ODNR and LEEDCo was signed July 20, 2017 and filed with the OPSB July 20, 2017 (link to MOU: http://dis.puc.state.oh.us/TiffToPDf/A1001001A17G20B35707J00358.pdf).

LEEDCo would develop a Bird and Bat Conservation Strategy to conduct thorough post-construction monitoring of Proposed Project impacts, and to undertake adaptive management measures, if necessary. Mitigation and adaptive management measures would be implemented if actual impacts exceed expectations.

Bat collision impacts at turbines are most frequent on nights when wind speeds are lower, especially during the late summer when migrating and swarming bats are most active. To address this concern, LEEDCo has agreed to feather the turbine blades (i.e., adjust the pitch of the turbine blades) up to the manufacturer's cut in speed (i.e., 6.7 mph, the speed at which the turbine starts generating electricity) during these active periods.

LEEDCo would follow lighting recommendations per the USFWS 2012 land-based wind energy guidance documents. Gehring et al. (2009) found that the use of red or white flashing obstruction lights strongly correlated with a decrease in avian fatalities compared to non-flashing, steady burning lights at tower systems. Gehring et al. (2009) further stated that "Removing non-flashing lights from towers is one of the most effective and economically feasible means of achieving a significant reduction in avian fatalities at existing communication towers.” The Proposed Project would use flashing red lights on turbines, as stipulated by the FAA for bird safety.

DOE has advised LEEDCo to continue to work with USFWS and ODNR to address any bird and bat issues that could arise during planning, construction, operation, or decommissioning of the Proposed Project. In addition, DOE has advised LEEDCo that they should work with USFWS to ensure that they comply with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. Finally, and in accordance with Section F.1. of the MOU between DOE and USFWS regarding implementation of Executive Order 13186, DOE has notified and advised LEEDCo “to contact the USFWS to discuss compliance with appropriate laws protecting migratory birds, independent of DOE’s funding decision.” LEEDCo’s coordination with USFWS and ODNR, as well as compliance with agreed upon measures, would be required as a condition of the DOE financial assistance award.

2.7.3 Spill Prevention, Control, and Countermeasure Plan

LEEDCo would comply with federal and state regulations for management of fluids and fuels, including maintaining and implementing a spill prevention, control, and countermeasure (SPCC) plan. Vessels would be navigated by trained, licensed vessel operators who would adhere to navigational rules and regulations, and would be equipped with spill handling materials adequate to control or clean up any accidental spill.

2.7.4 Inadvertent Return Contingency Plan

An Inadvertent Return Contingency Plan would be prepared by LEEDCo to address the potential risk of an inadvertent release of drilling fluids during the HDD of the proposed export cable. The plan would describe the procedures LEEDCo and the contractors would implement to avoid, minimize, and remediate potential environmental impacts that could result from an inadvertent release. The plan would be submitted as part of the USACE Section 404 permit application.

2.7.5 Traffic and Transportation

LEEDCo would implement the following safety measures associated with traffic and transportation.

Construction:

- Notify all applicable agencies (e.g., USCG, USACE, etc.) prior to construction that a construction vessel (or vessels) would be moored and/or traveling within navigable channels. Provide the USCG with the information necessary for the USCG to issue a Notice to Mariners.
- Follow any navigation restrictions imposed by the USCG.
- Notify appropriate authorities to include the wind turbines on navigation charts.

Operation:

Comply with FAA and USCG requirements regarding markings and lighting of turbines, including FAA L-864 aviation red-colored flashing lights (20 to 40 flashes per minute) for nighttime wind turbine obstruction lighting.

Decommissioning:

Follow all requirements of any approved Decommissioning Plan.

2.7.6 Cultural Resources

While no evidence of items of archeological or cultural significance have been identified, LEEDCo would continue to monitor for items of archeological or cultural significance and immediately notify the appropriate agencies of discovery of any previously unknown historic or archeological remains during construction.

2.7.7 Socioeconomic

LEEDCo would use designated truck routes which are designed to minimize impacts on residential areas and sensitive receptors (e.g., hospitals, schools, daycare facilities, etc.) to the extent possible.

SECTION 3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

Section 3 describes the existing environmental resources associated with the Proposed Project, including the wind turbines, inter-array cables, export cable, substation, O&M Center, the Port staging area, and any associated workspace for the Proposed Project. The section also analyzes the potential environmental effects of the Proposed Project and the No-Action Alternative on the environmental resources. Potential environmental effects are analyzed for each of the following phases of the Proposed Project: (1) construction, (2) operations and maintenance, and (3) decommissioning. The effects or impacts are described in terms of their type (adverse or beneficial); duration (short- or long-term); and intensity. The threshold definitions for the impact intensities used in this analysis are as follows:

- Negligible: Impacts on the resource, although anticipated, would be difficult to observe and are not measurable.
- Minor: Impacts on the resource would be detectible upon scrutiny or would result in small but measurable changes in the resource.
- Moderate: Impacts on the resource would be easily observed and measurable, but would be localized or short-term (equal to or less than 2 years).
- Major: Impacts on the resource would be easily observed and measurable, widespread, and long-term (i.e., more than 2 years).

In addition to these impact thresholds under NEPA, there are effects determinations definitions that are applicable specifically for the Endangered Species Act (ESA). The ESA effects determination for federally listed species can be as follows:

- No effect: Federally listed species or critical habitat will not be affected, directly or indirectly.
- May affect, but is not likely to adversely affect: All effects on federally listed species are beneficial, insignificant, or discountable.
- May affect, and is likely to adversely affect: An adverse effect to listed species may occur as a direct or indirect result of the proposed action and the effect is not: discountable, insignificant, or beneficial.

3.1 Environmental Resources Evaluated and Dismissed from Detailed Analysis

Consistent with NEPA implementing regulations and guidance, DOE focused the analysis in this EA on topics with the greatest potential for environmental impacts (known as the sliding-scale approach [40 CFR 1502.2(b)]). Section 3.1 and Table 3.1-1 present DOE's evaluations of the environmental resource areas on which LEEDCo's Proposed Project is expected to have no impact or a negligible impact. These resources are described below, but are not carried forward for detailed analysis.

Table 3.1-1. Resources Not Carried Forward for Detailed Analysis

Resource	Not Present	No Potential for Impact	Negligible Impact	Considerations
Currents and Waves		X		• Because of the small scale of the Proposed Project and circular shape of the turbine foundations, currents and waves would not be anticipated to be affected.
Groundwater		X		• Minor excavation for construction of the Proposed Substation would be shallow; approximately 3 feet. • The remainder of the onshore Proposed Project elements do not require excavation and have no potential to impact groundwater.
Aquatic and Terrestrial Vegetation			X	• Insufficient sunlight necessary for plant growth at depths beyond 52 feet; turbines proposed to be in 58 to 63 feet to the lakebed. • HDD would prevent impacts to nearshore submerged aquatic vegetation. • Potentially occurring aquatic vegetation that may be affected by cable burial would be expected to return to pre-installation conditions shortly after construction. • The onshore cable route and Proposed Substation would be constructed on developed land and would not require vegetation clearing at the site.
Terrestrial Amphibians, Reptiles, and Mammals			X	• Land-based wildlife in the Proposed Project Area are all highly urbanized species and have adapted to human activities such as construction. • Species that could be present during construction are highly mobile, and could actively avoid construction and decommissioning activities. • No impacts would be expected from decommissioning.
Wetlands	X			• No wetlands occur within 100 feet of the Proposed Project.
Shore Erosion and Accretion		X		• Shoreline is hardened near the proposed landfall, Lake Road Substation, Proposed Substation, HDD boring pit, as well as the Port used for the quayside staging area. • Erosion and sediment control best management practices would minimize sediment runoff impacts to Lake Erie.
Flood Plain and Flood Plain Hazards		X		• No impacts related to flood plain or flood plain hazards would be anticipated from construction, operations, maintenance, or decommissioning of the Proposed Project because onshore work and facilities would occur outside Federal Emergency Management Agency-mapped 100-year floodplain boundaries. • Proposed wind turbine area is located 8 to 10 miles offshore and would be unaffected by flooding events.
Land Use and Infrastructure			X	• Proposed Project would impact 0.34 acre of open lakebed, compared to the greater than 6 million acres of total open lakebed area in Lake Erie. • Export cable would be buried in open lakebed. • Proposed Substation would have a footprint of 0.22 acre on existing industrial land, adjacent to the Lake Road Substation.

Table 3.1-1. Resources Not Carried Forward for Detailed Analysis

Resource	Not Present	No Potential for Impact	Negligible Impact	Considerations
				• O&M Center and the Port staging area would be located on existing industrial land.
Intentional Destructive Acts			X	• Proposed Project would not transport, store, or use radioactive, explosive, or toxic materials. • Proposed Project would be a single component of a diversified power grid. • Proposed Project would not be considered to offer targets for intentional destructive acts.

3.1.1 Currents and Waves

Wave climatology of the lake is closely coupled with wind climatology. Rough waves are frequent during the autumn months, especially in the eastern half of the lake. Waves of 5 feet can be encountered approximately 30 percent of the time lake-wide (NOAA, 1987). Historical data (1981 through 2001) for a buoy located approximately 30 miles northwest of Cleveland indicated that average monthly significant wave heights ranged from 0.3 meter (approximately 1 foot) to 0.8 meter (2.6 feet), with maximum wave heights near 4 meters (13.1 feet; NOAA, 2003).

Hydrodynamic surveys were performed to determine how the Proposed Project might affect local and regional lake circulation patterns and how a potential change in currents could affect water quality and food webs. Sensors were deployed at one proposed turbine location and a reference station throughout the field season of May to October 2016 and re-deployed for the winter (October 2016 to April 2017). Monitoring to date shows small deviations between the top and bottom water velocity and direction with an average current velocity at the bottom of Lake Erie of 0.07 to 0.08 m/s and an average current velocity at the surface of 0.09 m/s. The average significant wave height and mean wave period recorded for 2016 was 0.43 meter (1.4 feet) and 2.5 seconds. The current velocities and wave data measured during the 2016 surveys correspond with previous measurements collected in the lake, and the data indicated that wind was the main driver for current in Lake Erie. Detailed results are provided in Appendix E.

Based on this understanding of Lake Erie currents and waves, the Proposed Project would utilize a circular foundation that minimizes potential impacts to currents and sediment scour. The circular shape of the foundation and tower minimizes eddy formation and allows currents to easily travel past the turbine with minimal interruption and disturbance. Because of the small scale of the Proposed Project, and circular shape of the turbine foundations, currents, and waves are not anticipated to be affected during construction, operations, maintenance, or decommissioning. Therefore, this resource is not carried forward for further analysis.

3.1.2 Groundwater

The Proposed Project, including the Proposed Substation, O&M Center, and staging area, would be located on developed land in downtown Cleveland with only the substation requiring excavation. The Proposed Substation would be built on existing filled land occupied by existing utility infrastructure. Minor excavation for construction of the Proposed Substation would be shallow, approximately 3 feet. There would be no anticipated impacts associated with groundwater because of the Proposed Project, and therefore, this resource is not carried forward for detailed analysis.

Additionally, because drinking water is obtained from Lake Erie and not from groundwater in this area, no impacts to drinking water would occur from work at the Proposed Substation. Impacts to drinking water are further evaluated in Section 3.3.2.2.

3.1.3 Aquatic and Terrestrial Vegetation

The Proposed Project turbines, located 8 to 10 miles offshore, would be in deep waters, approximately 58 to 63 feet to the lakebed. Water clarity data collected by LimnoTech in 2016 (Appendix E) at the proposed turbine sites indicates that solar radiation essential for plant growth is primarily nonexistent at depths beyond 52 feet. Water clarity at the proposed turbine sites is insufficient to allow growth of bottom vegetation. As such, there would be no reason to expect vegetation to grow on the lakebed near the proposed turbines or inter-array cables.

The use of HDD would prevent impacts to submerged aquatic vegetation that may be found along nearshore areas of the proposed export cable. Along the proposed export cable route from the HDD exit to the proposed turbine sites (or water depths beyond 52 feet), the direct disturbance resulting from cable burial would be approximately 15 feet wide, potentially disturbing a limited area of aquatic vegetation.

The onshore cable route and the Proposed Substation would be constructed on developed land, and would not require vegetation clearing at the site. The Proposed Project O&M Center would also have no impacts on vegetation because it would make use of an existing structure (to be leased by LEEDCo).

There would be no anticipated adverse impacts to aquatic or terrestrial vegetation resulting from implementation of the Proposed Project and, therefore, this resource is not carried forward for detailed analysis.

3.1.4 Terrestrial Amphibians, Reptiles, and Mammals

The Proposed Project, including the Proposed Substation, O&M Center, and staging area, would be located on developed land in downtown Cleveland along hardened shorelines. Wildlife that may occur in the upland area would likely be locally mobile species heavily adapted to urbanized human activity and locally mobile mammals, amphibians, or reptiles. Urban area nuisance species which may continue to live in the habitat available in parks, undeveloped parcels of land and vacant lots, may include raccoons, skunks, opossums, snakes, squirrels, groundhogs, and deer (ODNR, 2017a). Terrestrial amphibians, reptiles, and mammals (except for bats, which are evaluated in Sections 3.4.2.3 and 3.4.2.5) would not be expected to be influenced by the proposed activities; therefore, this resource is not carried forward for detailed analysis.

3.1.5 Wetlands

There are no wetlands within 100 feet of the Proposed Project as shown on USFWS National Wetland Inventory/surface water maps (USFWS, 2016). Lake Erie is considered open water and the shoreline is hardened near the Lake Road Substation, Proposed Substation, HDD boring pit, and the Port, which would be used as the quayside staging area for the Proposed Project (Figure 2-2). The Cuyahoga and Old Rivers also have hardened shorelines adjacent to the O&M Center. There would be no impacts to wetlands because of the Proposed Project; therefore, this resource is not carried forward for detailed analysis.

3.1.6 Shore Erosion and Accretion

The Lake Erie shoreline is hardened near the landfall, Lake Road Substation, Proposed Substation, HDD boring pit as well as the Port, which would be used as the quayside staging area for the Proposed Project.

No shore erosion or accretion would be anticipated during construction, operations, maintenance, or decommissioning because the proposed turbines would be 8 to 10 miles offshore in Lake Erie and activities associated with the export cable, Proposed Substation, and staging would occur where the shoreline is hardened. Because of the implementation of erosion and sediment control best management practices during work on the Proposed Substation, such as silt fences, sediment runoff impacts to Lake Erie would be minimized. Therefore, this resource is not carried forward for detailed analysis.

3.1.7 Flood Plain and Flood Plain Hazards

Surface water bodies around the Proposed Project include Lake Erie, the Cuyahoga River, and the Old River. The Cuyahoga River flows northwest, discharging into Lake Erie through a channel. The Old River is a short tributary draining into the Cuyahoga near the outlet to Lake Erie. Information on floodplains for these surface waters near the Proposed Project was obtained from the Federal Emergency Management Agency (FEMA; 2010).

The Proposed Substation would be located on CPP property adjacent to the Lake Road Substation. The waters of Lake Erie are designated as Zone AE, indicating there is a 1 percent annual chance of flooding. However, while the Proposed Substation site would be located adjacent to Lake Erie, it would be located outside the FEMA-mapped boundaries of the 100-year floodplain and associated floodways (FEMA, 2010).

The Proposed Project O&M Center would be located in an existing building on land leased from GLT, on Division Road approximately 1.6 kilometers (km) (1.0 mile) from the Cleveland outer harbor. This site abuts the Old River, which is also designated as Zone AE. However, as with Lake Erie, near the Proposed Substation, the FEMA-mapped 100-year floodplain does not extend beyond the banks of the river (FEMA, 2010).

No impacts related to flood plain or flood plain hazards would be anticipated because of construction, operations, maintenance, or decommissioning of the Proposed Project because onshore work and facilities would occur outside FEMA-mapped 100-year floodplain boundaries. The prospect of floods would not apply to the wind turbine component of the Proposed Project, because the turbines would be located in Lake Erie, 8 to 10 miles offshore. Any increase in the depth of water around the turbines would be negligible compared to the current water depth of approximately 62 feet CD at the proposed turbine locations. This resource is not carried forward for detailed analysis.

3.1.8 Land Use and Infrastructure

The Proposed Project Area for the proposed turbine sites would be approximately 4.2 acres of open lakebed in Lake Erie. The footprint of each foundation would be less than 0.06 acre, with a total footprint from all six turbines totaling 0.34 acre. The proposed export cable would be buried in open lakebed. The Proposed Substation would have a footprint of 0.22 acre on existing industrial land, adjacent to the Lake Road Substation. The O&M Center and the Port staging area would be located on existing industrial land.

There would be no change in land use because of the Proposed Project except where the turbine foundations would be located within Lake Erie. The Proposed Project would impact 0.34 acre of open lakebed.

Compared to the total area of Lake Erie (over 6 million acres), these foundations would represent an extremely small amount of the lake. The proposed export cable would not result in a change of land use, as it would be buried and covered by sediment.

The Proposed Project's land-based components would be located in downtown Cleveland adjacent to an extensive highway system and other existing infrastructure. The Proposed Substation would be connected to the existing 138 kV system at the Lake Road Substation with an overhead uninsulated cable and then transitioned to an underground concrete duct bank. The transition from the duct bank to the termination structures would be through a pre-cast concrete pulling pit. The underground circuit would run approximately 150 feet in a concrete encased conduit from an above grade termination structure in the Proposed Substation to an above grade termination structure in the Lake Road Substation. The Lake Road Substation would require minimal upgrades to existing infrastructure, and would have sufficient land to construct necessary Proposed Substation equipment. The Proposed Project would have a short-term impact on infrastructure during construction and decommissioning, through use of the highways (workers traveling to and from the site), the Port (fuel station, waste disposal), and work that would occur around the Lake Road Substation. However, the Proposed Project would result in a negligible increase in vehicular traffic and would not adversely impact operations at the Port or the Lake Road Substation. Therefore, the Proposed Project would not create a long-term change in traffic patterns or existing infrastructure.

There would be no anticipated adverse impacts to land use or infrastructure from implementation of the Proposed Project; therefore, this resource is not carried forward for detailed analysis.

3.1.9 Intentional Destructive Acts

Installation and operation of the Proposed Project would not involve the transportation, storage, or use of radioactive, explosive, or toxic materials. The Proposed Project would not be located near any national defense infrastructure or in the immediate vicinity of other substantial national structures. Further, the Proposed Project would be a single component of a diversified power grid. Consequently, implementation or non-routine events affecting the operation of the Proposed Project would not result in a substantial potential for disruption of electrical service. The Proposed Project would not be considered to offer any targets for intentional destructive acts.

There would be no anticipated adverse impacts associated with intentional destructive acts resulting from implementation of the Proposed Project; therefore, this scenario is not carried forward for detailed analysis.

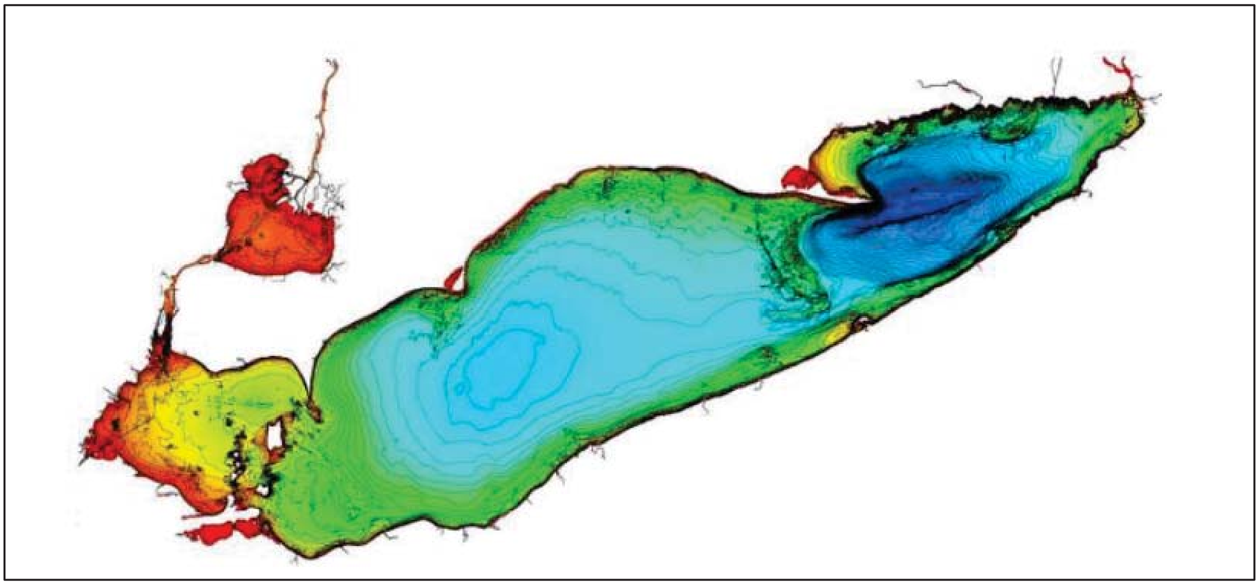
3.2 Physical Resources

3.2.1 Affected Environment

Several detailed technical surveys were conducted to determine the geological characteristics of the lakebed and the depth of water at the proposed turbine sites and along the proposed inter-array and export cable routes. The results of these surveys were used to characterize the physical features of Lake Erie in the vicinity of the Proposed Project, described in more detail below. Some of these surveys were used to establish baseline conditions of the lake and lakebed in the Proposed Project area while others were used to properly design the turbines and their foundations. The results of these surveys were also used to look for obstructions on the lake bottom and features such as ship wrecks (see Section 3.10**)**. The technical reports describing these surveys in more detail are attached as Appendices F-1 through F-3.

3.2.1.1 Lake Bathymetry

Lake bathymetry is the measurement of the depth of water and the topography of the lake bottom. Lake Erie is the shallowest of the Great Lakes with an average depth of 19 meters (62 feet) and a maximum depth of 64 meters (210 feet). It is the smallest of the Great Lakes by volume, although only the fourth smallest by surface area (NOAA, 2017a). Lake Erie consists of three distinct regions: the western, the central, and the eastern basins, each with significantly different bathymetric characteristics. The western basin is the shallowest with an average depth of 7 meters (21 feet) and features rocky outcrops, shoals, and islands (Lake Erie Waterkeeper, 2017). The central basin has a large flat bottom with an average depth of 20 meters (65 feet) and a maximum depth of 24 meters (80 feet) in a broad depression in the middle of the Lake (Lake Erie Waterkeeper, 2017; NOAA, 2017b). In contrast, the eastern basin contains a sharp, deep gouge with several steep slopes, an average depth of 24 meters (80 feet), and the deepest depths of the Lake off the tip of a long sandy peninsula (Lake Erie Waterkeeper, 2017). An overall view of Lake Erie is shown in Figure 3.2-1 (NOAA, 2017c).



Source: Appendix T

Figure 3.2-1. Bathymetric Map of Lake Erie (NOAA)

The Proposed Project would be located in the central basin. Site-specific bathymetric and side scan sonar results showed a generally uniform and smooth lake bottom at the proposed turbine locations (Appendices F-1 and F-2). Some evidence of ripples or other sedimentary features were observed along the proposed export cable route (Appendix T). Water depth increased linearly with increasing distance from shore. The proposed turbines and inter-array cables would be located in water depths of approximately 57 to 61 feet CD. The export cable would be located in water depths of approximately 60 feet to no shallower than 30 feet CD and buried at least 12 feet below either the break wall or the design dredge depth of the navigation channel. Figure 3.2-2 (Sheets 1 to 3) depicts the bathymetric contours of the Proposed Project Area.

3.2.1.2 Lake-Based Geology and Sediments

Bathymetric and side scan sonar results showed that the surficial lake bottom of the Proposed Project Area is comprised of soft, silty sediments (Appendices F-1 and F-2). The side scan sonar showed a generally uniform and smooth lake bottom at the proposed turbine locations (Appendix F-1). Figure 3.2-2 shows the Proposed Project, geological features of the Proposed Project Area, topographic contours, and oil and gas wells.

The proposed turbines would be located in an area of relatively uniform lakebed topography that slopes downward from southeast to northwest. Very-soft-to-soft sediments blanket the lake bottom in the area of the proposed turbines. Underneath these surface sediments, there are a discontinuous layered sequence of glacial and post glacial sediments, underlain by a thick sequence of normally-consolidated-to-slightly-overly-consolidated clay deposits. The general sequence of sediment layers is similar beneath the proposed turbine area; however, the details within the different layers vary considerably at the different proposed turbine locations. Bedrock beneath Lake Erie may consist of shale, siltstone, sandstone, and limestone as confirmed by site-specific geological surveys (Appendix F-2).

Along the proposed HDD cable alignment subsurface layers are composed primarily of cohesive sediments. Generally, the layers in descending order are lake-bottom mud, discontinuous sequence of layered silts, sands and clay, and normally-consolidated-to-slightly-over-consolidated clay (Appendix F-3).

Samples were collected during a site-specific geotechnical survey for analysis of physical and chemical characteristics such as grain size, total organic carbon, trace metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and organochlorine pesticides. The sediment analytical results were evaluated to determine the existing sediment quality in the vicinity of the proposed turbine sites and export cable route. Sediment results were compared to ecological sediment quality guidelines following the process outlined in OEPA's *Guidance on Evaluating Sediment Contaminant Results*. Results indicate that existing sediment quality at the four sampled locations would pose a low potential for toxicity to aquatic receptors. For more details on the sediment evaluation refer to the technical memorandum and Environmental Baseline Survey Technical Report in Appendix G.

Salt Mines

The Cargill Salt Mine extends from downtown Cleveland approximately 2.3 miles north beneath Lake Erie (juwi GmbH, 2009). The mine's roof is approximately 1,700 feet below the lakebed; it is a room and pillar mining system with unmined pillars remaining to support the overlying rock. There are long-term plans to extend the mine north and/or west beneath Lake Erie, though salt deposits would not be mined any closer to the lakebed. The salt mine is located approximately 4.7 miles from the nearest proposed turbine location and approximately 1.4 miles from the nearest edge of the export cable route envelope (Figure 3.2-3).

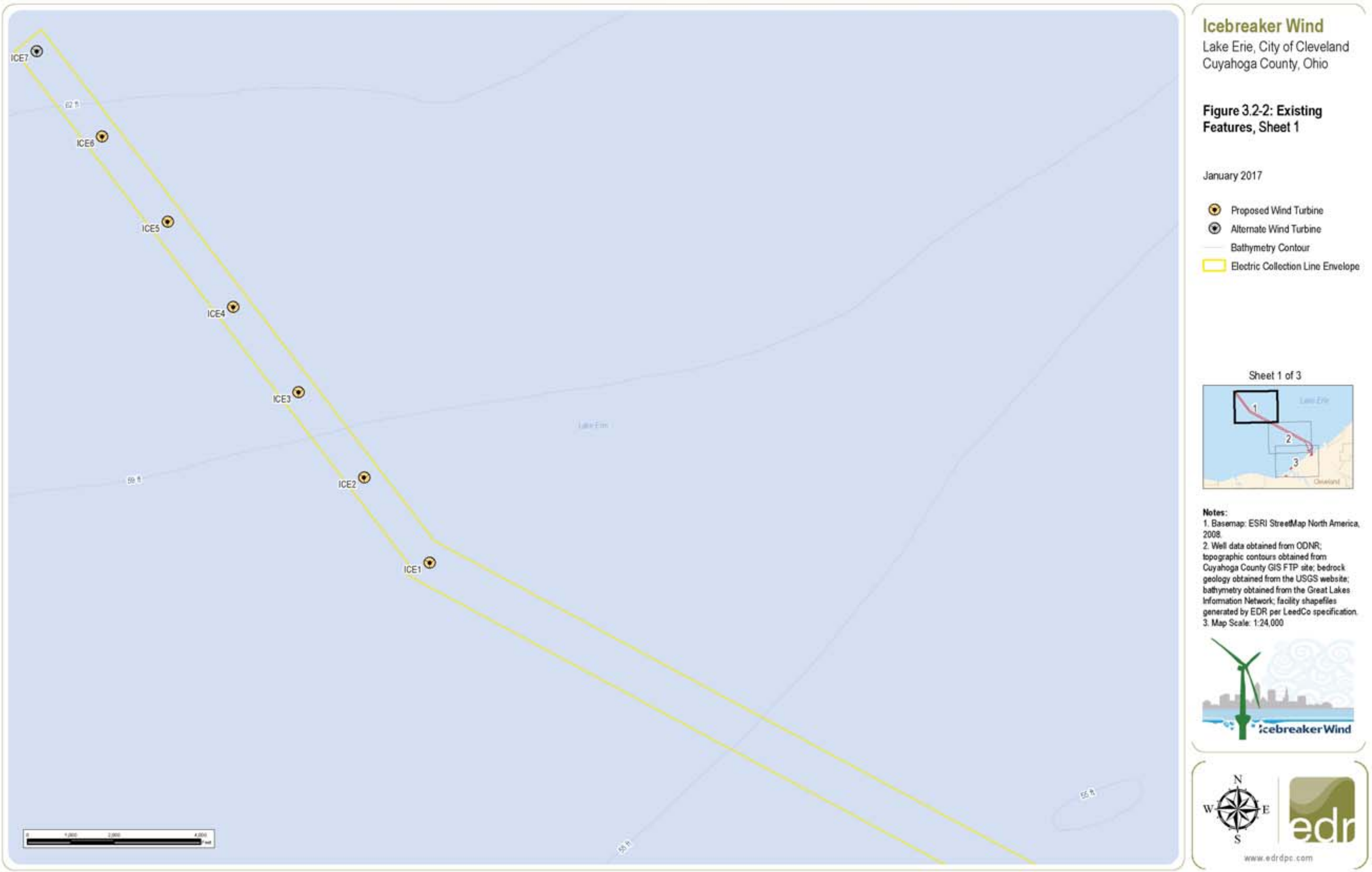


Figure 3.2-2. Existing Features, Sheet 1

Figure 3.2-2. Existing Features, Sheet 2

Figure 3.2-2. Existing Features, Sheet 3

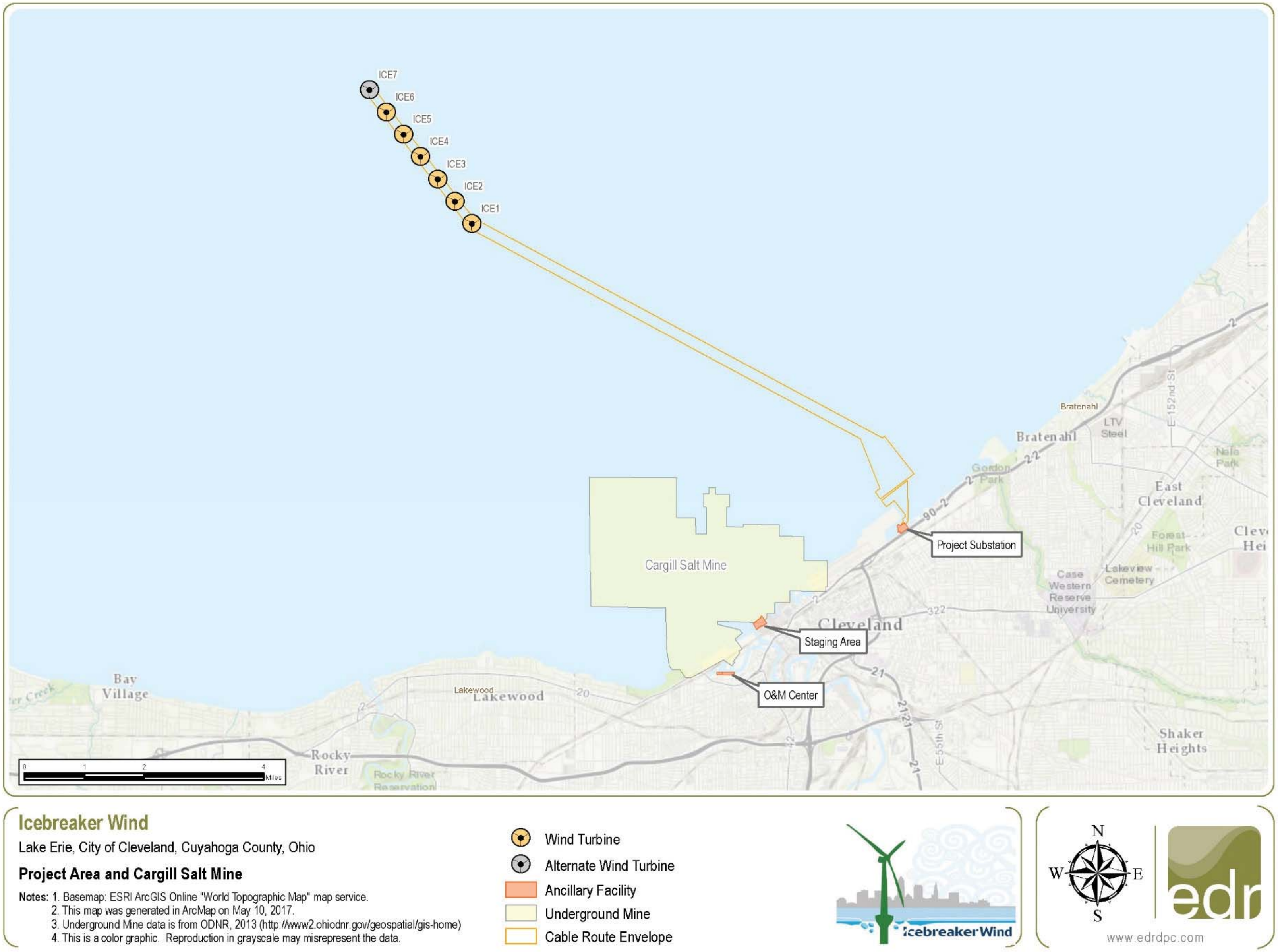


Figure 3.2-3. Location of Cargill Salt Mine in Relation to Proposed Project

Seismicity

Earthquakes of light to weak intensity have been reported near the Proposed Project Area. Most seismic activity in the area is less than magnitude 4, however, events greater than magnitude 4 have been recorded. According to the U.S. Geological Survey (USGS) (2017), earthquakes of magnitude 3 to 3.9 are described as weak (felt quite noticeably by persons indoors, especially on upper floors of buildings; standing motor cars may rock slightly; vibrations are similar to the passing of a truck). Earthquakes of magnitude 4 to 4.9 are described as light (felt indoors by many and outdoors by few during the day; at night, some people are awakened and dishes, windows, doors may be disturbed; the sensation is like a heavy truck striking a building). The average elapsed time between earthquakes is much longer in the eastern U.S. compared to the western U.S. The largest seismic event, magnitude 4.9, below the Lake Erie region occurred in Lake County, Ohio in 1986 (Ahmad and Smith, 1988). The epicenter was approximately 30 miles east of the Proposed Project Area. According to the USGS hazard map (2014), peak ground acceleration associated with a 2 percent probability of occurrence over a 50-year period is between 0.10 to 0.14 gravity (Appendix F-2). These hazard maps represent earthquake ground motion in terms of peak acceleration, defined as a percent of gravity, that have a common given probability of being exceeded in a defined number of years. These maps are employed to assess the probabilistic seismicity and provide information used to develop design provisions for building codes in the U.S. The codes provide design standards for buildings and infrastructure such as highways, bridges, and utilities. The higher the seismic hazard value is, the greater the potential hazard. The seismic hazard in the Proposed Project Area is low.

3.2.1.3 Land-Based Topography and Elevation

Figure 3.2-2 (sheet 3) depicts the land-based geological features of the Proposed Project, topographic contours, and oil and gas wells. The land-based components of the Proposed Project would be located at or near the Lake Erie shoreline, which has a relatively flat topography and an elevation approximately 600 feet above mean sea level.

3.2.1.4 Land-Based Geology and Soils

Land components of the Proposed Project would occur on currently developed land at or near the Lake Erie shoreline within the region known as the Erie Lake Plain. The Erie Lake Plain is comprised of lacustrine deposits and glacial drift. Glacial drift consists of varying amounts of gravel, sand, silt, and clay. Bedrock underlying the unconsolidated material beneath the Proposed Project Area is Devonian Age Ohio Shale and is reported to be several hundred feet below ground surface based on a review of Glacial and Surficial Geology of Cuyahoga County, Ohio maps prepared by the Division of Geological Survey (Hull & Associates, 2016). A geotechnical and subsurface exploration was completed to inform the design of the Proposed Substation (Appendix H).

Results of the subsurface exploration at the Proposed Substation show the area's upper surface consists of a gravel base and asphalt at some locations. Fill material was encountered from ground surface to a depth of approximately 29 to 35 feet below ground surface at boring locations. The fill material consisted of non-plastic silt and sand with varying amounts of wood, gravel, brick, slag, and coal fragments, with occasional zones of lean clay. The Lake Road Substation site was formerly submerged within Lake Erie. Based on review of historical USGS topographic maps, it appears the fill was placed directly on the lacustrine deposits to create developable land.

The subsurface investigation showed that soft to medium stiff lacustrine clay was present below the fill. This clay extended to the termination depth of the borings. In general, the first 5 to 15 feet of lacustrine clay deposits directly below the fill (approximately 35 to 50 feet below ground surface), was described as a non-plastic silt or silt sand and generally was not dense. Hull & Associates (2016) indicate that this is probably the former lakebed within the harbor. Bedrock was not encountered in any of the borings because it is anticipated to be over 150 feet below ground in this region.

3.2.2 Environmental Impacts Related to Physical Resources

3.2.2.1 Lake-Bathymetry

There would be no adverse or beneficial impacts, over the short- or long-term, to lake bathymetry from construction or operational activities associated with the Proposed Project.

3.2.2.2 Lake-Based Geology and Sediments

Construction

<u>Mono Bucket Foundations</u>

The MB foundation would require no site clearing, dredging, or drilling. The MB installation process would extract and discharge approximately 4,000 cubic yards of lake water from inside the bucket. Sediments from the top 0.1 to 0.3 meter (0.3 to 0.99 foot) of the lakebed could be sucked into the pump and become entrained in the discharge water during approximately the last meter of the penetration process. Water and the vast majority of suspended sediment removed during the MB installation would be pumped from the inside of the bucket back on to the lid of the MB. The quantity of sediment that would be pumped out may vary by location and the particular composition of the sediment at each of the six turbine sites. Finer grained sediments would become more easily entrained in the discharge water when compared to coarser grained sediments. The amount of sediment that might become entrained in the discharge water and released from the exhaust port is anticipated to be up to 75 cubic meters (2,649 cubic feet). The vast majority of the sediment would return to the lakebed on top of the MB lid, with a small amount possibly falling beyond the lid's diameter. Refer to Section 2.2.3.1 for detailed information on the MB installation process. The water and sediment pumped out would remain in the lake and any sediment removed and replaced would be expected to settle back to the lakebed.

Additionally, the jack-up vessel used for heavy lift operations would have a temporary impact on the lakebed. The heavy lift crane vessel used for the foundation installation may or may not have jack-up legs, while the heavy lift crane vessel used for the turbine installation would likely have jack-up legs with pads that would secure its position in the lakebed. Depending on the vessel used, the maximum pad dimension anticipated is 34 feet by 18 feet (612 square feet). Assuming six pads, this results in a maximum direct area of disturbance of just under 4,000 square feet or less than 0.1 acre. Movement of jack up legs could result in the suspension of lakebed sediments. Once the jack-up vessel is moved from a proposed turbine site, the location of legs would remain as a small depression that would fill in over time. The impacts would be minor, localized, and short-term in nature. If a DP vessel is used to perform the foundation heavy lift operations, there would be no direct impact to the lakebed because DP vessels do not require anchor placement and do not make direct contact with the bottom.

There would be no adverse or beneficial impacts, over the short- or long-term, to the salt mine, or seismicity that would result from MB foundation construction activities associated with the Proposed Project.

<u>Cable Installation</u>

Construction activities would temporarily impact the lakebed through burial of the inter-array cables and export cable. Prior to installing the cable, if any large debris were identified within the cable route envelope, it would be removed with a grapnel hook towed behind a small work boat. The grapnel would penetrate the lake bottom to an approximate depth of 1 foot and would disturb sediments and have a minor effect on the lake bottom. The proposed inter-array cables and export cable would be installed beneath the lakebed using a cable plow or jetting tool. Along the proposed cable route, the direct disturbance resulting from cable installation would be approximately 15-feet wide. During installation of the cable, bottom sediment would become suspended within the water column; however, the impact would be short-term and localized. Lake Erie has low current velocities; therefore, bottom sediments suspended during jetting installation would be expected to settle back to the lake bottom with minimal transport of suspended sediments from the localized area. The temporary increase in suspended sediments and its impact to water quality is described in Section 3.3.2.1.

There would be no adverse or beneficial impacts, over the short- or long-term, to the salt mine, or seismicity that would result from cable construction activities associated with the Proposed Project.

Operation and Maintenance
Operation and maintenance of the proposed turbines would not affect lake-based geology or sediments because any activities would occur at the lake surface and within the turbine.

Operation of the proposed inter-array cables and export cable may cause a minor increase in the temperature of the sediment immediately surrounding the cable. No other operational impacts would be anticipated to affect lake-based geology or sediments.

Maintenance repairs could require the proposed inter-array cables or export cable to be unearthed, which would affect lake bottom sediments similar to construction. These effects would occur infrequently and in smaller areas than initial construction and would therefore be negligible.

There would be no adverse or beneficial impacts, over the short- or long-term, to lake bathymetry, the salt mine, or seismicity that would result from operations and maintenance activities associated with the Proposed Project.

Decommissioning
The MB foundations would be de-installed by reversing the suction process utilized during the installation. Pressure would be applied to the bucket and water would be pumped into the bucket. The pressure inside the bucket would lift the bucket out of the sediment, temporarily suspending sediments in the area.

The export cable and inter-array cables would remain buried and therefore would have no impact on lake-based geology or sediments during decommissioning.

There would be no adverse or beneficial impacts, over the short- or long-term, to lake bathymetry, the salt mine, or seismicity that would result from decommissioning activities associated with the Proposed Project.

3.2.2.3 Land-Based Geology and Soils

There would be no adverse or beneficial impacts, over the short- or long-term, to land-based topography and elevation that would result from construction, operations, maintenance, or decommissioning activities associated with the Proposed Project.

Construction
The Proposed Substation would have a footprint of 0.22 acre within a currently developed area. The entire Proposed Substation area would be excavated to a depth of approximately 3 feet for the installation of the Proposed Substation grounding grid. All unused excavated backfill would be removed from the site for

appropriate upland disposal. There would be long-term impacts at the Proposed Substation from construction of the Proposed Project; however, impacts would be minimal as the site consists of previously disturbed, fill material.

Operation and Maintenance
Operation and maintenance of the Proposed Substation would have no impact to land-based geology or soils.

Decommissioning
During decommissioning, the Proposed Substation would be de-energized and disconnected and isolated from the grid interconnection. There would be no impacts to land-based geology or soils from decommissioning of the Proposed Project.

3.2.3 No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funds by LEEDCo in support of the Proposed Project. Any potential beneficial or adverse effects to the physical, natural, or socioeconomic resources would not be realized.

3.3 Water Resources

3.3.1 Affected Environment

Surface water bodies in the Proposed Project Area include Lake Erie[6], the Cuyahoga River, and the Old River. Lake Erie is the southernmost of the five Great Lakes with surface water flowing eventually into the Atlantic Ocean through the St. Lawrence River (Michigan Sea Grant, 2017). As the shallowest and smallest of the Great Lakes by volume, water retention or replacement is 2.7 years for Lake Erie, compared to 6 to 173 years for the other Great Lakes (NOAA, 2017a). The Proposed Project would be located within the central basin region of Lake Erie, as discussed in Section 3.2.1.1. The Cuyahoga River flows northwest, discharging into Lake Erie through an artificial channel. The Old River is a portion of the original Cuyahoga River channel, which drains into the Cuyahoga near the outlet to Lake Erie.

3.3.1.1 Lake Water Quality

The *Ohio 2014 Integrated Water Quality Monitoring and Assessment Report* summarizes water quality conditions in Ohio according to reporting requirements under Sections 303(d), 305(b), and 314 of the Clean Water Act (OEPA, 2014a). The report compares available data with water quality goals to determine the suitability of waters for specific uses, including aquatic life, recreation, human health impacts related to fish tissue contamination, and public drinking water supplies. The current assessment of Lake Erie is focused on attainment of standards within the coastal waters only (OEPA, 2014a).

The aquatic life use of the Lake Erie shoreline is currently considered impaired, due to nutrient and sediment loadings from tributaries, the proliferation of exotic species, algal blooms, and shoreline habitat modifications. The same nutrients that cause the aquatic life impairments are also a major contributing factor to harmful algal blooms, which are currently one of the most serious issues in Lake Erie (OEPA,

[6] The International Joint Commission (IJC) reviews applications for projects that may affect natural level and flow of water across borders within the Great Lakes. The U.S. State Department and Global Affairs Canada determined that the Proposed Project would not require approval under the Boundary Waters Treaty and therefore would not require further action with the IJC.

2014a). Specifically, phosphorus is recognized as the limiting nutrient in feeding algal blooms, meaning when all phosphorus is used, plant growth will cease, no matter how much nitrogen is available.

Preconstruction surveys of Lake Erie water chemistry were conducted from May to October 2016 by LimnoTech (Appendix E). Discrete grab sampling for water chemistry and clarity were conducted once a month from May to October 2016 at six reference locations (Ref 1-6) and three proposed turbine locations (ICE 2, 4, 6), as shown in Figure 3.3-1. Samples were collected for nitrogen, phosphorus, and chlorophyll-a analysis. A Secchi disk was used to measure water clarity, and a specialized light meter was used to determine light extinction. Temperature, dissolved oxygen (DO), conductivity, turbidity, chlorophyll-a, blue-green algae, and pH were measured at the six reference stations and all proposed turbine locations once monthly from June through October 2016. Continuous water chemistry sensors were deployed at one reference station (Ref 1) and one proposed turbine location (ICE 4) to monitor the amount of light available for photosynthesis, water temperature, and DO. In July and August, sensors were added to turbine locations ICE 1, 2, and 7 for monitoring of DO and water temperature. DO and temperature data were also retrieved from nearby buoys (45164 and 45176) to provide additional nearshore and offshore data. Figure 3.3-1 depicts the water monitoring gauging stations used in collecting preconstruction survey data.

Water chemistry parameters decreased from May to October except for phosphorus and chlorophyll-a, which began to increase in October. Average monthly water clarity was 6.5 feet in May before increasing to 24 feet in July and afterwards decreasing to 10.3 feet in October. Lake bottom DO continually dropped until water became anoxic (devoid of oxygen) in early August and did not permanently oxygenate until late-September. Weekly fluctuations in bottom lake temperature increased from offshore to nearshore as temperatures increased until the water column mixed in late-September. Surface water temperatures had little deviation from nearshore to offshore throughout the survey. Details of the preconstruction survey results are described in Appendix E.

3.3.1.2 Drinking Water Supply and Quality

The Source Water Assessment and Protection (SWAP) program helps public water suppliers protect sources of drinking water, including streams, rivers, lakes, reservoirs, and aquifers from contamination. In Ohio, the SWAP program addresses more than 4,500 public water systems (OEPA, 2003). Two intakes for the City of Cleveland Division of Water that are considered Source Water Protection Areas are located in Lake Erie in the vicinity of the Proposed Project. The intakes are approximately 4 miles offshore. Based on geographic information system (GIS) data, the export cable would be between approximately 2.9 and 3.3 km (1.8 and 2.1 miles) east of the nearest potable water intake (the Cleveland Crib). The proposed turbine sites would be approximately 6.8 km (4.2 miles) northwest of the nearest potable water intake. Figure 3.3-2 shows the location of the water intakes with respect to the Proposed Project.

Figure 3.3-1. Water Monitoring and Gauging Stations

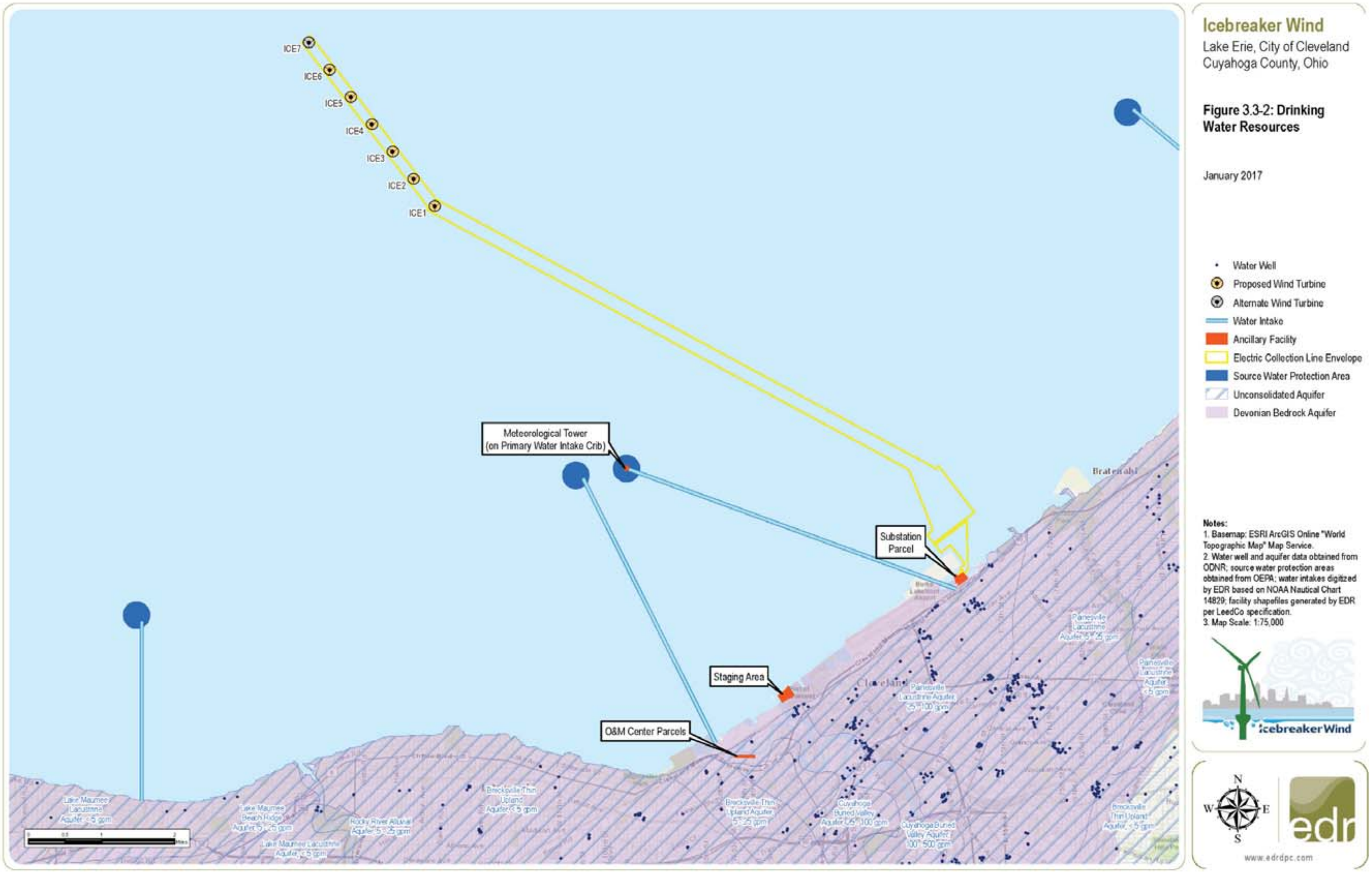


Figure 3.3-2. Drinking Water Resources

3.3.2 Environmental Impacts Related to Water Resources

3.3.2.1 Lake Water Quality

Construction

Installation of the MB turbine foundations would require no site clearing, dredging, or drilling. Sediments from the top 0.1 to 0.3 meter of the lakebed could be sucked into the pump and become entrained in the discharge water during approximately the last meter of the penetration process for the foundation installation. Water and the vast majority of suspended sediment removed during the MB installation would be pumped from the inside of the bucket back on to the lid of the MB. The vast majority of the sediment would return to the lakebed on top of the MB lid, with a small amount possibly falling beyond the lid's diameter. This process would result in minimal localized suspension of bottom sediments in the immediate vicinity of each MB foundation and would have a negligible impact on water quality. Refer to Section 3.2.2.2 for more information on sediments.

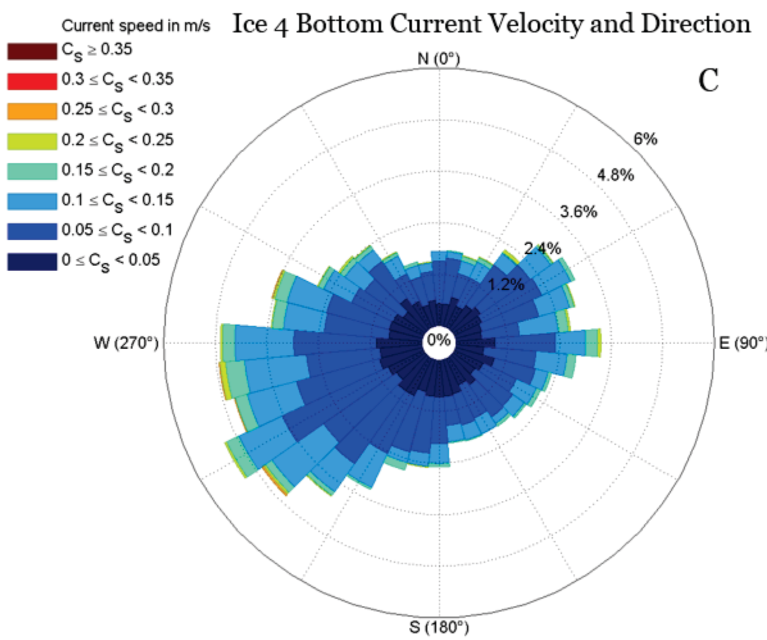
Additionally, the jack-up vessel to be used during installation of turbine components and possibly the foundations, could result in the suspension of lakebed sediments when the jack-up legs are moved. Similarly, vessel anchoring could also cause minimal suspension of lakebed sediments. These impacts would be minor, localized, and short-term in nature and would have a negligible impact on water quality.

Installation of the submerged electric cables (inter-array and export) would result in short-term, localized sediment suspension. Sediments would be disturbed along the approximately 12-mile length of the inter-array and export cables. Data from a similar project in Lake Erie and site-specific data were analyzed to assess potential suspended sediment impacts resulting from cable installation.

The *Lake Erie Water Quality Modeling Report* prepared by HDR Engineering, Inc. (2015) for a similar project in Lake Erie, the ITC Lake Erie Connector, was reviewed to assess the potential for increases in suspended sediment from the Proposed Project. The ITC Lake Erie Connector (LEC) Project is a proposed cable route approximately 80 miles east of the Proposed Project. The LEC cable route crosses a similar nearshore to offshore bathymetric gradient and water currents, and encounters a similar transition from sandy nearshore sediments to silt and clay offshore sediments as the Proposed Project. Modeling conducted for the LEC Project predicted that the highest total suspended solids (TSS) concentrations would occur around the point of cable installation and then decrease rapidly as distance from the installation area increases. At a lateral distance of 30 meters (98 feet) from the cable installation point, the maximum re-suspended TSS concentration increases were predicted to be less than 100 milligrams per liter (mg/L) above background conditions and at 100 meters (328 feet) from the cable installation point, the TSS concentration increases were predicted to be less than 3 mg/L above background conditions. TSS concentrations were predicted to drop to 100 mg/L above background TSS levels within the first hour and to less than 3 mg/L above background TSS levels within 1 to 4 hours, depending on the representative location. In the vertical direction, the model predicted that increased TSS concentrations would be limited to the bottom 5 to 11 meters (16 to 36 feet) of the water column depending on the representative location. Above these depths, the model predicted TSS concentrations of less than 3 mg/L above background conditions. Similar short-term and localized increases in TSS are expected to occur during installation of the proposed inter-array and export cables.

A variety of site-specific factors can affect the concentration and transport of suspended sediment, including the specific type of sediments and the speed and direction of water currents. Depending largely on the quantity of fine-grained sediments suspended and the properties of those sediments after suspension, sediments suspended during cable installation could remain concentrated above background levels for minutes to many hours after installation. Near the proposed turbine locations and within 2 km (1.2 miles) of the proposed turbines, surficial sediments are fine grained and typically composed of 34 to 58 percent clay, 34 to 50 percent silt, and less than 8 to 17 percent sand and gravel (Canadian Seabed Research Ltd., 2016). Along much of the proposed export cable route (i.e. from shore to 8 miles offshore), surficial sediments are sandy sediments, which, when suspended during cable installation, would settle immediately adjacent to the trench carrying the cable. Pockets of finer-grained sediments also exist along some portions of the proposed export cable route. These finer-grained sediments would remain suspended longer and travel farther than sands. Re-suspended fine-grained surficial sediments would tend to be re-suspended as flocs or masses rather than as individual particles. Consistent with this, the minimum settling rate of sediments could range from 1 meter per day (for floc settling of fine grain material) to over 100 meters per day (for coarse sand).

Ambient currents were monitored in 2016 as part of the Pre-Construction Monitoring study being conducted by LimnoTech (Appendix E). Lake currents from May to October 2016 were more frequently directed toward the southwest than to the northeast. Figure 3.3-3 shows a summary of current direction measurements near the bottom of the lake at the proposed turbine sites (ICE4). Typical persistent current speeds are low (about 4 centimeters per second). At this average current speed, fine grained sediments (with slow settling rates) could travel 3.5 km (2.2 miles) in 1 day if their characteristics are such that they remain suspended for this duration.



Note: Spokes represent the frequency of currents moving towards a particular direction.

Figure 3.3-3. 2016 Lake Bottom Current Velocity and Direction at ICE4

Ice scouring during winter months frequently creates large cuts and scars in the sediment bed that disturb sediment and displace aquatic life (USACE, 2000). Wind-driven resuspension can also increase ambient turbidity levels well above background levels. The National Aeronautics and Space Administration's (NASA's) earth observatory describes an event from 2015 (Figure 3.3-4), which shows widespread increases in turbidity across Lake Erie (NASA, 2015). Natural fluctuations in turbidity have also been measured by the City of Cleveland at their water intake cribs in Lake Erie (Moegling, 2017, pers. comm.).

Figure 3.3-5 shows the daily average of turbidity measurements from two of the four water intakes (Morgan and Baldwin) located approximately 4 miles offshore during the 2016/2017 season. Frequent turbidity spikes were observed at both intake locations. Further information on water quality impacts to drinking water is described in Section 3.3.2.2.

Figure 3.3-4. NASA Satellite Image from November 25, 2015 Showing Widespread Sediment Re-suspension Across Lake Erie

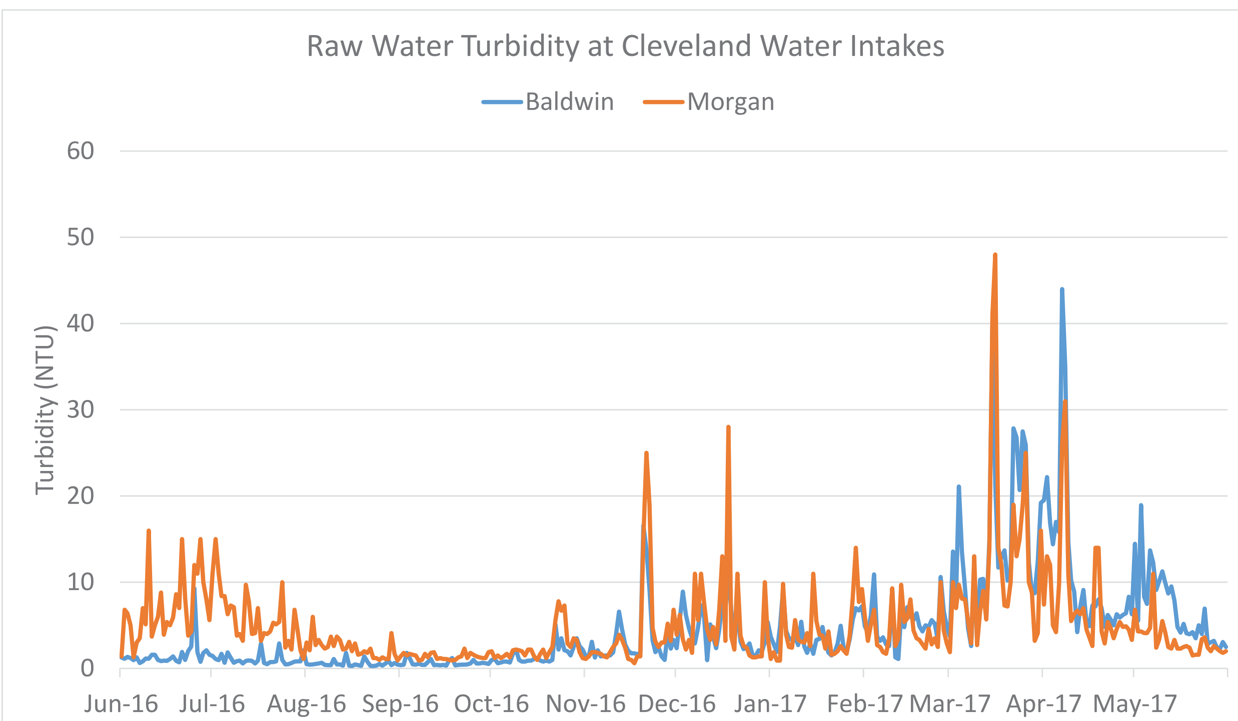


Figure 3.3-5. Turbidity Measurements at Two Cleveland Area Water Intake Cribs from June 2016 to May 2017

Additional sources of significant turbidity increases in Lake Erie are regularly caused by the passage of large tonnage lake carriers that frequent the Cleveland Harbor. Figure 3.3-6 shows the type of sediment disturbance that can take place as large ships move closer to shore along the designated shipping lanes. This image was captured on June 2, 2017 on Lake Erie by Aerial Associates of Ann Arbor during LEEDCo's recreational boat surveys that are being conducted for ODNR. In a given year, approximately 1,000 ships pass in and out of Cleveland (Port of Cleveland, 2017).

Figure 3.3-6. Aerial Image from June 2, 2017 on Lake Erie Showing Sediment Disturbance from Passing Ships

Installing the cable during the summer would also lower transport distances of re-suspended sediments as a thermocline (sharp change in water temperature and density) has been observed at the proposed turbine locations during summer months. The thermocline reduces the potential for sediments to be mixed higher in the water column and would also reduce the travel distance of re-suspended sediments. Short-term and localized increases in TSS are expected to occur during installation of the proposed inter-array and export cables similar to or less than those increases that already occur in this part of Lake Erie.

In addition to a temporary increase in turbidity and suspended sediment concentrations during the construction phase of the Proposed Project, temporary impacts to water quality from the disturbance of potentially contaminated sediment may occur. As described in Section 3.2.1.1, Lake Erie bottom sediments in areas offshore of Cleveland may contain elevated levels of contaminants, including metals, hydrocarbons, and PCBs. Limited bottom sediment samples were collected during a site-specific geotechnical survey in the vicinity of the proposed turbine sites and export cable route. Sediment results were compared to ecological sediment quality guidelines following the process outlined in OEPA's *Guidance on Evaluating Sediment Contaminant Results*. Results from this evaluation indicate that existing sediment quality at these four locations would pose a low potential for toxicity to aquatic receptors. Mobilization of potentially contaminated sediments could have a temporary indirect impact on water quality in the immediate vicinity of Proposed Project activities, primarily related to increased turbidity/suspended sediment; however, these impacts are expected to be temporary, localized and minor when compared to the surrounding natural sediment and water quality conditions in the Proposed Project Area.

Multiple vessels would be used during the construction of the Proposed Project. All vessels would comply with USCG requirements for management of onboard fluids and fuels, including maintaining and implementing SPCC plans. Refer to Section 2.7 Applicant Committed Measures regarding Proposed Project SPCC plans. The likelihood of spills would be low and impacts to water quality are unlikely.

The proposed export cable would be brought ashore under the Cleveland Harbor and the associated breakwater through a duct installed using HDD. Drilling operations would use drilling fluids to stabilize the bore hole and to lubricate the drilling process. The proposed drilling mud (a clay-based compound such as Bentonite) is National Sanitation Foundation-approved for drinking water applications such as water wells. The HDD contractor would take precautions to minimize or avoid a drilling fluid leak. An Inadvertent Return Contingency Plan would be prepared to address the potential risk of an inadvertent release of drilling fluids (refer to Section 2.7.4 Inadvertent Return Contingency Plan). If drilling fluid were to be inadvertently released during HDD activities, bentonite clay could become suspended in the lake and disperse in close proximity to HDD activities, which may cause temporary, local increases in turbidity. Overall impacts to water quality from such an inadvertent release would be minor and short-term.

In summary, there would be little sediment disturbance and impacts to the quality of Lake Erie surface waters associated with foundation installation. Sediment dispersion from cable burial is anticipated to be localized and short term, as sediment is expected to resettle and return to background levels shortly after cable burial is complete. Water quality impacts from inadvertent spills from vessels or bentonite release from HDD activities would be minimized through use of a SPCC and Inadvertent Return Contingency Plan. Therefore, impacts to water quality from construction of the Proposed Project would be minor and short-term.

Operations and Maintenance

The operation of the Proposed Project is not anticipated to generate any sources of pollutants to Lake Erie. To make sure that no discharges of any fluids (oil, hydraulic, cooling, etc.) occur even under abnormal circumstances, the turbine would be designed for three levels of containment as described in more detail in Section 2.2.2.1. The fluids associated with operations and maintenance (oil, hydraulic, cooling, etc.) are biodegradable, capable of being decomposed or broken down by the action of living things (such as microorganisms). In the extremely rare incident of failure of all three containment systems, any fluid that may leak into the environment would be inherently biodegradable. Most maintenance would occur inside the turbines, thereby reducing the risk of a spill, and no oils or other waste would be discharged during service events. The original coating system on the towers is designed to last the lifetime of the structure; therefore, no painting would be necessary during the life of the turbines other than to repair minor surface damage. As a result, impacts to surface water quality during operations and maintenance is expected to be negligible.

As with vessels associated with construction, any vessels used for operations and maintenance activities (approximately one per week) would comply with USCG regulations and applicable SPCC plans; therefore, potential impacts from spills are unlikely.

Operation of the proposed inter-array and export cables may cause an increase in water temperature because of the heat generated as electricity moves through the cable. A thermal analysis was completed by DOE as part of the LEC Project, a proposed cable route approximately 80 miles east of the Proposed Project. The proposed 1 gigawatt cable associated with the LEC is substantially more powerful than the Proposed Project's export cable. It was estimated for the LEC Project that the temperature at the water and sediment interface on the lakebed could increase a maximum of 4.4 degrees Fahrenheit (°F) during operations with the area of greatest temperature increase approximately 9 inches from the centerline of the proposed transmission cable in the down current direction of water flow. The physical extent of this temperature increase region is limited; dropping to a 0.2°F increase at only 4 inches from the warmed region (DOE, 2016). Effects on water temperature because of the presence and operation of the proposed inter-array or export cable are expected to be negligible.

If maintenance or an emergency repair of the inter-array or export cables is required, the effects would be limited to the immediate area of the repair site. During repair activity, the cable would be exposed, spliced with a new section, and reburied. Effects on water quality would only include local increases in turbidity and resuspension of sediments. Effects would be similar or less impactful to those of original installation.

Decommissioning

The removal of the MB foundations would be conducted by reversing the suction process utilized during the installation. Pressure would be applied to the bucket and water would be pumped into the bucket. The pressure inside the bucket would lift the bucket out of the sediment, temporarily suspending sediments in the area. Adverse impacts to water quality associated with sediment suspension resulting from the decommissioning phase of the Proposed Project would be minor and short-term.

The proposed export cable and inter-array cables would remain buried well below the surface of lake bottom sediments and therefore would have no impact on water quality from sediment suspension during decommissioning. As shown in Section 2.2.4, the project cables would not use any insulating fluids that could migrate into the water column.

Fuel spills or leaks from vessels and deconstruction equipment could also occur but would be unlikely because of secondary containment systems and SPCC plans. Similar to construction and maintenance, potential adverse impacts associated with fluids or spills resulting from the decommissioning phase of the Proposed Project would be minor and short-term.

3.3.2.2 Drinking Water Supply and Quality

Construction

The closest water intake and associated Source Water Protection Area (1,000-foot radius around the intake), shown in Figure 3.3-2, is between approximately 2.9 and 3.3 km (1.8 and 2.1 miles) from the proposed export cable and approximately 6.8 km (4.2 miles) from the closest proposed turbine. The potential for impacting water quality at the intakes depends on the prevailing lake currents during installation, precise type of sediment encountered along the proposed cable route, installation method (e.g., ship speed, trench depth/width, jet nozzle configuration), water intake design, and water plant pumping characteristics. Discussions with Cleveland Water indicate they frequently deal with natural increases in suspended sediment, or turbidity, at their intakes. The Cleveland Water conventional surface water treatment plant removes turbidity continuously as part of their treatment process to clarify and disinfect water (clarification to remove particulates, filtration to remove finest of particles and some dissolved chemicals if biological filtration is occurring, and disinfection with chlorine). The range of turbidity to be removed is part of the design process and uses worst case scenarios (from historical turbidity data) to establish the design capacities (Moegling, 2017, pers. comm.). Figure 3.3-5 shows the range of turbidity measured at their two intakes closest to the export cable route. It ranges from very low (under 10 NTU) to very high (30 to 50 NTU and higher), typically after a rain event or very choppy conditions on Lake Erie. The Cleveland Water treatment plant is large and therefore can handle most short term variations in turbidity from within the plant. For longer term events, Cleveland Water may adjust doses within the treatment process (Moegling, 2017, pers. comm.).

In addition, the configuration of the two water intakes only begins to let water flow in at depths of 5 to 10 feet above the lakebed, further limiting potential impacts. Water current data collected by LimnoTech, shown in Figure 3.3-3, show that water currents could carry sediments in the direction of the intakes and surficial sediment data from Canadian Seabed Research Ltd. (2016) show that areas of fine-grained sediment are located along the proposed export cable route in the region near the intakes.

To avoid potential impacts to the water intakes during cable installation, LEEDCo would work with the selected cable installation contractors to monitor and mitigate the amount of suspended sediment during cable installation. This would include careful review of selected contractor's equipment and installation method, initial monitoring of cable installation to ensure minimal impact, and adjustments to installation speed or jet pressure to limit suspension. LEEDCo would continue discussions with the City of Cleveland and develop a communications and monitoring plan that would inform Cleveland Water plant operators of construction schedule and provide field measurements of turbidity to optimize water treatment plant operation (as would occur under regular operating conditions during storm events). These precautions and mitigation measures would greatly reduce the potential for any negative impacts on drinking water supply. Any temporary impacts from increased suspended sediments would be expected to mirror other naturally occurring sediment resuspension events on Lake Erie.

Water and sewage from construction vessels would be emptied and disposed of at the Port. LEEDCo would use the existing infrastructure at the Port for disposal of water and sewage from construction activities. Therefore, no impacts or contamination to water supply are expected from these activities.

Operations and Maintenance

The operation of the Proposed Project is not anticipated to impact public water supplies. As stated above, the proposed turbines and the export cable would be located more than 4 and 1.8 miles respectively from the closest water intake, and with the general Lake Erie flow, the Proposed Project would be located down current from the water intakes. As discussed previously and in Section 3.5, any vessels used for operations and maintenance activities (approximately one per week) would comply with USCG regulations and applicable SPCC plans.

The current building proposed for the O&M Center has existing water, effluent, and sewage lines in place for full facilities (restrooms, showers, etc.). No modifications to the existing water, effluent, and sewage lines at any of the above facilities are anticipated for the Proposed Project.

Decommissioning

Similar to construction, impacts to water supply during decommissioning would not be anticipated.

3.3.3 No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funds by LEEDCo in support of the Proposed Project. Any potential beneficial or adverse effects to the physical, natural, or socioeconomic resources would not be realized.

3.4 Biological Resources

3.4.1 Affected Environment

3.4.1.1 Benthos

Benthic macroinvertebrates (small aquatic animals living among stones, sediments, and aquatic plants on the bottom of lakes, rivers, and streams) are very sensitive to water quality, often reflect changing environmental conditions, and serve as an important food source for fish. Benthic samples were collected by LimnoTech in conjunction with zooplankton and phytoplankton sampling at three locations (two proposed turbine locations and one reference location) once in May and once in October 2016. All benthos collected in May fell into three main classes: Bivalvia (aquatic mollusks with a hinged shell such as mussels), Insecta (insects), and Oligochaeta (worms). Most benthos collected in October fell into the same three groups, though a few crustaceans and nematodes (roundworms) were also collected in October. The densities of benthos were relatively consistent across the three sampling locations during the May and October 2016 sampling events. Detailed results of the site-specific benthic sampling can be found in Appendix E.

The Proposed Project's offshore area consists primarily of silty clay sediments and provides few natural, permanent structures for invertebrates to attach. The featureless, silty bottom sediment likely limits taxa diversity (e.g. mussels) but the absence of intolerant species (e.g. mayflies) is mainly because of extended periods of low dissolved oxygen, typically at or below 2 to 4 mg/L. Dissolved oxygen data collected in 2016 by LimnoTech show the Proposed Project turbine locations would be located within the Lake Erie Dead Zone and therefore offer poor habitat for macroinvertebrates. The Lake Erie Dead Zone (a large hypoxic zone) forms in late summer in the bottom of the central basin of Lake Erie and alters the lake ecosystem from July to October (ODNR, 2015). Invasive Dreissenid mussels (e.g. zebra and quagga mussels) were found as part of the site-specific LimnoTech study. Low summer DO prevents Dreissenid mussel populations from accumulating below the thermocline (about 40 feet deep) (Appendix E).

According to recent and historical data, the Lake Erie benthic community has experienced significant changes during the last half-century. The benthic community showed signs of recovery in conjunction with ecosystem restoration following the binational pollution and nutrient abatement program in the 1970s, but experienced major structural and functional changes with the introduction of Dreissenid mussels in the mid-1980s (Burlakova et al., 2014). The zebra mussel (*Dreissena polymorpha*) and the quagga mussel (*D. bugensis*) were introduced to the Great Lakes in the ballast of shipping barges and have nearly eliminated the native mussel communities in the Great Lakes (DOE, 2016). The Dreissenid mussel invasion appears to have had a larger effect on the benthic community in the lake over the last half-century than all other environmental changes.

3.4.1.2 Fish Resources

The Lake Erie fish community has undergone substantial changes during the last century. While natural processes such as predation, competition, and seasonal hypoxia play a role in determining the fish community, human-induced stressors have played the largest role in the last half century. Historically, the lake supported a species-rich and diverse fish assemblage and has had approximately 130 species documented. However, changes in the Lake Erie fish community caused by multiple stressors including watershed deforestation, contaminants, dams, deterioration of tributary streams, and nutrient enrichment has resulted in the loss of highly valued native species and the growth of invasive species (Ryan et al., 2003).

The Proposed Project is located in Lake Erie's central basin, the intermediate of the three basins in terms of temperature, productivity, and depth (Ludsin and Hook, 2013) and is dominated by cool-water species, including perch and walleye, with some warm and colder water species present. The lake provides a valuable commercial and sport fishery, including walleye and yellow perch. Other fish groups present in the central basin of Lake Erie include white bass, white perch, lake whitefish, trout, smelt, catfish, carp, herring, drum, minnows, and sunfish.

The proposed turbine sites are located in the Lake Erie Dead Zone, as described in Section 3.4.1.1, where there is minimal fish activity because of hypoxic (low DO) conditions that are reached in the late summer. The ODNR fish habitat analysis indicated that as well as being in the Dead Zone, the proposed turbine sites are not located near any fish spawning reefs or key habitat (Appendix I, Figure 22). Additionally, Ludsin et al. (2014) identified the spawning habitats for 24 fish species, including the most harvested commercial and recreational fish in Lake Erie, as well as important prey species. None of these fish species have preferred spawning habitat in the offshore region, except lake trout, which preferred a near-offshore presence.

In 2016, LimnoTech conducted fish surveys to identify larval and juvenile fish present near the proposed turbine sites. Larval fish were sampled once monthly in May, June, and July of 2016 at three locations (two proposed turbine locations and one reference site). No larval fish were collected in the May or July sampling events and only five larval fish (across nine trawls) were collected in the June sampling event. Overall, across all 29 trawls conducted near the proposed turbine sites in 2016, only five larval fish were collected. A single larval fish trawl was also conducted near the Cleveland Water Intake Crib in June of 2016 to compare the offshore results to a more nearshore location. This nearshore trawl collected 16 larval fish. The lack of larval fish in the Proposed Project Area is not surprising given that the proposed turbine sites are located far offshore where there are no preferred spawning habitat grounds and minimal near-shore mixing. The higher number of larval fish collected near the Cleveland Water Intake Crib and closer to shore further supports that there is likely very low larval fish abundance offshore near the proposed turbine sites.

Juvenile fish sampling was conducted in May, August, and October 2016 at the same three locations as the larval fish sampling. Sampling results from May indicated a species composition that is relatively consistent across all locations and replicates. White perch, yellow perch, and rainbow smelt dominated the samples, while walleye, goby, and emerald shiner were collected in low numbers. During the August sampling, only seven total fish were caught (six yellow perch all 3 or 4+ years in age and one large 2+ year old freshwater drum). The August event occurred while the thermocline was located 3 to 4 meters (9.8 to 13 feet) off the bottom, resulting in severe hypoxia. However, the hypoxic event had passed in October and the October samples were similar to those collected in the May event being dominated by smelt, followed by white perch and yellow perch. Freshwater drum, walleye, goby, ghost shiner, and white bass were collected in low numbers (Appendix I). This is consistent with yearly trawls completed by the ODNR, which were dominated by several species including white perch, rainbow smelt, and yellow perch (ODNR, 2016a). The full results of the site-specific LimnoTech fish surveys are included in Appendix I.

LimnoTech also deployed acoustic monitors to assess whether there were any unique fish densities at the proposed turbine sites and to establish baseline conditions. Hydroacoustic monitoring was performed monthly in May through October 2016 on three transects (one transect down the center of the proposed turbine sites and two transects in nearby areas to serve as a reference). While density among the transects was similar within months, there was a significant decline in total density across months. There was a considerable (5- to 30-fold) reduction in fish density in August and September compared to the other months (Appendix I). This trend is consistent with the lack of fish observed in the August juvenile trawls and follows the depletion in DO concentrations and the seasonal hypoxic event that occurs in the Lake Erie Dead Zone.

3.4.1.3 Birds and Bats

Migratory Birds

Migratory birds are regulated under the Migratory Bird Treaty Act (16 USC 703-712) which prohibits taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the DOI. The Proposed Project would be located between 8 to 10 miles off the coast of Cleveland, a location that provides minimal or negligible habitat for anything other than migratory transit. Significant numbers of birds do migrate through the Great Lakes region during spring and fall migration (Rich et al., 2004; France et al., 2012; Horton et al., 2016). The Proposed Project would be located approximately 4.5 miles from an Audubon Society-designated IBA, the Cleveland Lakefront IBA. The area was selected as an IBA because of the large concentration of birds that congregate there during spring and fall migration. The Proposed Project would also be located within the Lake Erie Central Basin IBA. This area was selected as an IBA primarily because of the large concentration of red-breasted mergansers and other migratory water birds that use the Lake as a migratory stopover site. These, and other migratory birds that use the IBA are discussed in more detail in the following sections. Avian and bat species that are listed under the protection of the federal ESA are discussed further in Section 3.4.1.5.

Bald and Golden Eagles

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 USC 668), which prohibits the take of the eagles or any part, nest, or egg. The Proposed Project would be located within the range of the bald eagle (*Haliaeetus leucocephalus*). Bald eagles typically breed and winter in forested areas adjacent to large bodies of water and select large canopy roost trees that are near large waterbodies that stay open during the winter. The Proposed Project Area does not support suitable eagle nesting habitat and typically eagles are unlikely to forage 8 to 10 miles offshore; however, in the winter, eagles will seek open water, potentially covering larger distances that are ice-covered. Eagles are discussed in more detail in the following sections.

Project Area Studies

Previously completed and ongoing surveys were reviewed to characterize and quantify a baseline of bird and bat populations in the Proposed Project Area including spatial and temporal distribution. There are challenges in gathering data on birds and bats in offshore environments. Project-specific baseline studies have been supplemented with available data from other independently performed field studies, surveys, and reviews of publicly available information.

A region-wide analysis of next-generation radar (NEXRAD) was conducted to study nocturnal bird migration patterns for the entirety of spring and fall migratory periods. The central Lake Erie basin study analyzed 1 year (two migratory seasons) of data from 2000. The study demonstrated that density of nocturnally migrating birds was 2.72 times higher over land than over water during the spring migration period in the central Lake Erie basin, where the turbines would be located, and 2.13 times higher over land than over the lake during the fall migration period (Diehl et al., 2003). In 2017, Western EcoSystems Technology, Inc. (WEST) completed a new analysis of nocturnal migrant bird movements over the Proposed Project Area in relation to comparison areas using NEXRAD (Appendix J). The results of this study were consistent with the Diehl et al. (2003) study in showing that migrant densities were approximately twice as high (average 2.5 times higher) over land as they were over water in the central

Lake Erie basin. The NEXRAD study by WEST strengthened the data for the Proposed Project relative to the Diehl et al. study in three principal ways: 1) the area of study was the Proposed Project Area; 2) the new study used more recent data, from 2013 to 2016; 3) the new study analyzed 3 years (six migratory seasons) of data.

Aerial avian surveys were conducted by the ODNR over a 2-year period over a large portion of the south-central Lake Erie basin, including the Proposed Project Area. The survey involved weekly flights during fall (mid-October through mid-December) and spring (mid-March through mid-May) in 2009-2010 and 2010-2011 with human observers. In total, 725,785 individual bird observations were recorded, representing 51 species (Norris and Lott, 2011). Data from the survey indicated that bird abundance drops rapidly at distances 2 miles (year 1) and 5 to 7 miles (year 2) from the Lake Erie shoreline and was negligible (year 1) or minimal (year 2) at distances between 8 and 10 miles from shore, where the turbines would be sited. Figure 3.4-1 shows results of total bird observations in relation to distance from shoreline. Specific species are discussed by guild/taxon in the following sections.

Tetra Tech conducted boat-based visual observation surveys in the early morning, early evening, and night during the spring and fall 2010 migration periods to determine species composition, spatial and temporal distribution, relative abundance, and behavior of avifauna in the Proposed Project Area. Surveys were conducted along a single "saw-tooth" transect that covered an 11.1 square km area within an offshore area around the Cleveland Water Intake Crib, approximately 3 miles off the coast of Cleveland. Species diversity during the 2010 surveys was minimal, consisting primarily of common and abundant species around Lake Erie. No state or federally listed rare, threatened, or endangered species were observed. Ring-billed and herring gulls accounted for 97 percent of birds recorded during the spring surveys, and 58 percent of recorded birds during fall surveys (Appendix K).

Bird use of Lake Erie is discussed as follows by guild/taxa (e.g., raptors, songbirds, water birds).

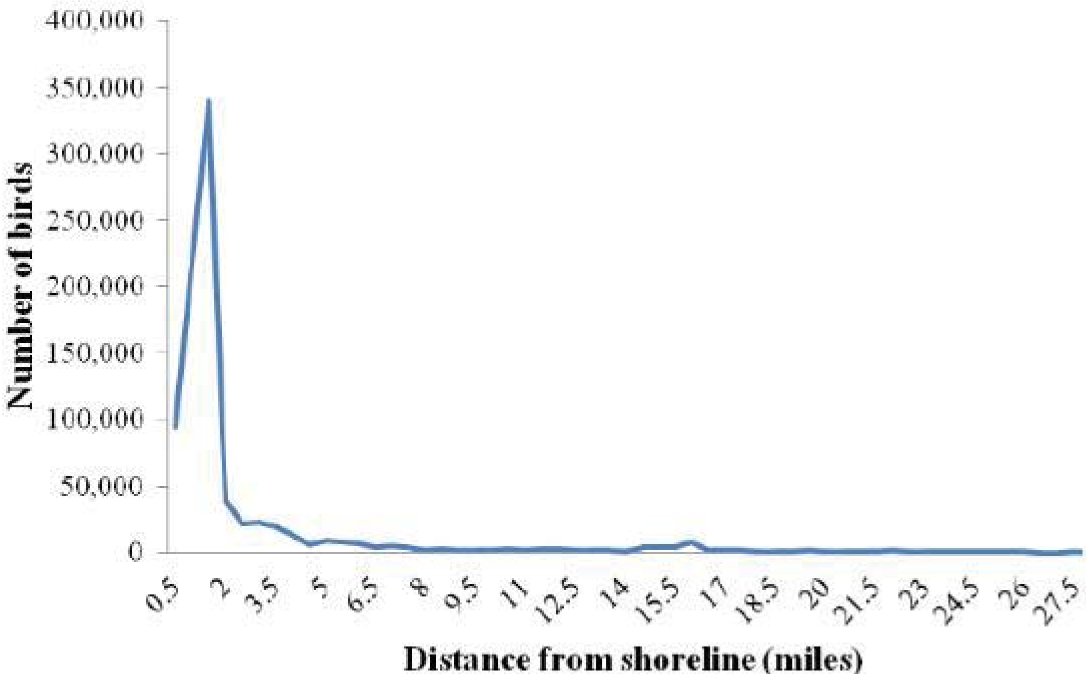
Raptors and Eagles

Large congregations of migrating birds in the spring or fall along the shoreline may attract raptors (ODNR, 2017b). No species of eagle or other raptor regularly utilizes offshore environments 8 to 10 miles from shore (Appendix L). An exception to note is from a mid-Atlantic offshore study which indicated extensive use of the offshore environment by peregrine falcons (*Falco peregrinus)* (Williams et al., 2015).

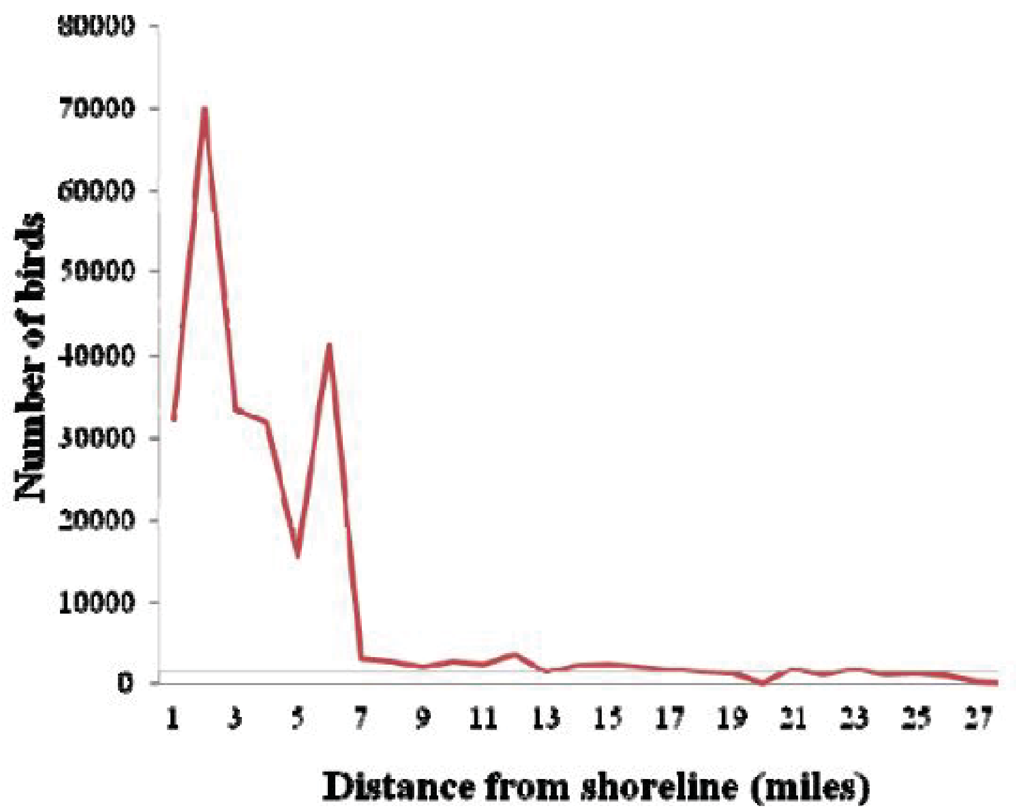
Although bald eagles and osprey (*Pandion haliaetus*) both regularly forage over water for fish, these species are typically restricted to areas within several miles of shore (Buehler, 2000; Poole et al., 2016). This general pattern was evidenced specifically for the proposed turbine sites and vicinity by the boat-based avian baseline surveys conducted in offshore waters near the Proposed Project in May, September, and October 2010 (Appendix K) and the aerial avian surveys conducted in 2009-2011 by ODNR (Norris and Lott, 2011), neither of which resulted in observations of any raptors in the offshore environment within 10 miles of the proposed turbine sites. The presence of ice in the winter may affect available foraging areas, resulting in eagles traveling longer distances.

Songbirds

Although songbirds are generally terrestrial species that nest and forage onshore, nocturnally migrating songbirds and similar birds migrate across Lake Erie in the spring and fall. At least 95 percent of the songbird migration in the region is expected to be nocturnal. Nocturnal migrants include all of the warblers, thrushes, sparrows, flycatchers, vireos, orioles, grosbeaks, buntings, tanagers, and other small birds that are similar to songbirds such as cuckoos. Among songbirds, only a very small minority of species migrate during the day, including swallows (Cornell University, 2017).



Total bird observations in relation to distance from Lake Erie shoreline from fall 2009 to spring 2010



Total bird observations in relation to distance from Lake Erie shoreline from fall 2010 to spring 2011

Source: Norris and Lott, 2011

Figure 3.4-1. Results from the ODNR Aerial Avian Survey

Analyses of NEXRAD data demonstrated that the density of songbird migration over the central Lake Erie basin was less than one half of what it was over terrestrial environments within the region (Diehl et al., 2003). Several recent studies employing marine radar in shoreline environments have demonstrated relatively high densities of nocturnal migrant birds along the shorelines of Lake Erie and Lake Ontario, reinforcing the understanding that such migrants tend to concentrate along coastlines and avoid flying over large water bodies, such as Lake Erie, if possible (Rathbun et al., 2016; Horton et al., 2016). The WEST NEXRAD data analysis of migration over the Proposed Project Area showed that migration intensity was 2.5 times lower at the Proposed Project Area than over land in both spring and fall. When comparing over water sites, it is worth noting that migration intensity was more than 7 times higher over eastern Lake Erie than over the Proposed Project Area in central Lake Erie (Appendix J).

Waterfowl and Waterbirds

Examination of species-specific and spatially-explicit patterns in the ODNR aerial survey data suggest that the only species that may occur in the vicinity of the Proposed Project Area on a somewhat consistent basis are red-breasted merganser (*Mergus serrator*), common loon (*Gavia immer*), horned grebe (*Podiceps auritus*), Bonaparte's gull (*Chroicocephalus philadelphia*), ring-billed (*Larus delawarensis*), and herring gull (*L. argentatus*). Several additional gull species (e.g., glaucous gull [*L. hyperboreus*], Iceland gull [*L. glaucoides*], great black-backed gull [*L. marinus*]) likely use the Proposed Project Area on an occasional basis (Norris and Lott, 2011). For the merganser, loon, and grebe, the estimated survey abundance of birds in the vicinity of the Proposed Project Area was roughly one bird per survey or lower. Ring-billed gull, herring gull, and Bonaparte's gull are the only bird species that used the Proposed Project Area and vicinity at estimated abundance generally greater than one bird observed per survey (abundance of up to five birds per survey) (Norris and Lott, 2011). The overlap of the ODNR transect survey and the proposed turbine area were not determined quantitatively, but visually estimated from the ODNR report figures, with the transect survey appearing to have included a path that went through or very near to the proposed turbines. The quantitative information extracted from the figures, while estimated, is informative regarding the abundance and species composition of birds that use the offshore environment in the vicinity of the Proposed Project.

Bats

Tetra Tech conducted a bat acoustic survey deploying four ultrasound detectors at land-based locations along the central Lake Erie shore and four identical detectors on the Cleveland Water Intake Crib, located roughly 3 miles offshore of Cleveland in Lake Erie, to gather data on offshore compared with onshore bat acoustic activity in the central Lake Erie basin. Ultrasound acoustic recordings were gathered at these locations during the entire spring and summer/fall migratory periods in 2010 to quantify bat use of the area. During the spring 2010 deployment (April 1 through May 31, 2010), a total of 244 detector-nights of data were gathered at the onshore locations, and a total of 232 detector-nights of offshore data were gathered at the Crib. During the summer/fall 2010 deployment (June 1 through November 10, 2010), a total of 616 detector-nights of data were gathered at the onshore locations, and a total of 482 detector-nights of offshore data were gathered at the Crib (Appendix K).

During spring 2010 monitoring periods, five bat species were detected, including: hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*, big brown bat (*Eptesicus fuscus)*, eastern red bat (*Lasiurus borealis*), and little brown bat (*Myotis lucifugus)*. Two of these species (big brown bat and little brown bat) were only identified at the onshore detectors and were not detected offshore. Summer/fall monitoring identified six bat species at both onshore and offshore detectors, including hoary bat, silver-haired bat, big brown bat, eastern red bat, tri-colored bat (*Perimyotis subflavus)*, and little brown bat (Appendix K).

Tetra Tech's bat acoustic monitoring showed that peak nights of bat activity occurred during late April and early May at the onshore detector locations in the spring, while spring offshore acoustic calls peaked mid-May. Summer and fall monitoring had peak nights of bat activity during late July and early August at the onshore detector locations, while peak activity at offshore detectors occurred later in the survey period, mid-to late August. Migratory tree-roosting species, big brown bats, and *Myotis* species were recorded at offshore detectors during all summer and fall months. At onshore locations, all species were recorded during each month of the summer and fall survey period.

The eastern red bat, hoary bat, and silver-haired bat, are state-listed as species of concern (Section 3.4.1.5 provides a more detailed discussion of protected species). These bats are known to migrate long distances, are known to occur in the offshore environments of Lake Michigan (Boezaart and Edmonson, 2014) and Lake Erie (Stantec, 2016). These bats were all positively identified in the recordings from both the spring and fall 2010 monitoring periods during the Tetra Tech baseline study for the Project. In this baseline study, calls of these bats were recorded onshore nearly two times more frequently than they were offshore. The spring, summer, and fall acoustic survey indicated that the Lake Erie shoreline, and to a lesser extent the offshore Cleveland Water Intake Crib location, are used during migration by some bat species, primarily eastern red bat, hoary bat, and silver-haired bat. The offshore study area and shoreline habitat is also used by non-migratory and migratory species during the summer residency period. The peak activity periods and the high proportion of migrant species recorded suggest migration occurs along Lake Erie's shoreline and to a lesser extent over Lake Erie. The relatively low number of call sequences recorded offshore during the baseline study suggests that the Proposed Project Area is not likely a major migratory corridor for bats.

The acoustic baseline study also demonstrated that overall bat activity level, based on total bat call rate of all species combined, was roughly 10 times greater on land than offshore during the spring and summer/fall study periods. This study may overestimate offshore bat activity at the proposed turbine sites because the offshore call rates were recorded at the Cleveland Water Intake Crib, roughly 3 miles from shore. Because there were substantially lower levels of bat activity 3 miles from shore when compared to the onshore activity, and the proposed turbines would be 8 to 10 miles offshore, even lower levels of bat activity are expected where the turbines would be located.

3.4.1.4 Insects

A Presidential Executive Memorandum was issued in 2014 to create a federal strategy for promotion of the health of honey bees and other pollinators, which includes the monarch butterfly. On December 14, 2014, 90-day findings were published in the Federal Register for a petition requesting the USFWS to list the monarch butterfly (*Danaus plexippus plexippus*) under the ESA as a threatened species. The USFWS found that the petitioned actions may be warranted, and initiated a status review to determine whether actions under the ESA are warranted. After the status reviews, the USFWS was told to issue a 12-month finding in accordance with 16 USC 1533(b)(3)(B) of the ESA, stating whether listing, reclassification, or delisting, as appropriate, is warranted. The 12-month finding was not issued and a lawsuit was filed against the USFWS. Subsequently, an agreement was reached requiring the USFWS to determine by June 2019 whether the monarch butterfly will receive federal protection under the ESA (USFWS, 2017a). Because the monarch butterfly USFWS status review is pending, the species is not discussed within Section 3.4.1.5, Protected Species, but is discussed in the following text.

Monarch Butterfly

The monarch butterfly can be found in all 88 Ohio counties but is most common in late summer during its fall migration in late August, September, and early October (ODNR, 2017c). Monarch butterflies are known to migrate through the Proposed Project Area. Research conducted by Monarch Watch (2015) and citizen scientists provide evidence that monarch butterflies cross Lake Erie during migration using the Point Pelee National Park on the North shore of Lake Erie in Ontario, Canada; South Bass Island and the Lake Erie islands; and along the shoreline of Lake Erie in Ohio for resting. Monarchs have also been reported at Wendy Park on Whiskey Island near downtown Cleveland and from observers on recreational boats within the lake. Observers have noted ranges of flying heights of 10 to 15 feet, 12 to 45 feet, 20 to 30 feet, 20 to 60 feet, and 60 to 100 feet above the water. Many observers also noted that monarchs appear to continue their migration with northerly winds but may roost along the shoreline if strong southerly winds and/or storm fronts are present (Monarch Watch, 2015).

Monarch butterfly habitat predominantly consists of milkweeds and native flowering plants or nectar producers. Monarch waystations, small areas of milkweed and/or wild flowers, have become a common conservation practice to provide habitat during spring and summer breeding season and during the fall migration. Cleveland Metroparks (2016) has registered monarch waystations in and around the Cleveland area. There is no monarch habitat at the Proposed Substation, O&M Center, Port staging area, or where the export cable makes landfall, which would be located on developed land.

Other Insects

State-listed threatened and endangered species reported to occur within Cuyahoga County include four insects: black caddisfly (*Chimarra social*), two-spotted skipper (*Euphyes bimacula*), regal fritillary (*Speyeria idalia*), and marked noctuid (*Tricholita notate*). Habitat for these species includes high velocity water for the black caddisfly, wetlands for the two-spotted skipper, and prairies for the regal fritillary and marked noctuid. These habitats are not found within the Proposed Project Area. State-protected species are discussed further in Section 3.4.1.5.

3.4.1.5 Aquatic and Terrestrial Protected Species

Federally-Listed or Protected Species

The USFWS has identified five federally listed species that may occur in Cuyahoga County and therefore have the potential to be affected by the Proposed Project. Table 3.4-1 details these federally listed species. There are no candidate species, proposed listed species, or proposed or designated critical habitats in this location (USFWS, 2017b).

Table 3.4-1. Federally Listed Species Occurring in Cuyahoga County

Common Name	Scientific Name	Federal Listing	Critical Habitat Present
Birds			
Kirtland's Warbler	*Setophaga kirtlandii*	Endangered	None
Piping Plover	*Charadrius melodus*	Endangered	None
Red Knot	*Calidris canutus rufa*	Threatened	None
Mammals			
Indiana Bat	*Myotis sodalis*	Endangered	None
Northern Long-eared Bat	*Myotis septentrionalis*	Threatened	None

More detailed information on the life cycle and historic abundance of these five federally listed species can be found in Appendix M.

Indiana Bat

Indiana bats migrate seasonally between their summer habitats and winter hibernacula, which are large, climatically stable caves and mines where the bats hibernate. Indiana bats are generally not found hibernating in artificial roosts, such as buildings. Indiana bats exhibit site fidelity to traditional summer maternity areas, returning annually to the same established home ranges and individual roost trees (Gardner et al., 1991; Callahan et al., 1997; Gumbert et al., 2002; Kurta and Murray, 2002). Reproductive females migrate to their summer habitats where they form maternity colonies of typically 20 to 100 mature individuals to give birth and raise their young (Kurta, 2004). Maternity colonies are usually selected in riparian zones, floodplains, bottomland habitats, upland communities, or wooded wetlands, although maternity roosts are occasionally found in pastures (Humphrey et al., 1977; Gardner et al., 1991; Callahan et al., 1997; Whitaker and Hamilton, 1998). The summer months are spent foraging for aquatic and terrestrial insects along streams, in riparian forests and floodplains, and in upland forests and low open areas. Indiana bats typically avoid urban habitats, and prefer to forage along streams or rivers and above waterbodies, but they are also known to utilize upland forests, clearings with successional old field vegetation, the borders of croplands, wooded fencerows, and pastures (Humphrey et al., 1977; LaVal et al., 1977; Brack et al., 1983; Gardner et al. 1991; Sparks et al., 2005). A variety of deciduous tree species are used for roosting, and it is believed that the presence of exfoliating bark or crevices, a high amount of solar exposure (less than 20 percent canopy cover), and a large diameter tree are important factors in Indiana bats selecting a suitable roost site (Foster and Kurta, 1999; Kurta, 2004).

The federally and state-listed endangered Indiana bat is largely distributed throughout the central and eastern U.S. (22 states) and southeastern Canada. The USFWS defines four Recovery Units based on “evidence of population discreteness and genetic differentiation, differences in population trends, and broad-level differences in macrohabitats and land use” (USFWS, 2007). The entire state of Ohio is located within the Midwest Recovery Unit. The Indiana bat population in the Midwest Recovery Unit represents approximately 45.9 percent of the 2017 overall range-wide population. As summarized in Table 3.4-2, USFWS population estimates indicate that the overall Indiana bat population in the Midwest Recovery Unit has declined by 13.7 percent since 2009 with the proliferation of white-nose syndrome (WNS) (USFWS, 2017c).

Table 3.4-2. Indiana Bat Population Estimates for the Midwest Recovery Unit

State	2009	2011	2013	2015	2017	% Change from 2015
Indiana	213,244	225,477	226,572	185,720	180,583	-2.8%
Kentucky	57,319	70,626	62,018	64,571	58,155	-9.9%
Ohio	9,261	9,870	9,259	4,809	2,890	-39.9%
Tennessee	1,657	1,791	2,369	2,401	1,598	-33.4%
Alabama	253	261	247	90	85	-5.6%
Southwest Virginia	217	307	214	137	70	-48.9%
Michigan	20	20	20	20	20	0.0%
Total	**281,977**	**308,352**	**300,699**	**257,748**	**243,401**	**-5.6%**
Range-wide Total	**612,337**	**628,234**	**610,512**	**550,224**	**530,705**	**-3.5%**

Source: USFWS, 2017c.

The number of Indiana bats within Ohio has always been a small fraction of the range-wide population, even before WNS. Within the Midwest Recovery Unit, approximately 1.2 percent of the Indiana bats hibernated in Ohio in 2017. Since the onset of WNS, the population of Indiana bats in Ohio is declining faster than the overall Midwest Recovery Unit, declining 69 percent since 2009 compared to 14 percent across the entire unit (USFWS, 2017c).

Indiana bat hibernacula are categorized into the following four different priority groups based on population size: Priority 1 (P1, ≥10,000 Indiana bats), Priority 2 (P2, 1,000-9,999 Indiana bats), Priority 3 (P3, 50-999 Indiana bats), and Priority 4 (P4, 1-49 Indiana bats). There are seven known Indiana bat hibernacula in the state of Ohio, and of these, two still have winter populations (i.e., at least one record since 1995). The two surviving hibernacula consist of a P2 hibernaculum located in Preble County in southwest Ohio, and a P3 hibernaculum located in Lawrence County in south-central Ohio (USFWS, 2007). The two known hibernacula closest to the Proposed Project are both P4 hibernacula located in Lawrence and Beaver Counties, in Pennsylvania, more than 70 miles southeast of the Proposed Project. Most Ohio capture records of reproductive Indiana bat females and juveniles have been reported from the western part of the state (USFWS, 2009a). In Cuyahoga County, where the proposed Project would be located, there is one known Indiana bat maternity colony and no known hibernacula (USFWS, 2007).

The relatively low level of bat acoustical activity recorded at sites greater than 3 miles from shore to date (Ahlén et al., 2009; Pelletier et al., 2013; Boezaart and Edmonson, 2014; Stantec, 2016) is consistent with the basic observation that bats are primarily terrestrial animals. Pre-construction bat acoustic surveys were conducted by Tetra Tech in 2010 to evaluate offshore bat use of Lake Erie near the Proposed Project. The acoustic survey was conducted offshore at the Cleveland Intake Crib and at select sites along the shoreline of Lake Erie during the spring, summer, and fall of 2010 to quantify bat use onshore and offshore near the Proposed Project. Bat acoustic monitoring cannot reliably distinguish between the high frequency calls of multiple *Myotis* species, including Indiana bat, little brown bat, northern long-eared bat, and eastern small-footed bat. Therefore, the Tetra Tech study could neither confirm nor rule out the presence of Indiana bats in the vicinity of the Proposed Project. The *Myotis* species group was recorded at both onshore and offshore detectors, but represented a very small percentage of the total calls recorded (2.4 percent in the spring and 2.2 percent in the fall). The acoustic data indicate that for all bat species detected, offshore activity levels were substantially less than onshore activity levels. Only 6 and 7 percent of the total number of call sequences were recorded offshore in the spring and fall, respectively (Appendix K).

There is no undisturbed forested area typically utilized as summer habitat by Indiana bats in the vicinity of the Tetra Tech shoreline monitoring sites, and there are no known colonies of Indiana bats in Ontario (the species is almost unknown in Ontario). Therefore, it is unlikely that these bats migrate across the lake or are present around the proposed wind turbines because there is no habitat or known colonies on either side of the lake. Based on these factors, and the results of the acoustic survey, Tetra Tech (2012) concluded that Indiana bat is unlikely to occur in the vicinity of the Proposed Project, and if the Indiana bat is present, it is likely to occur in very small numbers.

Northern Long-eared Bat

There is little information available regarding spring emergence and dispersal of northern long-eared bats from hibernacula. Shortly after emergence, northern long-eared bats migrate to their summer habitat. Spring migration direction of northern long-eared bats appears to radiate outward from hibernacula during migration, with the bats migrating directly to maternity sites, rather than moving primarily north or south (Davis and Hitchcock, 1965; Fenton, 1970; Griffin, 1970; Humphrey and Cope, 1976). Northern long-eared bats have shown high site fidelity related to summer roost habitat (Sasse and Pekins, 1996; Patriquin et al., 2010; Perry, 2011). Northern long-eared bats most frequently utilize mature-growth forests during the summer maternity season (Lacki and Schwierjohann, 2001; Ford et al., 2006; Foster and Kurta, 1999). Day and night roosts are used by northern long-eared bats during spring, summer, and fall, usually within mature forest communities with decaying trees and/or live trees with cavities or exfoliating bark selected most frequently (Foster and Kurta, 1999; Owen et al., 2003; Broders and Forbes, 2004). Northern long-eared bats do not forage in intensively harvested forest stands or open agricultural areas, generally restricting movement to intact forests (Patriquin and Barclay, 2003; Henderson and Broders, 2008). They are known to forage under the forest canopy at small ponds or streams, along paths and roads, or at the forest edge (Caire et al., 1979).

Late summer swarming behavior and relatively high concentrations at some caves indicate that there is some degree of local or regional movement prior to reproduction. Mine and cave sites have been most often reported as hibernacula for northern long-eared bats (Whitaker and Winter, 1977; Stones, 1981; Griffin, 1945). Hibernating northern long-eared bats do not form large aggregations or clusters typical of some bat species. Instead, individuals or small groups seem to favor deep crevices for hibernation (Caceres and Barclay, 2000), and often go unnoticed until spring emergence.

Prior to the spread of WNS to Ohio, northern long-eared bats were typically the second to fourth most commonly caught bat in Ohio studies. Although there was evidence of northern long-eared bat reproduction in many Ohio counties across the state, the northeastern part of the state appeared to have the greatest concentration of northern long-eared bats (Brack et al., 2010). Despite this, northern long-eared bats would not be expected to breed in the area of the Proposed Project. According to the USFWS (2014a), "Trees found in highly developed urban areas (e.g., street trees, downtown areas) are extremely unlikely to be suitable NLEB [northern long-eared bat] habitat." However, it is possible that northern long-eared bats could migrate through the Proposed Project, as the species has been documented in Ontario, along the northern shores of Lake Erie (Dzal et al., 2009).

As described previously with Indiana bats, Tetra Tech biologists conducted a bat acoustic survey in the Action Area during the spring, summer, and fall of 2010 to quantify bat use near the Proposed Project. The *Myotis* species group was recorded at both onshore and offshore detectors, but represented very small percentage of the total calls recorded (2.4 percent in the spring and 2.2 percent in the fall). The high frequency *Myotis* group accounted for 2.6 percent of all calls onshore and 2.4 percent of all calls offshore in spring, and 2.1 percent of all calls onshore and 3.5 percent of all calls offshore in fall. Because bat acoustic monitoring cannot reliably distinguish between the high frequency calls of multiple *Myotis* species, the Tetra Tech study could neither confirm nor rule out the presence of northern long-eared bats. Comprehensive comparisons (all bat taxa) of onshore against offshore bat acoustic activity from the Tetra Tech study are presented in Section 3.4.1.3 and Appendix K. For all bat species detected, the acoustic data indicate that offshore activity levels were substantially less than onshore activity levels (Appendix K). Because of this and the lack of maternity and foraging habitat in the vicinity of the Proposed Project, if the northern long-eared bat is present it would likely occur in very small numbers.

Kirtland's Warbler

The Kirtland's warbler may have the most geographically restricted distribution of any mainland bird in the continental U.S. (USFWS, 2012). Michigan's Lower Peninsula is still the primary nesting range; the known nesting range has expanded somewhat, and currently includes several much smaller areas in Michigan's Upper Peninsula, as well as Wisconsin and Ontario, Canada. Kirtland's warblers winter primarily in the Bahama Islands, with reports of solitary individuals in Mexico, the Dominican Republic, Cuba, and Bermuda (Faanes and Haney, 1989; Mayfield, 1996; USFWS, 2012). Migrating Kirtland's warblers generally enter and leave the U.S. along the coasts of North and South Carolina, arriving on the northern breeding grounds in mid-May (Mayfield, 1988).

The habitat requirements for nesting birds are both highly specific and disturbance-dependent. Optimal nesting habitat can be characterized as large jack pine (*Pinus banksiana*) stands, composed of 8- to 15-year old trees that regenerated after wildfires, with 35 to 65 percent canopy cover, and more than 3,000 stems per acre. Nests are on the ground, well concealed under arching plants near the bases of pines. Kirtland's warblers are primarily insectivorous, and forage by gleaning pine needles, leaves, and ground cover.

The Kirtland's warbler, like other North American warblers, is a nocturnal migrant. During the migratory periods of spring (roughly mid-March through mid-April) and fall (roughly mid-August through mid-October), individuals enter a state of migratory restlessness stimulated by hormonal changes, and individuals engage in migratory flights that generally extend from just after dusk until just before dawn, completing their entire migratory journey in as little as 1 to 2 weeks (Bocetti et al., 2014). It is thought that "all or nearly all" of the Kirtland's warbler population passes through Ohio during migration (ODNR, 2007a). In fact, the species was first discovered when a spring migrant was collected from a farm near Cleveland in May 1851 (USFWS, 1985). Most migrants appear to be concentrated in northwest Ohio, along the shores of Lake Erie between Toledo and Sandusky (eBird, 2016; USFWS, 2012). There were only five documented sightings of Kirtland's warbler in the Cleveland region between 1950 and 2004 (McCarty, 2012).

Piping Plover

The piping plover is a small migratory shorebird that nests in three separate geographic areas in the U.S.: the Great Plains, the shores of the Great Lakes, and the shores of the Atlantic coast. In the Great Lakes region, piping plovers breed and raise young on the shores of the Great Lakes, spending approximately 3 to 4 months a year on breeding grounds. Birds begin arriving on breeding grounds in late April, and most nests are initiated by mid- to late May. Piping plovers depart Great Lakes breeding areas from mid-July to early September. Migration of piping plovers is nocturnal; while migration routes are poorly understood, it has been thought that most piping plovers probably migrate non-stop from interior breeding areas to wintering grounds along the Atlantic and Gulf coasts (Haig and Plissner, 1993; USFWS, 2003).

Piping plovers once nested on Great Lakes beaches in Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin, and Ontario, Canada (USFWS, 2003). The piping plover disappeared from southern Lake Erie's shores somewhat earlier than from the other lakes. Despite the 2001 designation of two critical habitat units in Ohio (i.e., OH-1 near Sandusky and OH-2 near Painesville [66 Federal Register {FR} 22967]), piping plovers do not currently breed in Ohio. The piping plover is now considered only a migrant species in Ohio (ODNR, 2017d). No piping plovers were found in the Proposed Project's offshore study area during boat-based visual observation surveys or avian acoustic monitoring, both conducted during the spring and fall migration periods (Appendix K). Regional scarcity of piping plovers has also been documented in The Birds of North America (Elliott-Smith and Haig, 2004) and in the eBird database (eBird, 2016).

Rufa Red Knot

The rufa red knot is a migratory shorebird with one of the longest yearly migrations of any bird. It migrates annually between its breeding grounds in the central Canadian Arctic and several wintering regions, including the Southeast United States, the Northeast Gulf of Mexico, northern Brazil, and Tierra del Fuego at the southern tip of South America (Baker et al., 2013). Rufa red knots are restricted to ocean coasts during winter, and occur primarily along the coasts during migration. However, single birds or small flocks of rufa red knots are reported annually across the interior U.S. during spring and fall migration (eBird, 2016). These reported sightings are concentrated along the Great Lakes, but multiple reports have been made from every interior state (USFWS, 2014b). During both the northbound spring and southbound fall migrations, rufa red knots use key staging and stopover areas to rest and feed. Rufa red knot is a specialized molluscivore, eating hard-shelled mollusks, sometimes supplemented with easily accessed softer invertebrate prey, such as shrimp- and crab-like organisms, aquatic worms, and horseshoe crab eggs.

Reliable rangewide population data is not available for rufa red knot. Rufa red knots are only occasionally seen in the region during migration, and in very low numbers, as evidenced in the eBird database (2016). Small numbers of rufa red knots pass through Ohio, with more moving through in the fall than in the spring (ODNR, 2017e). In the Great Lakes region between 25 and 100 birds are recorded annually in spring and between 100 and 200 in the fall, the majority along the shores of Lakes Michigan and Erie. Most of these records are of singles, pairs, or small flocks of 3 to 10 birds. The species appears to be opportunistic and can occur almost anywhere along the Great Lakes shores or inland on mudflats of falling reservoirs in late summer and autumn or flooded fields in spring. The northern shoreline of Ohio is visited regularly during fall migration, particularly Ottawa National Wildlife Refuge (USFWS, 2014b). No rufa red knots were found in the Proposed Project's offshore study area during boat-based visual observation surveys or avian acoustic monitoring, both conducted during the spring and fall migration periods (Appendix K).

State-Listed Species

State-listed threatened and endangered species within Cuyahoga County are listed in Table 3.4-3. The ODNR lists 16 mammals, 8 birds, 4 insects, 4 fish, 6 invertebrates, 2 reptiles, 1 amphibian, and 17 plants considered threatened, endangered, or species of concern in the county.

Table 3.4-3. State-Listed Species Occurring in Cuyahoga County

Species Name	Common Name	Habitat	State Status[1]
Plants			
Calopogon tuberosus	grass-pink	wet areas	T
Carex louisianica	Louisiana sedge	forested swamps	E
Cyperus schweinitzii	Schweinitz's umbrella-sedge	sandy areas	T
Cypripedium reginae	showy lady's-slipper	wet areas	T
Elymus trachycaulus	bearded wheat grass	variety	T
Epilobium strictum	simple willow-herb	wet areas	T
Hieracium umbellatum	Canada hawkweed	dry, sandy areas	T
Juncus platyphyllus	flat-leaved rush	various open	E
Juniperus communis	ground juniper	various open	E
Melampyrum lineare	cow-wheat	variety	T
Monarda punctata	dotted horsemint	dry, sandy areas	E
Oryzopsis asperifolia	large-leaved mountain-rice	well-drained areas	E

Table 3.4-3. State-Listed Species Occurring in Cuyahoga County

Species Name	Common Name	Habitat	State Status[1]
Plagiothecium latebricola	lurking leskea	swamps, marshy areas	T
Sisyrinchium montanum	northern blue-eyed grass	wet areas	T
Solidago puberula	dusty goldenrod	dry areas	E
Solidago squarrosa	leafy goldenrod	rocky woods, thickets	T
Viburnum alnifolium	hobblebush	moist woods	T
Insects			
Chimarra socia	a black caddisfly	High velocity water	E
Euphyes bimacula	two-spotted skipper	wetlands	SC
Speyeria idalia	regal fritillary	prairies	E
Tricholita notata	marked noctuid	prairies	E
Aquatic Invertebrates			
Alasmidonta marginata	elktoe	streams, small/medium rivers	SC
Lasmigona compressa	creek heelsplitter	creeks, small rivers	SC
Ligumia recta	black sandshell	medium/large rivers	T
Orconectes propinquus	Great Lakes crayfish	rapidly running streams	SC
Orconectes virilis	northern crayfish	rocky streams	SC
Ptychobranchus fasciolaris	kidneyshell	medium/large rivers	SC
Fish			
Notropis dorsalis	bigmouth shiner	stream pools, sandy substrates	T
Percina copelandi	channel darter	shorelines	T
Rhinichthys cataractae	longnose dace	rocky streams/shorelines	SC
Salvelinus namaycush	lake trout	deep water basin	SC
Reptiles and Amphibians			
Clemmys guttata	spotted turtle	wetlands	T
Emydoidea blandingii	Blanding's turtle	wetlands	T
Hemidactylium scutatum	four-toed salamander	wetlands	SC
Birds			

Table 3.4-3. State-Listed Species Occurring in Cuyahoga County

Species Name	Common Name	Habitat	State Status[1]
Accipiter striatus	sharp-shinned hawk	woodlands	SC
Charadius melodus	piping plover	migrant	E[2]
Setophaga kirtlandii	Kirtland's warbler	migrant	E[2]
Dolichonyx oryzivorus	bobolink	grasslands, prairies, pastures	SC
Falco peregrinus	peregrine falcon	variety	T
Gallinula chloropus	common moorhen	marshes	SC
Rallus limicola	Virginia rail	marshes	SC
Sphyrapicus varius	yellow-bellied sapsucker	wet, deciduous forests	SC
Mammals			
Condylura cristata	star-nosed mole	near lakes or streams	SC
Eptesicus fuscus	big brown bat	woodlands	SC
Lasionycteris noctivagans	silver-haired bat	woodlands	SC
Lasiurus borealis	red bat	woodlands	SC
Lasiurus cinereus	hoary bat	woodlands	SC
Microtus pinetorum	woodland vole	woodlands	SC
Mustela erminea	ermine	variety	SC
Myotis lucifugus	little brown bat	woodlands	SC
Myotis septentrionalis	northern long-eared bat	woodlands	SC
Myotis sodalis	Indiana bat	woodlands	E
Napaeozapus insignis	woodland jumping mouse	brushy areas near water	SC
Peromyscus maniculatus	deer mouse	variety	SC
Sorex fumeus	smoky shrew	birch and hemlock forests	SC
Synaptomys cooperi	southern bog lemming	low damp bogs and meadows	SC
Taxidea taxus	badger	variety	SC
Ursus americanus	black bear	woodlands	E

Sources: ODNR, 2016b, 2016c, and 2017f,

[1] E = Endangered, T = Threatened, SC = Species of Concern.

Habitat for these state-listed species is generally not found associated with the Proposed Project, which includes developed, urban environment, and hardened shorelines of the Cuyahoga River, the Old River, and Lake Erie in the vicinity of the Proposed Substation, export cable landfall, HDD boring pit, O&M Center, and Port staging area; and Lake Erie open water. Migrating species such as birds and bats may pass through the area during spring and fall migrations.

A letter from the ODNR Division of Wildlife on February 1, 2017 which can be found in Appendix N indicated they have no records of rare or endangered state-listed species in the Proposed Project Area.

3.4.2 Environmental Impacts Related to Biological Resources

3.4.2.1 Environmental Impacts Related to Benthos

Construction

Foundations and Turbines

Installation of the turbines would directly disturb approximately 0.34 acre of substrate habitat for the turbine foundations and less than 0.1 acre of substrate habitat associated with the legs used to stabilize the heavy-lift crane vessel. If a DP vessel is used to perform the foundation heavy lift operations, there would be no direct impact to the lakebed because DP vessels do not require anchor placement and do not make direct contact with the bottom. These activities would result in the loss of infauna (small aquatic animals that burrow into soft sediment or live between sediment particles of the lakebed) and benthic invertebrates within the immediate footprint of construction disturbance. However, this footprint is small compared to the total area of Lake Erie. Following construction, benthic macroinvertebrates would be expected to recolonize the areas directly disturbed by turbine installation. Direct impacts to benthic habitat and benthic invertebrates from installation of the turbines would represent a minor adverse impact.

The MB turbine foundation installation would result in minimal indirect impacts to benthic resources from sediment resuspension. Since the MB foundation would use suction technology, no lakebed preparation would be necessary (dredging, leveling, or drilling) for installation, and disturbance to sediment would be limited to the area immediately around the bucket associated with either the water pumped out of the bucket or the water jets adjusting the verticality of the bucket. Sediment suspended during MB installation would be expected to settle back to the lakebed, resulting in a short-term, localized and minor increase in sediment suspension. Minimal sediment resuspension would also occur from movement of the jack-up legs on the heavy-lift crane vessel and from anchoring of the feeder barge.

Inter-Array and Export Cables

During construction, an approximately 15-foot wide area would be directly disturbed for installation of the proposed export cable and inter-array cables along the 12.1-mile length (up to the HDD location). As with the MB turbine foundations, these activities would result in the loss of infauna and benthic invertebrates within the immediate area of construction disturbance. Following construction, benthic macroinvertebrates would likely recolonize the areas directly disturbed by cable installation.

Sediment disturbed from cable installation activities would be expected to settle quickly out of the water column, and benthic invertebrates from adjacent, undisturbed areas of Lake Erie would recolonize the affected area. Recolonization depends on the stability of the disturbed area, tolerance of benthic organisms to physical changes, and availability of recruits in the area. The benthic community recovery time ranges from several months to several years depending on the type of community and type of disturbance (DOE, 2013).

Installation of the inter-array cables and export cable would also result in a temporary indirect impact to benthic habitat and benthic invertebrates from sediment resuspension. These impacts would occur during inter-array cable and export cable installation and at the HDD tie-in location. These short-term impacts would be expected to last only several hours and have limited spatial extent beyond the point of installation. Refer to Section 3.3.2.1 for more detailed information on impacts from suspended sediment.

Operation and Maintenance

Turbines

The presence of the proposed turbine foundations would result in the loss of approximately 0.34 acre of substrate habitat and would alter habitat in the Proposed Project Area through small-scale loss of silty-bottom areas. This loss would be temporary and of unknown duration as the habitat would be reconstituted after decommissioning and removal of the MB foundation. The bare silty-bottom sediment directly covered by the footprint of the turbine foundations may be altered along with the resident benthic organisms and those species that prey on them. Sediment would return to the lakebed on top of the MB lid, with a small amount possibly falling beyond the lid's diameter. This fallback of sediment onto the lid would reconstitute portions of the benthic habitat that would be lost because of the installation of the MB.

The turbine foundation, the shaft and potentially the MB lid, below the surface water would create small microhabitats comparable to those found in hard surface artificial reefs. An artificial reef is an object of human origin which has been deployed purposefully to the sea (or lake) bottom, which adds a vertical profile to the benthic environment, which can then be settled by fish and other invertebrates (Seaman, 2000). The artificial reefs created around each turbine would allow for attachment of sessile invertebrates, such as mussels. According to Seaman (2000), there is an expectation that over the long-term, assemblages of sessile organisms would eventually increase the biomass at the local site of an artificial reef created by a turbine foundation. Although the loss of habitat is approximately 0.3 acre of substrate, more surface area of potential reefing habitat is introduced when considering the vertical surface area provided by each turbine.

Thickness of the biological growth depends on site-specific characteristics such as illumination, alkalinity, oxygen content, flow, turbulence, and temperature; while also considering the relative position of structural components with respect to their water level and exposure, with prominent biological growth expected in the splash zone and the submerged sections. Limited biodiversity and hypoxic conditions have been documented at the proposed site; the amount of surface created by the foundation would be minimal; therefore, it would not be expected to impact aquatic life.

The artificial reef habitat could attract invasive species such as Dreissenids (e.g. zebra and quagga mussels) found during the LimnoTech survey (Appendix E). These mussels can cause significant biofouling of structures. Depending on depth, the quagga mussel may be increasingly significant to the Proposed Project because it can outcompete the zebra mussel in deeper and colder water habitats. Therefore, structures in deep water, particularly, may encounter increased fouling by this species. The zebra mussel is currently the primary fouling threat to most shallow hard and soft substrates in Lake Erie, but even at these depths, their impact has been tempered by the quagga mussel. Little record exists of native fouling species in Lake Erie; therefore, it is likely they would have a negligible role.

While low summer DO prevents permanent populations of Dreissenids from accumulating below the thermocline (about 40-foot depth) (Appendix E), these mussels could use the turbine tower above the thermocline.

Inter-Array and Export Cables

The sediment composition following construction is likely to be similar to the existing conditions along the cable route, as sediment resettles. A slight depression in the lake bottom would be present over the installed inter-array cables and export cable temporarily, but pre-installation conditions are expected to return through natural deposition to the lakebed. The only permanent disturbance of the lakebed would be the presence of the inter-array and export cables, proposed to be buried approximately 1 to 1.5 meters (3.3 to 5 feet) below the surface, although in some places the cables may be buried deeper. The impacts from alteration of the silty-bottom along the inter-array cables and export cable route would be minor and short-term as natural sediment accretion would occur again after construction is complete.

As described in Section 2.2.4, the proposed cables would be 34.5 kV alternating current cables and would be composed of a three-core copper conductor with XLPE or EPR insulation (insulation would be dependent on manufacturer). The magnetic field associated with a transmission cable can travel through sediment and water; however, studies show that the magnetic fields are similar to background levels and decrease exponentially with distance from the cable. Bureau of Ocean Energy Management (BOEM) research compared fish and invertebrate assemblages for buried and unburied pipes and cables, and natural habitat and found that each community strongly overlapped, and differences between communities were indistinguishable and negligible (Love et al., 2016). LimnoTech, using available specifications for the proposed inter-array and export cables and voltage for the Proposed Project, estimated the magnetic field at 1 meter (3.3 feet) from the proposed inter-array and export cables as approximately 2 micro tesla units (μT). The level of the naturally occurring magnetic field from the earth is around 50 μT, and a comparison of electromagnetic field (EMF) studies at existing buried cable installations found the maximum magnetic field of existing buried cables at the seabed to be around 18 μT and average 7.8 μT. More details on the comparison study can be found in the LimnoTech Report (Appendix E). No major effects on benthic communities would be expected because of the minor increase in the magnetic field associated with the operation of the proposed inter-array and export cables and as supported by BOEM studies (Love et al., 2016).

Similarly, anticipated increases in the temperature of the sediment and water column associated with the inter-array and export cables would be expected to fall within the range of natural ambient variability and would not affect benthic communities, as concluded for the LEC Project, a proposed cable approximately 80 miles east of the Proposed Project in Lake Erie (DOE, 2016).

Following recovery of the benthos after construction, the operations and maintenance of the proposed cable would result in minor impacts to benthic resources.

Decommissioning

Impacts to benthos during decommissioning would be similar to disturbance during construction with temporary, localized sediment suspension from the removal of the turbine foundations, barge anchoring and jack-up legs from the heavy-lift crane vessel. Benthic habitat that was occupied by the surface area of the MB turbine foundations would become available again as habitat following removal of the foundations and the transmission cable would remain buried.

3.4.2.2 Fish Resources

Construction

Habitat Disturbance and Suspended Sediment

Installation of the turbines would directly disturb approximately 0.3 acre for the turbine foundations and less than 0.1 acre associated with the legs used to stabilize the heavy-lift crane vessel. Installation of the inter-array cables and export cable would directly disturb approximately 22 acres. These activities would result in the potential loss of fish habitat within the immediate area of construction disturbance. Following construction, benthic macroinvertebrates would likely recolonize the areas directly disturbed by turbine and cable installation and would once again become available as potential prey for fish species.

The MB turbine foundation installation would result in minimal indirect impacts to fish resources from sediment resuspension. As described in Section 3.4.2.1, sediment suspended during MB installation would be expected to settle back to the lakebed, resulting in a short-term, localized, and minor increase in sediment suspension. Minimal sediment resuspension would also occur from movement of the jack-up legs on the heavy-lift crane vessel and from anchoring of the feeder barge. Installation of the inter-array cables and export cable would also result in a temporary indirect impact to fish species from sediment resuspension. These short-term impacts would be expected to last only several hours and have limited spatial extent beyond the point of installation. Refer to Section 3.3.2.1 for more detailed information on impacts from suspended sediment.

Because larval fish are not anticipated to occur at the proposed turbine sites, the direct disturbance to the lakebed and minimal increase in suspended sediment would primarily affect older life stages of fish that are mobile and can temporarily avoid the area of construction and higher suspended sediment. This temporary displacement of fish and avoidance behavior during turbine and cable installation activities is anticipated to be localized and small in scale. Fish would use nearby habitat and would be expected to return to the area shortly after construction activities are complete. Effects are also expected to be minimal because the proposed turbine sites are not located near any identified fish spawning areas, larval nursery areas, or critical habitat areas (Appendix I).

Noise Disturbance

The MB foundation design eliminates the need for pile driving and significantly reduces potential construction related noise when compared to other foundation types. The MB installation produces noise at levels of 73 decibels (dB), versus pile driving, which produces noise at 191 dB. Other construction-related noise expected in the vicinity of the proposed turbine sites would consist mainly of noise related to construction vessels and onboard equipment.

While there is some research on underwater sound-fields surrounding offshore wind turbines, there is little knowledge of how it affects fish behavior and health, particularly in freshwater ecosystems. To date, most of the research surrounding underwater sound levels has been conducted to investigate pile driving. Extreme noise from pile driving is highly likely to cause mortality and tissue damage in fish (Bergstrom et al., 2014). However, gravity-based foundations, like the proposed MB foundations, do not require pile driving and result in considerably lower noise levels. Fish may react to the low intensity noises associated with gravity foundation installations by leaving the area, but the intensity of disturbance is low, and fish are likely to return soon after exposure has ended (Bergstrom et al., 2014). While knowledge on how freshwater fish hear is well documented, noise-related impacts to fish in field conditions is unclear.

There would be additional boat traffic associated with construction of the proposed turbine foundations, inter-array cables, and export cable. However, noise levels during construction would be temporary and similar to noise levels experienced consistently in the region which experiences up to 1,000 passing lake freighters traveling into and out of the Port annually. The additional noise-related effects to aquatic communities, including fish species, from a temporary increase in boat traffic are expected to be similar to what these aquatic organisms experience regularly. Therefore, noise-related impacts from proposed construction activities to fish are expected to be negligible.

There would be minimal anticipated noise effects on fish or other organisms from HDD construction operations associated with the proposed export cable installation because the noise generating equipment would be located onshore, except for the drill bit and string, which would be located approximately 12 feet below the lakebed (Xodus, 2015). Noise generated from HDD would be short-term with impacts occurring only during actual HDD activities, which would be expected to last approximately one month.

Operation and Maintenance

Habitat Disturbance and Reef Effect

The proposed turbine foundations would result in the loss of approximately 0.3 acre of existing substrate habitat (0.05 acre per turbine). Spacing between turbines is approximately 0.5 mile. Therefore, the footprint of the foundations represents an insignificant loss of habitat to fish species.

The foundations of the proposed turbines are anticipated to have impacts similar to those observed for offshore oil rigs in the Gulf of Mexico and offshore wind facilities in Europe. These structures would likely have an artificial reef effect that would increase both the diversity of fish and abundance of some fish species within the immediate vicinity of the foundations (Bergstrom et al., 2014; Wilhelmsson et al., 2006). The artificial reefs created around each turbine would allow for attachment of sessile invertebrates and would provide structure and feeding areas for fish. These new structures would provide new habitat and make different prey available to fish in this localized area.

The sediment composition following construction is likely to be similar to the existing conditions at the proposed turbine sites and along the proposed cable route, as sediment resettles. The only permanent disturbance of the lakebed habitat resulting from cable installation would be the presence of the inter-array and export cables; however, these cables would be buried approximately 1 to 1.5 meters (3.3 to 5 feet) below the surface and in some areas, may be buried deeper. Therefore, they would not interfere with fish migration or movement.

Electric and Magnetic Fields

To determine the potential significance of EMF from the operating inter-array and export cables, a literature review of EMF related to fish was conducted (Appendix O). The electric field is produced by stationary charges, and the magnetic field is produced by moving charges. Impacts from electric fields are not anticipated for the Proposed Project as the cable conductors are shielded and jacketed with an insulator, which is designed to virtually eliminate any electric field losses outside the cable. The magnetic field on the other hand cannot be contained by the cable shielding and can travel through sediment and water, to some degree. However, the estimated magnetic field from the proposed inter-array and export cables is low in comparison to other underwater transmission lines and should be less than background levels (Appendix O). LimnoTech reviewed a study involving lake sturgeon, which are benthic feeding and considered an electro-sensitive species. The study indicated that the threshold for behavioral response was 1,000 to 2,000 µT, when located 4 to 8 inches away from the full-strength EMF. The EMF from the proposed inter-array and export cables will be well below the strength threshold for behavioral response in lake sturgeon because the cables will be buried at a depth of approximately 1 to 1.5 meters (3.3 to 5 feet) (Appendix O).

In marine environments, BOEM conducted a study to more fully understand the potential effects of energized, seabed deployed, power cables on marine organisms. The study found that there were no biologically significant differences among fish and invertebrate communities in the vicinity of energized cables, pipes, and natural habitats. BOEM reported that the EMF produced by energized cables diminishes to background levels about 1 meter (3.3 feet) away from the cable. BOEM concluded that given the rapidity with which the EMF produced by energized cables diminishes, and the lack of response to that EMF by fish and invertebrates, cable burial is not actually necessary for biological reasons (Love et al., 2016).

Based on the low expected EMF levels to be generated by the Proposed Project, the added diminishment of EMF from burial of the proposed inter-array and export cables, and current research regarding EMF impacts on fish behavior, no impacts to fish are anticipated from EMF generated by the Proposed Project.

Similarly, anticipated increases in the temperature of the sediment and water column associated with the inter-array and export cables would be expected to fall within the range of natural ambient variability and would not affect fish species as concluded for the LEC Project, a proposed cable approximately 80 miles east of the Proposed Project in Lake Erie (DOE, 2016).

Noise Disturbance

A review of the current knowledge of fish detection and reaction to underwater sound with special emphasis on underwater noise from offshore wind farms was conducted by Wahlberg and Westerberg (2005). The review looked at sound impacts to fish from noise generated by wind farms in terms of masking of acoustic communication, consistent triggering of alarm reactions, and temporal or permanent hearing damage. Sound measurements from a European offshore wind farm (with seven 1.5 MW turbines) were taken across low, medium, and high wind speeds from November 2002 to February 2003. The review predicted that goldfish, Atlantic salmon, and cod can detect offshore wind turbines at distances of 0.4 km (0.25 mile) to 25 km (15.5 miles). There was no evidence that wind turbine noise causes temporary hearing loss in fish even at a distance of a few meters (3 to 7 feet). Wind turbines produce sound intensities that may cause permanent avoidance by fish within ranges of approximately 4 meters (13.1 feet), but only at high wind speeds. The wind turbine noise may have a significant impact on the maximum acoustic signaling distances by fish. However, it is not known to what degree this reduces the fitness of the fish (Wahlberg and Westerberg, 2005).

Wind turbine type has a large effect on the sound intensities generated and, therefore, on the range at which fish may be affected. Additional factors, especially the number of wind turbines, water depth, and bottom type may cause the detection and masking ranges calculated to vary considerably between different wind turbine sites (Wahlberg and Westerberg, 2005). Overall, it seems most likely that noise impacts to fish are limited to high wind speeds at short distances from the foundation (Bergstrom et al., 2014).

Shipping causes considerably higher sound intensities than wind turbines (Wahlberg and Westerberg, 2005). Commercial ships are a dominant source of radiated underwater noise at frequencies less than 200 hertz (Hz), which is within the hearing range of many fish (Hildebrand, 2009; Slabbekoorn et al., 2010). Offshore wind farms can create low-frequency noise at high source levels during their construction (especially from equipment such as a pile driver and jacket hammer), but only at moderate source levels during their operation (Hildebrand, 2009). A cargo vessel (173 meters [568 feet] in length, at 16 knots) will produce a source level of 192 dB re 1 micropascals (μPa) at 1 meter (3.3 feet), a small boat outboard engine (at 20 knots) will produce a source level of 160 dB re 1 μPa at 1 meter (3.3 feet), and an operating wind turbine will produce a source level of 151 dB re 1 μPa at 1 meter (3.3 feet) [7] (Hildebrand, 2009). Therefore, noise generated from the operation of the proposed turbines would be less than routine vessel sounds that occur in the Proposed Project Area and are not anticipated to have an adverse impact to fish species.

There would be a slight increase in boat traffic consisting on average of one trip for a crew transfer vessel or tug boat per week over the year during maintenance activities at the proposed turbines. However, because Lake Erie experiences frequent boat traffic from commercial shipping and fishing and recreation, no significant additional underwater noise impacts would be anticipated from maintenance activities.

Based on the information above and LimnoTech's pre-construction ambient noise monitoring (see Section 3.12), noise generated from operation of the Proposed Project would result in negligible impacts to fish. Overall, long-term adverse impacts to fish species from operations and maintenance of the Proposed Project would be minor.

Decommissioning

Impacts associated with decommissioning activities are expected to be similar to or less than construction activities, including temporary displacement and avoidance behavior during removal of the turbines. The inter-array and export cables would remain buried, therefore avoiding additional construction vessels.

3.4.2.3 Birds and Bats

An avian and bat risk analysis was prepared by WEST in 2016 to identify the relevant ecological resources in and around the Proposed Project Area and evaluate the level of risk to birds and bats posed by the Proposed Project. WEST reviewed and summarized baseline data and other publicly available data on bird and bat use including post-construction monitoring results of other offshore wind energy facilities and land-based wind energy facilities in the region, as well as other information about the Proposed Project's environment, for the purpose of evaluating the level of risk posed by the Proposed Project to birds and bats. The WEST report is provided as Appendix L.

Construction

Potential impacts associated with construction of the Proposed Project could include behavioral avoidance and displacement effects associated with the presence or activity of construction.

Displacement Effects

The potential for displacement effects, defined as the transformation of the Proposed Project Area from suitable habitat to less suitable habitat as a result of construction, was evaluated by examining data on the use of the Proposed Project Area and other offshore environments in the central Lake Erie basin by birds and bats for activities other than transit, in the context of technical literature on the subject. Baseline data have shown that the use of the Proposed Project Area as a habitat for anything other than migratory transit by any bird or bat species is minimal or negligible. For example, the ODNR aerial survey conducted over a large portion of Lake Erie, including the Proposed Project Area, documented the presence of only six species of water birds at abundances that can be considered above negligible or occasional in the vicinity

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[7] Hydrophones measure sound pressure, normally expressed in units of μPa. Early acousticians working with sound in air, realized that human ears perceive differences in sound on a logarithmic scale, so the convention of using a relative logarithmic scale (dB) was adopted. To be useful, the sound levels need to be referenced to some standard pressure at a standard distance. The reference level used in air (20 μPa at 1 meter) was selected to match human hearing sensitivity. A different reference level is used for underwater sound (1 μPa at 1 meter). Because of these differences in reference standards, noise levels cited in air do NOT equal underwater levels.

of the Proposed Project Area. By contrast, the ODNR survey effort documented markedly higher bird species richness and abundance closer to shore. Three of these species were gulls (Bonaparte's gull, ring-billed, and herring gull), with averages roughly between one and five individual birds observed in the Proposed Project Area and vicinity per survey. For the other three species, (i.e., horned grebe, common loon, and red-breasted merganser), averages of roughly one individual or fewer were observed within the Proposed Project Area and vicinity per survey. At such low abundance, statistically significant displacement effects would be difficult to detect and would not be expected to have any population-level impact on any species. Therefore, the displacement effects of construction to birds or bats of the Proposed Project would be negligible.

Behavioral Avoidance

Behavioral avoidance is defined as the avoidance of the Proposed Project by bird or bat species that would otherwise use the Proposed Project Area strictly for transit (other uses are covered by displacement effects). Some migrating birds and bats from a variety of taxa would be likely to migrate through the Proposed Project Area during construction. Migrating birds and bats may detect construction equipment and vessels and fly around them, or avoid areas of construction. In such cases, the additional energy expenditure of this avoidance behavior is expected to be negligible (Appendix L). Therefore, the potential for adverse effects from avoidance behavior during construction is likely negligible.

Operation and Maintenance

Potential impacts associated with operation and maintenance could include displacement effects, behavioral avoidance, or attraction effects, such as barriers to flight paths from the presence of the turbines or attraction to the turbines, and the risk of collision with wind turbines.

Displacement Effects

Similar to displacement effects for construction, the potential for displacement effects as a result of operation and maintenance, defined as the transformation from suitable habitat to less suitable habitat including use or avoidance of foraging, roosting, breeding, or wintering habitat, was evaluated by examining data on the use of the Proposed Project Area and other offshore environments in the central Lake Erie basin by birds and bats for activities other than transit. Baseline data have shown that the use of the Proposed Project Area as a habitat for anything other than migratory transit by any bird or bat species is minimal or negligible. Therefore, because of the low abundance of birds and bats, the displacement effects of operation and maintenance to birds or bats of the Proposed Project would be negligible.

Behavioral Avoidance/Attraction Effects

The potential for behavioral avoidance or attraction effects was evaluated by examining post-construction monitoring results of other offshore wind energy facilities, and by reviewing technical literature on this subject. As previously stated, behavioral avoidance is defined as the avoidance of the Proposed Project by bird or bat species that would otherwise use the Proposed Project Area strictly for transit. Behavioral attraction is defined as attraction to the Proposed Project by bird or bat species that would otherwise utilize the area less frequently or not at all. The analysis concluded that the proposed wind turbines do have the potential to generate both behavioral avoidance and attraction effects in some groups of birds or bats. Although the passage rates of migrating birds through the area of the proposed turbines are expected to be lower than on land, along the shore of Lake Erie, or in near-shore waters, some migrating birds and bats from a variety of taxa are likely to migrate through the Proposed Project Area regularly. After construction, some migrating birds and bats may detect the presence of the wind turbines and fly around them. In such cases, the additional energy expenditure of this avoidance behavior is expected to be negligible, as has been demonstrated at offshore wind projects in Europe (Appendix L). Therefore, the potential for adverse effects from avoidance behavior is likely negligible.

Other birds and bats flying in the vicinity may be attracted to the proposed wind turbines and platforms as structures to perch or roost. This is not likely to occur in nocturnal (nighttime) migrant birds, because the wind turbines would utilize flashing red aviation obstruction lights, which do not attract nocturnal migrants or other birds. Attraction effects are more likely to occur with some diurnal (daytime) water birds such as gulls and cormorants, as has been demonstrated in Europe, and may also occur with additional taxa, including bats. This attraction effect may be beneficial by providing foraging sites or roosting in an area not typically used by birds or bats or may be adverse, increasing the risk of collision with the operating turbines (Appendix L).

Collision Effects

The potential for collision effects was evaluated by examining data on the use of the proposed turbine sites and other offshore environments in the central Lake Erie basin by birds and bats, including merely for transit, contextualized with information on taxon-specific wind-turbine collision susceptibility patterns from technical literature and publicly available post-construction monitoring reports from other wind energy facilities. Direct monitoring of offshore wind facility fatalities has rarely been attempted, and minimal data are available. Most European offshore wind facility impact studies focus on collision risk modeling. Using the information on the collision probability from European offshore wind studies, combined with known bird and bat fatality patterns from North American land-based wind energy facilities provides a basis for assessing collision risk anticipated for various bird and bat species from the Proposed Project. The risk evaluations (e.g. low, moderate, high) refer to how the range of potential fatality rates likely to be generated by the Proposed Project compare to fatality rates that have been documented at typical land-based energy facilities in the region.

The overall conclusion of the risk assessment was that total fatality levels of birds and bats are expected to be lower for the Proposed Project than for typical land-based wind energy facilities in the region. The proposed wind turbines are not likely to generate population-level effects for any species. These conclusions are based primarily on the low use of offshore environments within the central Lake Erie basin by birds and bats, as well as the small size of the Proposed Project, and are also influenced by known patterns of taxon-specific collision susceptibility, behavioral and morphological factors, and species' geographic ranges (Appendix L). As seen in the following discussion, the collision risks for the categories of birds and bats that may use the Proposed Project area are low. As such, the potential impacts to birds and bats would be considered minor.

Raptors and Eagles

A small number of eagles and other raptors may be exposed to collision risk if they encounter the proposed wind turbines while migrating across Lake Erie. However, eagles and other raptors tend to avoid migrating over large water bodies such as Lake Erie, and no raptors were documented within 10 miles of the Proposed Project Area during a 2-year baseline survey effort (Norris and Lott, 2011) or in the boat-based baseline survey conducted specifically for the Proposed Project Area and vicinity (Appendix K). Therefore, collision risk would be unlikely for migrating eagles and other raptors. Foraging raptors and eagles would be unlikely to forage 8 to 10 miles offshore during the summer when plentiful food sources are available. In winter as the lake freezes, eagles will feed on fish and waterfowl along the leading edge of the ice. In 2014, a severe winter, even with extensive ice cover, numerous water openings were observed throughout the offshore ice sheet with open water between Cleveland and the Proposed Project Area (Appendix L). While extensive ice has the potential to put eagles near the proposed turbines, such extensive icing events are rare, and during such events it is unlikely that the proposed turbine sites would provide a unique ice-free environment. Therefore, collision risk for foraging eagles or raptors would be low.

Songbirds

The majority of concern regarding collision risk for songbirds and other small migratory birds is during the night, though it is not exclusively restricted to the night. Nocturnally migrating songbirds and similar birds may be exposed to collisions with the proposed turbines as they migrate across Lake Erie in the spring and fall. The results of available mortality studies conducted primarily in terrestrial environments indicate that most collisions with man-made structures take place at night during periods of inclement weather (Kerlinger, 2000). Birds that fly within the rotor swept zone of the proposed turbines during periods of low visibility would be at the greatest risk of collision. As a group, nocturnally migrating songbirds and similar birds exhibit low general susceptibility to collisions with wind turbines based on land-based wind energy facilities bird fatality studies. Such studies integrate all weather conditions over the time periods during which the studies are conducted. Susceptibility may be related to overall abundance of the species in the area, amount of time spent flying within rotor swept altitudes, behavioral/morphological factors (e.g. high degree of aerial maneuverability), and lack of attraction of nocturnally migrating birds to wind turbines, as long as intermittent aviation obstruction lighting is used on the nacelles (Appendix L).

A region-wide analysis of NEXRAD data demonstrated that the density of songbird migration over the central Lake Erie basin was less than one half of what it was over terrestrial environments within the region (Diehl et al, 2003). This conclusion was reinforced by WEST’s January 2017 analysis of 3 years of more recent NEXRAD data over the Proposed Project Area and six on- and off-shore comparison sites. Several recent studies employing marine radars in shoreline environments have demonstrated relatively high densities of nocturnal migrant birds along the shorelines of Lake Erie and Lake Ontario (Rathbun et al., 2016; Horton et al., 2016), reinforcing the understanding that such migrants tend to concentrate along coastlines and avoid flying over large water bodies, such as Lake Erie, if possible.

WEST’s report (Appendix L) compared studies conducted at operational, land-based wind energy facilities with the Great Lakes region to develop rough, quantitative predictions of the Proposed Project’s collision fatality rates for nocturnal songbirds. Land-based facilities include a significant proportion of collisions by birds that are local, diurnally active residents in the facility area and not from collisions during nocturnal migratory flights, which the Proposed Project would not include. Therefore, using the total bird fatality rates for predicting nocturnal migrant songbird fatality rates at the Proposed Project would likely result in an overestimate but still provides a useful prediction. Studies show fatality rates would most likely be between 2.10 and 3.35 birds per MW per year for small passerines, most of which are nocturnal migrants which would lead to roughly 21 to 42 total bird fatalities per year for the Proposed Project.

Based on the preference for migrating along shorelines and nocturnal migrant birds lack of attraction to flashing red lights, and also the size of the Proposed Project, the overall collision risk for nocturnally migrating songbirds and similar birds would be low, and unlikely to have population-level impact on any species of nocturnal migrant birds (Appendix L).

Waterfowl and Water Birds

For waterfowl and other water birds, baseline aerial survey data have shown that these birds are largely restricted to the first 3 to 6 miles from shore in the central/southern Lake Erie basin, with minimal or negligible density of waterfowl and other water birds in the vicinity of the proposed wind turbines (Norris and Lott, 2011). A variety of studies at U.S. land-based wind energy facilities near waterfowl concentration areas have shown low wind-turbine collision susceptibility of waterfowl (Derby et al., 2009, 2010; Jain, 2005; Niemuth et al., 2013). Certain other water bird species, notably several species of gulls, may experience higher levels of exposure to potential collision risk, as they occur more regularly at the proposed wind turbine site and are known to fly more frequently within rotor swept altitudes. Such exposure may be increased further if gulls are attracted to the proposed wind turbines after construction, as has been shown for some gull species at some European offshore wind energy facilities (e.g. Krijgsveld et al., 2011). Although this exposure is likely to result in some collisions of gulls with the proposed turbines, such collisions are likely to be rare in relation to exposure, because of the high degree of aerial maneuverability and visual acuity of gulls, which confers low wind turbine collision susceptibility to gulls as a group (Cook et al., 2014). For this reason, the current European practice is to assign a very high collision avoidance probability to gull species in avian collision risk modeling studies for European offshore wind energy facilities (Cook et al., 2014).

Similar to eagles, waterfowl and water birds would have the potential to be near the proposed turbines as part of an ice-free zone during winter. However, review of ice cover data for the lake indicates that extensive icing events are rare and, when they do occur, there are generally ice-free areas distributed across the Lake, including nearer to shore than the proposed turbine sites.

As detailed in Appendix L, the overall risk of collision for waterfowl and waterbirds from the Proposed Project would be considered low.

Bats

Bat use of the airspace around the proposed turbines is expected to be largely limited to migratory transit (Appendix L). Although bats are primarily terrestrial animals, some species are likely to cross Lake Erie and the Proposed Project Area regularly, particularly as they are migrating. The extent to which bats may be attracted to the proposed turbines as they are migrating across the Lake is not well-known.

The relationship between pre-construction bat acoustic activity, or “exposure” data and post-construction collision fatality at wind energy facilities is known to be complex. However, the baseline information on bat abundance in the offshore environment of the central Lake Erie basin can be compared with publicly available, bias-corrected bat fatality rates for land-based wind energy facilities in the Great Lakes region.

Bats that are known to migrate long distances, including the eastern red bat, hoary bat, and silver-haired bat, are the most commonly found bats in North American wind farm fatality studies, comprising 78 percent of fatalities (Arnett et al., 2008).

WEST (2016) applied such comparisons to make rough, quantitative predictions of the Proposed Project’s collision fatality rates for bats. Such comparisons indicate that bat fatality rates would most likely be on the order of one to four bats per MW per year, which would lead to roughly 21 to 83 total bat fatalities per year for the Proposed Project. WEST noted that bat fatality rates could be as high as 20 to 30 bats per MW per year if there is a substantial behavioral attraction effect, but the small size of the Proposed Project limits the magnitude of this risk to a moderate level in relation to other regional wind energy facilities, even under this worst-case scenario.

Overall, long-term adverse impacts to bats from operations and maintenance of the Proposed Project would be minor.

Decommissioning

Adverse impacts to bird and bat species associated with decommissioning activities are expected to be minimal and short-term, similar to construction activities.

3.4.2.4 Insects

Construction

The shoreline and land areas of the Proposed Project do not include monarch butterfly habitat; therefore, the Proposed Project would have no impacts to monarch habitat during construction. However, the Proposed Project would be located within the migration path of the monarch butterfly. Monarch butterflies must maintain a body temperature of 55°F for flight (Masters et al., 1988). Warm air over Lake Erie is present from the middle of July until the middle of October as lake waters cool much more slowly than surrounding air over land (NOAA, 2017d). Construction of the Proposed Project is proposed to begin in the spring and be completed by the fall of the same year. Fall construction activities such as vessel traffic on the lake, could affect migrating monarch butterflies if they pass near the Proposed Project Area; however, it is unlikely that construction activities would adversely impact the monarch butterfly. The number of vessels that would be used for construction of the Proposed Project would not be a significant increase over current vessels operating in the Proposed Project Area. In addition, observations from a charter boat captain in Lake Michigan reported observing migrating monarchs during an afternoon charter trip and noted that they never landed on his boat (Monarch Watch, 2015). Therefore, monarch butterflies are not likely to be disturbed by vessels or construction activities during installation of the Proposed Project.

The four state-listed insects that occur in Cuyahoga County are generally found in high velocity rivers and streams, wetlands, and prairie habitats, which do not occur within the Proposed Project Area. The Port, the Proposed Substation, onshore cable route, and HDD boring pit would be within developed land which does not provide habitat for these state-listed threatened and endangered species. This is the only area proposed for onshore construction activities. The ODNR Natural Heritage Program had no records for rare or endangered species in the Proposed Project Area. Therefore, impacts to state-listed insect species are not anticipated for the Proposed Project during construction.

Operation and Maintenance

The shoreline and land areas of the Proposed Project do not include monarch butterfly habitat or state-listed insect habitat; therefore, the Proposed Project would have no impacts to monarch butterfly or state-listed insect species habitat during operation.

The proposed wind turbines would be located within the migration path of the monarch butterfly. Direct research on the impact of wind turbines on migrating butterflies is limited; however, other studies on butterflies offer data that suggest wind speeds and patterns associated with operating turbines likely would not cause collision issues (Grealey and Stephenson, 2007). Butterflies approaching from a downwind direction may be repelled by the wake from the turbine or become trapped in the wake of the downwind vortex created by wind turbines. Butterflies approaching a turbine from an upwind direction likely will be unaffected unless they collide with the turbine. Wind currents created by turbine blades may be great enough to sweep butterflies away from the turbine blades before physical collision can occur (Grealey and Stephenson, 2007). Because of the small scale of the Proposed Project, variability in flight heights of the migrating monarch butterfly, and limited time in which the monarch butterfly migrates through the area, adverse impacts during operation and maintenance are expected to be negligible.

Decommissioning

Similar to construction, the Proposed Project would have no anticipated impacts to state-listed insect species or monarch butterfly habitat during decommissioning because there is no habitat for these species within the Proposed Project Area. Vessel traffic required for decommissioning would be similar to current vessels operating in the Proposed Project Area and the presence of vessels is not anticipated to alter the monarch butterfly's flight pattern even if activities are conducted during the monarch butterfly migration period. Therefore, impacts to monarch butterflies are anticipated to be negligible and no impacts are anticipated for state-listed insects during decommissioning activities.

3.4.2.5 Aquatic and Terrestrial Protected Species

State-listed species are not expected to occur in the Proposed Project Area based on a lack of habitat and the ODNR Division of Wildlife letter (2017) indicating no records of rare or endangered species in the area. Therefore, state-listed species are not evaluated further in this section except for bird and bat species that are also federally listed.

A Biological Assessment has been prepared for the purpose of the ESA Section 7 consultation with USFWS. This consultation is in progress to review and determine to what extent, if any, the Proposed Project would affect the federally listed threatened and endangered species discussed in Section 3.4.1.5.

WEST completed a bird and bat risk analysis for the Proposed Project (Appendix L) which is discussed in more detail in Section 3.4.2.3 Birds and Bats.

Construction

Potential impacts associated with construction of the Proposed Project could include loss of habitat and disturbances associated with the presence or activity of construction.

Indiana Bat and Northern Long-Eared Bat
Habitat associated with the Proposed Project includes developed, urban environment, hardened shorelines of the Cuyahoga River, the Old River, and Lake Erie, and Lake Erie open water. Undisturbed forested habitat typically occupied by Indiana and northern long-eared bats does not occur near the Proposed Project; therefore, no Indiana bat or northern long-eared bat habitat would be lost from construction of the Proposed Project.

Baseline data have shown that the use of the Proposed Project Area as a habitat for anything other than migratory transit by any bat species is minimal or negligible. The presence or activity of construction would have negligible effect on Indiana bats or northern long-eared bats because they are unlikely to occur in the vicinity of the Proposed Project, or if present, it is likely in very small numbers.

Kirtland's Warbler
Habitat associated with the Proposed Project includes developed, urban environment, hardened shorelines, and Lake Erie open water, none of which are considered important habitat for Kirtland's warbler. Nesting habitat preferred by the Kirtland's warbler does not occur near the Proposed Project; therefore, no Kirtland's warbler habitat would be lost from construction of the Proposed Project. Migrating Kirtland's warbler could pass through the Proposed Project area during construction; however, there have been only five documented sightings of Kirtland's warbler in the Cleveland region between 1950 and 2004. Effects from the presence or activity of construction would be negligible.

Piping Plover

The piping plover is now considered only a migrant species in Ohio (ODNR, 2017d) and no project construction activities would occur in areas that might be used by feeding or resting plovers. Therefore, no piping plover habitat would be lost from construction of the Proposed Project. Migrating piping plover could pass through the Proposed Project area during construction; however, effects from the presence or activity of construction would be negligible.

Rufa Red Knot

The rufa red knot is only a migrant species in Ohio and no project construction activities would occur in areas that might be used by feeding or resting rufa red knots. Therefore, no rufa red knot habitat would be lost from construction of the Proposed Project. Migrating rufa red knot could pass through the Proposed Project area during construction; however, effects from the presence or activity of construction would be negligible.

Operation and Maintenance

Potential impacts associated with operation could include disturbances, such as barriers to flight paths from the presence of the turbines, and the risk of collision with wind turbines. Potential effects associated with maintenance activities could include disturbances with the presence or activity of equipment or vessels (similar to construction).

Indiana Bat and Northern Long-Eared Bat

The Indiana bat is unlikely to occur in the Proposed Project area because there is no undisturbed forested area typically utilized as summer habitat nearby. In addition, because there are no known colonies of Indiana bats in Ontario, it is unlikely it migrates across the lake or is present in the area of the proposed wind turbines. The Proposed Project may affect but is not likely to adversely affect Indiana bats and population-level impacts are not expected.

It is possible that northern long-eared bats could migrate through the Proposed Project Area, as the species has been documented in Ontario, along the northern shores of Lake Erie (Dobbyn, 1994; Dzal et al., 2009). However, the species is not a long-distance migratory bat species and unlikely to cross Lake Erie, and therefore, unlikely to come into contact with the proposed turbines. Bat collision impacts at turbines are most frequent on nights when wind speeds are lower, especially during the late summer when migrating and swarming bats are most active. To address this concern, LEEDCo has agreed to feather the turbine blades (i.e., adjust the pitch of the turbine blades) up to the manufacturer's cut in speed (i.e., 6.7 mph, the speed at which the turbine starts generating electricity) during these active periods. Therefore, the Proposed Project may affect but is not likely to adversely affect northern long-eared bats and population-level effects are not expected.

Kirtland's Warbler

Kirtland's warblers are known to migrate along the Lake Erie shoreline through Ohio in late April to May and late August through early October (USFWS, 2017b). It is thought that "all or nearly all" of the Kirtland's warbler population passes through Ohio during migration (ODNR, 2007a). While no Kirtland's warblers were observed during the boat surveys or detected during the spring and fall avian acoustic monitoring, the species is known to migrate through the Cleveland area, as evidenced by five documented sightings in the Cleveland region between 1950 and 2004 (McCarty, 2012). A model previously developed by the USFWS to assess the effects of communication towers on the Kirtland's warbler was used to evaluate the potential effects of the Proposed Project. The model predicted that, over the 30-year lifespan of the

Proposed Project, the take of Kirtland's warbler may be estimated at 0.002 warblers per year (one Kirtland's warbler death every 500 years) (Kerlinger and Guarnaccia, 2013).

Details of the Kirtland's warbler migration and specific habitat used during migration are not well understood (USFWS, 2012). However, coastal areas along the Atlantic Ocean and the Great Lakes are areas of potential importance to the species during migration (USFWS, 2012). Several recent studies employing marine radars in shoreline environments have demonstrated relatively high densities of nocturnal migrant birds along the shorelines of Lake Erie and Lake Ontario (Rathbun et al., 2016; Horton et al., 2016), reinforcing the understanding that such migrants tend to concentrate along coastlines and avoid flying over large water bodies, such as Lake Erie, if possible. Marine surveillance radar studies conducted at approximately 20 sites in the eastern U.S. have indicated that in spring and fall migratory periods, there is more nocturnal songbird migration at higher altitudes than there is within the altitudes that would be swept by the Proposed Project's turbines (Kerlinger and Guarnaccia, 2013). Although there is little data specific to Kirtland's warbler, nocturnally migrating songbirds generally exhibit low susceptibility to collisions with wind turbines.

Therefore, the Proposed Project may affect but is not likely to adversely affect Kirtland's warbler and population-level effects are not expected.

Piping Plover

The piping plover is now considered only a migrant species in Ohio (ODNR, 2017d). While no piping plovers were found in the offshore study area during boat-based visual observation surveys or avian acoustic monitoring, both conducted during the spring and fall migration periods (Appendix K), the possibility exists that piping plovers could migrate through the Proposed Project Area and collide with the wind turbines. There are two piping plover critical habitats in Ohio. OH-1 near Sandusky is located approximately 60 miles to the west of the Proposed Project Area and OH-2 near Painesville is located approximately 30 miles to the east of the Proposed Project Area. Both critical habitats are used as migration stopover locations and have regular observations of plovers during migration (USFWS, 2009b). In addition, documented migration stopovers also occur at Point Pelee and Long Point in Ontario, on the north side of Lake Ontario (USFWS, 2009b). While little is known about the exact migration routes of piping plovers, observations along the Great Lakes shoreline suggests plovers may use the shorelines as a migration corridor.

The risk of collision of piping plover during migration movements would be based on flight frequency through the area, height of flight, visibility conditions, and turbine avoidance behaviors (which are not known). Unfortunately, piping plover migration is poorly understood, but interior populations, such as those with breeding grounds around the Great Lakes, likely make non-stop migrations to their wintering grounds (Haig, 1992). It is not known what flight paths piping plovers use on their migration, if plovers cross Lake Erie during migration, or their average flight height. Shorebirds migrating from Nova Scotia were recorded flying at an overall mean altitude of approximately 6,500 feet (2,000 meters) (median 5,500 feet [1,700 meters]), well above the rotor swept area (Richardson, 1979). These birds are known to cross large expanses of land and water and make stop-overs at staging areas along the way. Looking at numerous studies, Richardson (1978) determined that for most bird species, the number of birds migrating peaked when winds were in the direction of the migration path. Following winds would be important for birds that migrate long distances, especially over barren landscapes (Richardson, 1990), such as Lake Erie. Piping plovers migrate both during the day and night (O'Brien et al., 2006), and may wait out inclement weather conditions prior to flight, thereby reducing collision risk.

Although there is little data about collision risk to piping plovers specifically, studies conducted to date have shown that shorebirds generally have a low risk of collision mortality. For example, post-construction bird and bat fatality monitoring studies conducted by the New Jersey Audubon Society at the Atlantic City Utilities Authority's Jersey Atlantic Wind Power Facility revealed negligible shorebird fatality rates despite this project's location adjacent to coastal habitat within one of the most concentrated shorebird migration corridors on the east coast of the U.S. (New Jersey Audubon Society, 2008a; 2008b; 2009). No piping plover fatalities have been documented at operating wind energy facilities. The same model used to predict take of the Kirtland's warbler (discussed above) was used to estimate the piping plover take because of the Proposed Project. The estimated take for piping plovers was one piping plover every 2,500 years.

Therefore, the Proposed Project may affect but is not likely to adversely affect piping plover and population-level effects are not expected.

Rufa Red Knot

The rufa red knot is a migratory bird traveling yearly from the Arctic to South America. Small numbers of rufa red knots pass through Ohio, with more moving through in the fall than in the spring (ODNR, 2017e). The species can occur almost anywhere along the Great Lakes shores or inland on mudflats of falling reservoirs in late summer and autumn or flooded fields in spring. The northern shoreline of Ohio is visited regularly during fall migration, particularly the Ottawa National Wildlife Refuge (USFWS, 2014b), approximately 66 miles west of the nearest turbine. While no red knots were found in the offshore study area during boat-based visual observation surveys or avian acoustic monitoring, both conducted during the spring and fall migration periods (Appendix K), the potential exists for the species to migrate through the Proposed Project Area.

Although there are no documented instances of red knot mortality from wind energy facilities, the Proposed Project operation could result in red knot mortality from collision with the wind turbine blades. Red knots can travel 1,500 miles or more per day, migrating both day and night (Normandeau Associates, Inc., 2011) to reach their staging and stopover locations to rest and feed. Birds on long-distance flights, such as red knots crossing the offshore environment, fly at higher altitudes than short-distant migrants (78 FR 60024), thereby reducing exposure to wind energy facilities. Although no red knot avoidance data is available, studies to date indicate that collision risk for shorebirds, in general, is low (New Jersey Audubon Society, 2008a; 2008b; 2009).

It is unlikely that the proposed wind turbines would pose a significant barrier to bird migration or local flight paths on Lake Erie. If migratory or local movement takes red knots in the vicinity of the Proposed Project, it is expected that birds would normally cross the wind turbines well above the rotor-swept area (Gordon and Nations, 2016).

Therefore, the Proposed Project may affect but is not likely to adversely affect rufa red knot and population-level effects are not expected.

Decommissioning

Impacts associated with decommissioning activities are expected to be similar to construction activities. Therefore, effects to the Indiana bat, northern long-eared bat, Kirtland's warbler, piping plover, and rufa red knot because of decommissioning would be negligible.

3.5 Health and Safety

3.5.1 Affected Environment

3.5.1.1 Waste Management

The OEPA, Division of Materials and Waste Management defines non-hazardous waste to include solid waste, infectious waste, and construction and demolition debris (OEPA, 2017a). No significant debris or solid waste has been identified within the Proposed Project Area.

3.5.1.2 Hazardous Materials

Hazardous materials are materials with properties that make them dangerous, or capable of having a harmful effect on human health or the environment. Hazardous wastes are defined in 40 CFR 261.3.

A search of the EPA Envirofacts lists CPP as a Conditionally Exempt Small Quantity Generator and regulated under the Resource Conservation and Recovery Act, and the former CPP site as a Brownfield property (EPA, 2017a).

3.5.1.3 Public Health and Safety

Public safety concerns associated with the Proposed Project construction include: (1) the movement of large construction vehicles, vessels, equipment, and materials; (2) slips, trips, and falls; (3) falling overhead objects; and (4) electrocution. Public health and safety requirements for the Proposed Project while working on the Proposed Project components are regulated by the U.S. Occupational Safety and Health Administration (OSHA), while health and safety requirements for activities that take place on vessels would be regulated by the USCG under its regulations at 46 CFR Part 4.

3.5.2 Environmental Impacts Related to Health and Safety

3.5.2.1 Construction

Waste Management

The amount of construction waste generated by the Proposed Project would be minimal and consist of some solid waste, primarily plastic, wood, cardboard, and metal packing/packaging materials; construction scrap; and general refuse. Construction waste would be collected from turbine sites and other Proposed Project work areas, and disposed of in dumpsters located at the O&M Center. Any waste generated on installation vessels during the Proposed Project construction would be brought back to the Port for disposal. Waste would be recycled when possible, and if it is not recyclable it would be disposed of at dumpsters located at the O&M Center. A private contractor would empty the dumpsters on an as-needed basis, and dispose of the refuse at a licensed solid waste disposal facility. The following is a list of the estimated solid waste that would be generated by construction activities.

- Wood (Clean) – 500 kilograms (kg) (1,102 pounds)
- Recyclable waste (soiled wood) – 600 kg (1,323 pounds)
- Recyclable waste (paper, plastic) – 200 kg (441 pounds)
- Combustible general waste – 700 kg (1,543 pounds)
- Landfill – 250 kg (551 pounds)
- Oils – 20 liters (5.3 gallons)
- Paints – 5 kg (11 pounds)

Because these waste amounts are small waste quantities managed regularly by waste companies, the potential impacts from waste generated from the Proposed Project would be negligible.

Hazardous Materials

Construction equipment and vessels used during construction of the Proposed Project would use minor amounts of hazardous materials (oil, fuels, hydraulic fluids, lubricants) necessary for proper operation. Contractors would be required to develop and implement a SPCC plan. Used oil and universal waste would be handled, managed, and disposed of in accordance with federal, state, and local regulations and compliance with these regulations would ensure that potential impacts from hazardous materials during construction would be negligible.

It is not anticipated that construction of the Proposed Project would increase the amount of hazardous wastes generated by the CPP facility. It is also not anticipated that CPP's identification as Conditionally Exempt Small Quantity Generators would affect the Proposed Project construction. Furthermore, the proposed export cable and the Proposed Substation on the CPP property will not result in excavation in any areas that may be used for waste storage.

Public Health and Safety

Health and safety issues would be most relevant to construction personnel who would be working in close proximity to construction equipment and materials and exposed to construction-related hazards daily. The risk of construction-related injury would be minimized through weekly safety meetings, regular safety training, and the use of appropriate safety equipment. The Proposed Project would employ OSHA measures to ensure worker safety during construction and operation. Construction contractors would follow safety procedures and best practices for offshore wind construction as specified by LEEDCo's project partner, Fred. Olsen Windcarrier, and outlined in its parent company, Fred. Olsen Ocean's Construction Phase Health, Safety and Environmental Plan.

The general public would also be exposed to construction-related hazards from unauthorized access to work sites (on foot, by motor vehicle, or boat). The latter could result in collision with construction equipment (barges, cranes) and with turbine towers. Exposure risk to the public is anticipated to be minimal, because there would be buoys marking a site exclusion zone during construction, and guard vessels to keep out errant vessels. Vessels involved in the construction phase would be properly marked, lighted, and outfitted with sound signals in accordance with navigational rules. Notices to mariners (as well as Proposed Project website notices) and/or radio navigational warnings would be broadcast prior to and during construction.

In accordance with OSHA Part 1926.35, the prime contractor would develop and implement a Project Emergency Action Plan for the construction phase. Additionally, LEEDCo would work with local fire departments and other emergency responders to provide training for response to emergency situations related to the Proposed Project and equipment.

Adverse impacts to health and safety from the Proposed Project would be short-term and minor during construction.

3.5.2.2 Operation and Maintenance

Waste Management

For the most part, operation and maintenance of the Proposed Project would not result in significant generation of debris or solid waste. Waste generated from the O&M Center could include wood, cardboard, metal packing/packaging materials, general refuse, and used antifreeze. The O&M Center offices would generate solid wastes comparable to a typical small business office. The O&M Center would utilize local solid waste disposal and recycling services. Facility operation would not require acquisition of waste generation, storage, treatment, transportation, and/or disposal licenses or permits.

Hazardous Materials

Any used oil and universal waste generated from the Proposed Project during operation and maintenance would be handled, managed, and disposed of in accordance with federal, state, and local regulations.

The operation of the Proposed Project would not generate any sources of pollutants to Lake Erie. In order to make sure that no discharges of any fluids (oil, hydraulic, cooling, etc.) occur even under abnormal circumstances, the turbine would be designed for three levels of containment. Each primary system, i.e. gearbox, would be a sealed system with multiple sensors that monitor fluid performance and containment, with each of these inspected at regular maintenance intervals. The secondary system would be in the nacelle itself, where fluid containment reservoirs would be designed to capture any leaks from a primary system failure. If both primary and secondary containment fails, the bottom of the tower would have a reservoir to contain any fluids originating from the nacelle. However, in the extremely rare incident of failure of all three containment systems, any fluid that may leak into the environment would be inherently biodegradable. In addition, service vessels would be equipped with oil spill handling materials adequate to control or clean up any accidental spill.

As part of the O&M Plan for the operations of the turbines, a SPCC plan would be developed which would include the identification of a qualified Spill Responder. The Spill Responder would maintain the resources and availability necessary to address any spills. It is anticipated that development of the oil spill response plan would be performed through close communication with the appropriate agencies such as the USCG. Therefore, potential adverse impacts associated with hazardous materials and wastes resulting from the operations and maintenance phase of the Proposed Project would be negligible and short-term.

It is not anticipated that operation of the Proposed Project would increase the amount of hazardous wastes generated by the CPP facility. It is also not anticipated that CPP's identification as Conditionally Exempt Small Quantity Generators would impact the Proposed Project operation.

Public Health and Safety

Turbines would be fitted with safety lighting to satisfy FAA and USCG standards. The lowest tip of the turbine blade would be 20 meters (65 feet) above the surface of Lake Erie. A recreational boat study was performed in 2016 to count and classify power and sail boats in recreational harbors, marinas, and yacht clubs in Lorain, Cuyahoga, and Lake Counties (Appendix P). Of all the sailboats classified in the study, 99 percent of boats had a mast height below 65 feet. Additionally, a study of location of boats offshore found that only 2 percent of the boats counted in all of the surveys were within 3 miles of the proposed turbine sites (Appendix I). The Proposed Project, working with the USCG, has prepared a preliminary Navigational Risk Assessment to ensure all navigational hazards are appropriately addressed; the Navigational Risk Assessment is discussed in Section 3.9, Traffic and Transportation.

Adverse impacts to health and safety from the Proposed Project would be long-term and minor during operation and maintenance.

3.5.2.3 Decommissioning

Waste Management

With decommissioning, removal of the Proposed Project would be accomplished by simply reversing the installation process, and would permit complete removal and recycling of steel materials. Other project materials including items such as fittings and connectors, light sources, control equipment and electronics, and waste would be recycled when possible, and if it is not recyclable, it would be disposed of appropriately at a licensed solid waste disposal facility.

Hazardous Materials

Construction equipment and vessels used during decommissioning of the Proposed Project would require minor amounts of hazardous materials (oil, fuels, hydraulic fluids, lubricants). Contractors would be required to develop and implement a SPCC plan. Used oil and universal waste would be handled, managed, and disposed of in accordance with federal, state, and local regulations.

Public Health and Safety

Similar to construction, safety trainings and weekly meeting would be completed, OSHA measures would be employed and appropriate plans implemented for construction workers.

Adverse impacts to health and safety from the Proposed Project would be short-term and minor during decommissioning.

3.5.3 No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funds by LEEDCo in support of the Proposed Project. Any potential beneficial or adverse effects to the physical, natural, or socioeconomic resources would not be realized.

3.6 Air Quality

3.6.1 Affected Environment

Ambient Air Quality

The OEPA Division of Air Pollution Control publishes air quality data for the state of Ohio annually. The most recent summary of air quality data available for the state is the *Division of Air Pollution Control 2013 Annual Report* (OEPA, 2014b). Included in that report is a summary of 2013 air quality data, a discussion of toxics monitoring projects, and trend studies for selected pollutants. Pollutants monitored over 13 monitoring sites in Cuyahoga County include carbon monoxide, particulate matter (2.5 micron, 2.5 micron continuous, and 2.5-micron speciation), total suspended particulate, nitrogen dioxide, ozone, lead, and sulfur dioxide. There were violations of National Ambient Air Quality Standards (NAAQS) reported at monitoring stations in Cuyahoga County for 2.5-micron particulate matter (3-year average of annual average), ozone (4th highest 8-hour concentration), and lead (highest 3-month concentration) (OEPA, 2014b).

Air emissions in the Proposed Project Area would be related primarily to vehicular travel and manufacturing. The greatest sources of manufacturing emissions in the vicinity of the Proposed Project originate from ArcelorMittal Cleveland LLC., approximately 4 miles south of the Cleveland Harbor; CEI Lake Shore Plant, located along the Cleveland Harbor; and Cleveland Thermal LLC., located less than 1 mile from the Cleveland Harbor (OEPA, 2014c).

General Conformity

The Clean Air Act (CAA), as amended in 1990, requires the EPA to set NAAQS (40 CFR 50) for pollutants considered harmful to public health and the environment. The EPA Office of Air Quality Planning and Standards has set NAAQS for six principal pollutants, which are called “criteria” pollutants and include carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur dioxide. Areas not meeting the standards are designated as “nonattainment areas” and states are required by the CAA to submit State Implementation Plans describing how they will attain and/or maintain the NAAQS for each criterion pollutant exceeding or that has exceeded its standard in the past. As described above, air quality monitoring occurs in Cuyahoga County. According to the OEPA (2014b), violations of NAAQS were reported for 2.5-micron particulate matter (3-year average of annual average), ozone (4th highest 8-hour concentration), and lead (highest 3-month concentration).

The 1990 CAA amendments prohibit federal entities from taking actions in nonattainment and maintenance areas that do not conform to State Implementation Plans, and require that a conformity evaluation be conducted to ensure that federal actions conform to these plans. A conformity evaluation is comprised of an applicability analysis and, if necessary, a conformity determination.

3.6.2 Environmental Impacts Related to Air Quality

3.6.2.1 Air Quality Impacts

In accordance with Section 111 of the CAA, the EPA established New Source Performance Standards (NSPS) to regulate emissions of air pollutants from new stationary sources. The OAC regulations do not contain any NSPS regulations for the Proposed Project Area beyond those promulgated at the federal level. These standards apply to a variety of facilities including landfills, boilers, cement plants, and electric generating units fired by fossil fuels. Because wind turbines generate electricity without releasing pollutants into the atmosphere, NSPS would not apply to the Proposed Project.

All new sources of air emissions in Ohio are required to obtain a Permit to Install for Title V facilities, or a Permit to Install and Operate for non-Title V facilities. Because wind turbines generate electricity without releasing pollutants into the atmosphere, the Proposed Project would not require a Permit to Install or a Permit to Install and Operate.

Administered by the EPA, the Acid Rain Program was established by the CAA Amendments of 1990 to reduce emission of sulfur dioxide and oxides of nitrogen (NO_X) through regulatory and market-based approaches. Because wind turbines generate electricity without releasing pollutants into the atmosphere, the Proposed Project would not require an acid rain permit.

Prevention of Significant Deterioration applies to new major sources of pollutants, and/or major modifications at existing sources for pollutants where the source is located in an area in attainment or unclassifiable with the NAAQS. The Proposed Project would not be a major source of any pollutants. Therefore, Prevention of Significant Deterioration would not apply.

Construction

The Proposed Project would be located in Lake Erie, 8 to 10 miles north of the City of Cleveland. Site clearing would not be required for construction, and any sediment disturbance during construction of turbine foundations, towers, and electrical cable would be submerged at the lakebed. Therefore, fugitive dust control would not be an issue for the Proposed Project. The proposed substation would be located at an already-developed parcel in use as electric system infrastructure and no clearing activities would be anticipated.

Air contaminants would be emitted from the vessels used to transport project components and work crews to the project location out in Lake Erie. These emissions would be limited to the products of combustion from diesel and gasoline engines, including: carbon dioxide, particulate matter, volatile organic compounds, and NO_X. Table 3.6-1 shows the estimated air pollutant emissions for the project construction activities. The engines would be both those used for vessel propulsion and those needed to power cranes and other onboard construction equipment. During construction, these pollutants would be emitted during the transit to and from the Port as well as while construction vessels were on station erecting the proposed foundations and wind turbines as well as during the laying off the proposed electrical export cable. These emissions from the Proposed Project would be very similar in nature to those regularly occurring on Lake Erie from commercial shipping and commercial and recreational fishing activities.

Table 3.6-1. Emissions Estimates by Engine Type as a Percentage of 2014 Cuyahoga County Annual Totals in 2014

Vessel/ Vehicle Type		Large lift crane barge	Large lift crane barge	Material supply barge	Tow tug	Crew boat	Inspection boat	Heavy lift vessel	Generators	Totals
Emissions (tons per year) Total	CO_2	1,019.661	1,113.600	0.000	14,683.115	2,141.288	2,141.288	7,647.456	6,681.600	35428
	CO	1.736	5.280	0.000	24.999	3.646	3.646	13.020	31.680	84
	NO_2	20.833	23.040	0.000	299.989	43.748	43.748	156.244	138.240	726
	SO_2	6.266	7.766	0.000	90.224	1.326	1.326	46.992	46.598	200
	VOC	0.789	0.616	0.000	11.363	1.657	1.657	5.918	3.695	26
	PM	0.742	0.672	0.000	10.681	0.630	0.630	5.563	4.032	23

Source: EPA, 2017b

Operation and Maintenance

The nature of emissions of air contaminants during operation and maintenance would be the same as those emitted during construction, but are anticipated to be substantially less in quantity annually because most of the effort for maintenance would be expected to be from smaller vessels than those used during initial construction.

Decommissioning

Emissions of air contaminants during decommissioning would be the same or less than those emitted during construction, both in the nature and quantity of the contaminants as those that would be emitted during initial construction.

3.6.2.2 Conformity Analysis

The Proposed Project would be located in an area that reported violations to NAAQS. Therefore, it would be within a designated nonattainment area. LEEDCo conducted an applicability analysis to evaluate whether construction and operation of the Proposed Project would negatively affect state efforts to comply with NAAQS. Estimated onshore emissions of carbon dioxide, particulate matter, volatile organic compounds, and NO_X were estimated to be less than the EPA de minimis threshold values. Furthermore, as shown in Table 3.6-2, the estimated offshore emissions of air pollutants during construction and operation of the Proposed Project would be 1 percent or less than the 2014 emission totals for Cuyahoga County (EPA, 2017b). Therefore, a conformity determination would not be necessary for the pollutants that would be emitted during the construction, operation, and decommissioning of the Proposed Project. Because of this, the potential impacts to air quality from the Proposed Project would be negligible.

Table 3.6-2. Total Emissions of Criteria and Greenhouse Gas Pollutants for Cuyahoga County, Ohio in 2014

	Cuyahoga County 2014 Annual Total Emissions (Tons)	Project Icebreaker Construction Emissions (Tons/Year)	Cuyahoga County 2014 Annual Total Emissions (Tons)	Percent Emissions from Project Icebreaker towards Total Emissions for Cuyahoga County in 2014
Criteria Pollutants				
Nitrogen Oxides (NOx)	457,982.71	726	457,982.71	**0.158%**
Volatile Organic Compounds (VOCs)	668,528.65	26	668,528.65	**0.004%**
Sulfur Dioxide (SO_2)	377,375.78	200	377,375.78	**0.053%**
Carbon Monoxide (CO)	2,011,156.20	84	2,011,156.20	**0.004%**

Table 3.6-2. Total Emissions of Criteria and Greenhouse Gas Pollutants for Cuyahoga County, Ohio in 2014

	Cuyahoga County 2014 Annual Total Emissions (Tons)	Project Icebreaker Construction Emissions (Tons/Year)	Cuyahoga County 2014 Annual Total Emissions (Tons)	Percent Emissions from Project Icebreaker towards Total Emissions for Cuyahoga County in 2014
Primary PM, Filterable and Condensable Portions (All Less than 1 Micron) (PE)	658,030.10	23	658,030.10	**0.003%**
Lead (Pb)	32.21			
Greenhouse Gas Pollutants				
Carbon Dioxide (CO_2)	73,976,902.87	35,428	73,976,902.87	**0.048%**

Source: EPA, 2017b

3.6.3 No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funds by LEEDCo in support of the Proposed Project. Any potential beneficial or adverse effects to the physical, natural, or socioeconomic resources would not be realized.

3.7 Climate Change

3.7.1 Affected Environment

Global climate change is a transformation in average weather, which can be measured by changes in temperature, wind patterns, and precipitation. Human activities since the Industrial Revolution have increased the abundance of greenhouse gases resulting in rising average global temperatures (NOAA, 2017e). Greenhouse gases (GHGs) trap heat in the atmosphere and regulate the Earth's temperature. They include water vapor, carbon dioxide, methane, nitrous oxide, ground-level ozone, and fluorinated gases such as chlorofluorocarbons and hydrochlorofluorocarbons.

3.7.2 Environmental Impacts Related to Climate Change

3.7.2.1 Effects of Project on Climate Change

Anticipated GHG emissions from the construction and operation of the Proposed Project were evaluated. Table 3.6-1 provides the Proposed Project emissions.

Construction

Emissions of GHG from Proposed Project construction will be minimal and short-term. As shown in Table 3.6-2, GHG emissions from construction of the Proposed Project would be far less than 1 percent of the annual GHG emissions in Cuyahoga County, Ohio. Any potential air quality impacts related to GHG emissions from construction activities would be negligible.

Operation and Maintenance

There would be minimal emissions of GHG from the Proposed Project operation and maintenance activities. The potential GHG emissions during operation and maintenance would be offset by the reductions in GHG emissions that would result from the generation of emissions-free electricity by the Proposed Project. Any potential air quality impacts from operation and maintenance activities would be negligible.

Decommissioning

The estimated emissions of GHG from decommissioning is expected to be the same as those resulting from construction activities and would be minimal and short-term. Any potential air quality impacts from decommissioning activities would be negligible.

3.7.2.2 Effects of Climate Change on Project

Construction

The Proposed Project would be constructed between 2018 and 2020 when the necessary permits and approvals are obtained. Climate change phenomena such as water level changes in Lake Erie would not be expected to occur at levels that would cause difficulties in constructing the Proposed Project.

Operation and Maintenance

According to the NOAA Great Lakes Environmental Research Laboratory, forecasts for future, long-term Great Lakes water levels are uncertain. Based on recent studies, there is little evidence that future water level variability will greatly exceed the historical range (NOAA, 2017f).

There is a large variation of ice cover at Lake Erie, ranging from less than 25 percent cover of the lake surface in a mild year to 100 percent cover during severe winters (Daly, 2016). Ice cover in Lake Erie has the potential to produce two different types of loading on the proposed turbine towers. Surface ice can grow to be several feet thick and, when driven by winds and currents, the ice can cause steady and periodic loads on the wind-turbine tower. Loading can also come from ice pressure ridges when ridges and keels are formed as the ice moves during the winter. Ice load data were investigated using multiple approaches, and are discussed in more detail in Appendix Q. The results provided an extensive data set for sheet ice thickness, frequency of ridges and keels, the maximum possible thickness of consolidated ice, and estimated dynamic ice forces and their significance in the fatigue limit design of the turbine foundations. The final ice analysis reviewed all previous calculations and data to confirm that the Proposed Project foundation design would meet design requirements and be able to withstand Lake Erie ice loadings.

Should changes occur to Lake Erie water levels, ice formation or dynamic ice forces from climate change, the Proposed Project may potentially be affected. As discussed above, the Proposed Project would be designed to withstand the expected ice loading conditions and so impacts to the Proposed Project from climate change would be negligible.

Decommissioning

As time goes on, climate change processes may result in changes to lake levels and ice formation. If such changes occur during the service life of the Proposed Project, it may make decommissioning activities more complex. However, such impacts would be expected to be minor.

3.7.3 No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funds by LEEDCo in support of the Proposed Project. Any potential beneficial or adverse effects to the physical, natural, or socioeconomic resources would not be realized.

3.8 Lake Use

3.8.1 Affected Environment

The Cleveland Harbor consists of an outer harbor formed by breakwaters and an inner harbor made up of the Cuyahoga River and the Old River. The harbor is approximately 1,600 to 2,400 feet wide and approximately 1,300 acres (USACE, 2009). The main entrance to the Harbor is a dredged navigational channel opposite the mouth of the Cuyahoga River. Additional entrances include a navigational channel at the east end and one at the west end for small crafts. The Cleveland Harbor is a USACE navigation civil works project in which the USACE provides safe, reliable, efficient, and environmentally sustainable waterborne transportation for movement of commerce, national security needs, and recreation. More details and dimensions for the Cleveland Harbor are provided in the Navigational Risk Assessment in Appendix R.

There are extensive waterfront facilities in the Cleveland outer harbor and along the banks of the Cuyahoga River and Old River. Facilities in the Cleveland Harbor are listed in U.S. Coast Pilot (NOAA, 2016a). During the closed navigation season, many of the piers, wharves, and docks are available for winter mooring of vessels. The harbormaster, who has control of the waters for the anchorages, generally orders vessels to anchor outside the harbor.

The Cleveland-Cuyahoga County Port Authority operates the Port of Cleveland in the Cleveland Harbor. The Port has cargo terminals with 12 docks to the east and west of the Cuyahoga River along the Lake Erie shoreline. Major commodities handled at the port include iron, steel, and aluminum products, limestone, iron ore, sand, stone, salt, and other minerals, petroleum products and other liquid bulk cargo, and general and containerized cargo in the foreign trade (NOAA, 2016b). The Port of Cleveland also includes the Cleveland Bulk Terminal, which is approximately 44 acres in size and located west of the river. The Cleveland Bulk Terminal primarily handles iron ore and limestone.

The waterways in the Proposed Project Area experience both commercial and recreational vessel traffic, both of which increase in numbers during the peak spring and summer boating season. Commercial vessels in the Great Lakes typically include bulk freighters, self-unloaders, integrated tug barges, chemical carriers, cement carriers, tugs, and barges (Haberly and Stalikas, 2013). The Cleveland Bulk Terminal is the main Port facility located to the west of the Cuyahoga River.

The ODNR manages sport and commercial fisheries in 2.24 million acres of Lake Erie. Ohio commercial fisheries harvested 4.6 million pounds of fish in 2015 with a dockside value of $4.9 million (ODNR, 2016a). Harvest included burbot, freshwater drum, gizzard shad, lake whitefish, buffalo, bullhead, common carp, channel catfish, goldfish, quillback, suckers, white bass, white perch, and yellow perch. Yellow perch, freshwater drum, and white bass were the three primary fish harvested accounting for 28, 20, and 17 percent of the total commercial harvest, respectively (ODNR, 2016a). The proposed location of the turbines would be in ODNR management units that comprised less than 3 percent of total commercial fishery nets pulled in Lake Erie from 2011 to 2015 (Appendix R, Figure 9). The more heavily fished areas are to the west of the proposed turbine sites.

The ODNR prepared a sport fishery effort map during the creation of their Offshore Wind Turbine Placement Favorability Analysis. In the sport fishery effort map, the 10-minute quadrangle that included the proposed turbine locations was determined to receive 106,000 to 700,000 average hours targeting walleye and yellow perch from 2000 to 2006. This represented the greatest concentration of sport fishery effort mapped by the analysis. However, in 2016, LimnoTech conducted aerial surveys of the 5-minute quadrangles in the Cleveland area to count boats on 12 different days between May and October. Across all dates, only 2 percent of the boats counted were in the vicinity of the proposed turbines. These data indicate that recreational boating (including recreational fishing) occurs closer to shore than suggested by the ODNR-developed sport fishery effort maps. The ODNR sport fishery effort maps are based on data from 10-minute survey grids, which are likely too coarse to evaluate expected fishing effort in the immediate vicinity of the proposed turbines (Appendix R).

There are no transportation passenger ferry routes that operate out of the Cleveland Harbor or navigate around the Proposed Project Area (ODNR, 2007b); however, there are numerous commercial passenger cruises (Donahue, 2016) and charter boats that can be rented for various activities including fishing and diving.

Cleveland Harbor hosts many recreational vessels including yachts, sailboats, power boats, and fishing boats. Recreational craft usage in the inner harbor typically peaks in June, July, and August and tends to be higher on the weekends and when weather conditions are favorable. Marinas in the inner harbor provide access to the Cuyahoga River and Lake Erie for over 800 recreational craft (USACE, 2009). Additional details on the Cleveland Harbor marinas are described in the Navigational Risk Assessment in Appendix R.

Several lake-based events take place in the Lake Erie waters off the coast of Cleveland, including sailing boat races, sailing regattas, festivals, boat shows, boat exhibitions, and fireworks displays. Most of the sailing regattas in the Proposed Project Area are hosted by the Cleveland Sailing Association with buoys for race courses marked (Appendix R, Figure 8). These buoys are not located within the proposed export cable route or the proposed wind turbine sites.

LimnoTech conducted an aerial survey to monitor use of the Proposed Project Area by recreational boaters (Appendix E) and a recreational boat slip study in 2016 to count and classify power and sail boats in recreational harbors, marinas and yacht clubs in Lorain, Cuyahoga, and Lake Counties (Appendix I). Data from the aerial surveys show that boating activity and recreational fishing occurs closer to shore and well away from the proposed turbine sites. Across all dates, only 2 percent of the boats counted were found within the ODNR 5-minute block covering the proposed wind turbine sites (Appendix E, Figure 30). Aerial imagery from August 3, 2016 was used to inventory a total of 6,057 boat slips across 16 marinas. Of the sailboats classified through the recreational boat slip study, 99 percent had a minimum mast height below 65 feet, which is less than the proposed clearance between the lowest point of the turbine blade to the water of 20 meters (65.6 feet).

More details and historical data for vessel activity are provided in Section 3.9 (Traffic and Transportation) and in the Navigational Risk Assessment in Appendix R.

3.8.2 Environmental Impacts Related to Lake Use

Construction

Typical vessels that would be used in the installation of the Proposed Project include tugs, barges, jack-up rigs, supply and crew transport vessels, and cable-laying vessels. Vessels would be operating continually between the Port, proposed turbine locations, and Proposed Substation. Vessels would be properly marked, lighted, and outfitted with sound signals in accordance with applicable navigational rules. During construction, a 500-meter (1,640-foot) safety avoidance zone would be requested around the installation vessels and a 100-meter (328-foot) safety avoidance zone around each proposed wind turbine and the Proposed Substation. During installation of the export cable, a 500-meter (1,640-foot) safety avoidance zone would be requested around the cable-lay vessel. In addition, security would be maintained by 24-hour presence of the site safety craft. Vessels would be warned to maintain a safe clearance from the work site by means of Notices to Mariners and radio navigational warnings broadcast by the USCG at regular intervals.

Approximately 10 vessels would be used for construction of the Proposed Project. This would be a minor increase over current vessels operating in the Proposed Project Area; however, any increase in vessels would potentially increase risks of collision or other interactions. Coordination between the USCG, harbormaster, and construction vessels would minimize risks.

The Proposed Project would have a short-term, minor adverse effect on lake use associated with temporary displacement of commercial and recreational boating, fishing, and tourism activities during construction. However, proposed construction activities would occupy only a small portion of available lake area used for fishing and boating and there would be plenty of adjacent areas unaffected by construction where these activities could still take place during construction. In addition, most of the recreational and commercial vessel activity occurs outside of the proposed turbine sites. Most construction impacts would occur in the areas closer to shore when vessels are transiting to the proposed turbine sites or during installation of the export cable.

Operation and Maintenance

Vessels most likely to access the proposed turbine sites are commercial fishing, recreational fishing, commercial charter, and recreational passenger vessels. Operation of the Proposed Project would introduce a potential obstacle to traditional navigation routes and to vessels in the area because of the presence of the six proposed turbines. However, the turbines would be spaced 0.5 mile apart which would allow vessels to access the area both through and around each proposed turbine while also maintaining safe distance from other vessels and commercial shipping lanes. The proposed turbines would be marked and lighted in accordance with navigational rules which provide added safety measures. In addition, no vessel exclusions within the proposed turbine sites are anticipated during operation; therefore, vessels are expected to be able to operate without restrictions in this area. In addition, the inter-array and export cables would be buried to an approximate depth of 1 to 1.5 meters (3.3 to 5 feet) beneath the lakebed and would not interfere with vessel anchoring or commercial fishing gear.

According to vessel traffic data obtained from the Automatic Identification System (AIS) collected by the USCG, cargo, tug and towing, passenger and pleasure craft, and sailing vessels are all documented in the general vicinity of the Proposed Project Area, but are found only in low densities around the proposed turbine sites (Marine Cadastre, 2016). Therefore, operational impacts to commercial and recreational vessels in the lake are further reduced given the low densities of vessels documented around the proposed turbine sites.

There is the potential that recreational fishermen in the region may seek to fish at the proposed turbines because they will serve as new structures on the lakebed that will likely attract certain recreational species such as smallmouth bass. This new potential lake use would be an operational benefit of the Proposed Project to recreational fishers.

The proposed turbine sites, inter-array cables, and export cable were sited outside of transportation ferry routes that operate out of the Cleveland Harbor and outside of the race courses set by the Cleveland Sailing Association for sailing regattas. Therefore, the Proposed Project is not expected to have an impact on commercial ferry traffic or recreational sailing events during operation.

Overall, the anticipated impacts from operation of the Proposed Project on lake use would be minor.

Decommissioning

Decommissioning of the Proposed Project may result in a temporary increase in the number of vessels operating in the area; however, similar to the impacts described for the construction phase, these impacts to lake use would be short-term and minor. Upon completion of decommissioning activities, the Proposed Project Area is expected to return to pre-construction conditions and the inter-array cables and export cables would be rendered inactive and remain buried.

3.8.3 No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funds by LEEDCo in support of the Proposed Project. Any potential beneficial or adverse effects to the physical, natural, or socioeconomic resources would not be realized.

3.9 Traffic and Transportation

3.9.1 Affected Environment

3.9.1.1 Lake Transportation

Commercial and recreational vessel traffic occurs in the vicinity of the Proposed Project, both of which increase in numbers during the peak spring and summer boating season. As described in Section 3.8, commercial vessels in the Great Lakes typically include bulk freighters, self-unloaders, integrated tug barges, chemical carriers, cement carriers, tugs, and barges (Haberly and Stalikas, 2013). The Cleveland Bulk Terminal is the main Port facility located to the west of the Cuyahoga River and accommodates around 150 vessel movements per year from self-unloading vessels delivering bulk commodities. The inner harbor accommodates around 700 commercial vessels per year and experiences around 1,400 vessel transits per season with an average of approximately four transits per day during March through December. More details and historical data for vessel calls are provided in the Navigational Risk Assessment in Appendix R.

Deep-draft vessels normally anchor approximately 2 miles southwest or 3 miles east of Cleveland Waterworks Intake Crib Light. Additionally, vessels are prohibited from anchoring within 2,000 feet west of the main entrance channel (NOAA, 2016a). Within the harbor, general anchorages are located in the northwest part of the west basin and south of the dredged channel in the east part of the east basin.

There are no transportation passenger ferry routes that operate out of the Cleveland Harbor or navigate around the Proposed Project Area (ODNR, 2007b). However, there are numerous commercial passenger cruises (Donahue, 2016) and charter boats can be rented for various activities including fishing and diving.

There are three known shipping channels within the Proposed Project Area, two of which cross over the proposed underwater export cable. Vessel traffic data, or AIS data, collected by the USCG, is available for the Great Lakes Region. While AIS is not a precise indicator of the entire range of vessel traffic that may traverse the area, it does provide a relative indicator of where vessel traffic is heaviest. Vessel density from 2013, including data for cargo vessels, tug and towing vessels, passenger vessels, pleasure craft, and sailing vessels, are available for the Proposed Project Area from the Marine Cadastre marine information system website. As described and depicted in Figures 9 through 12 of the Navigational Risk Assessment (Appendix R), these data indicate that cargo, tug and towing, and commercial pleasure craft and sailing vessel traffic is generally concentrated within the inner and outer Cleveland Harbors, and within the 2 miles leading to the main harbor entrance. As distance from port increases, the traffic density decreases, as vessel traffic spreads out over the shipping channels. Any reported vessel travel in the vicinity of the proposed turbines are shown to occur at low densities. Passenger vessel density was reported as low throughout the Proposed Project Area and, while passenger traffic would likely cross the proposed export cable route, based on the historical vessel traffic data, it would not intersect with the proposed turbine sites. While cargo, tug and towing, passenger, pleasure craft and sailing vessels occur at times in the vicinity of the Proposed Project Area, they are only present in low densities around the proposed turbine sites.

As described in Section 3.8, recreational craft usage in the inner harbor typically peaks in June, July, and August and tends to be higher on the weekends and when weather conditions are favorable. Marinas in the inner harbor provide access to the Cuyahoga River and Lake Erie for over 800 recreational craft (USACE, 2009). Sailing regattas occur in the Lake Erie waters off Cleveland; however, race courses for these regattas occur outside the proposed export cable route and proposed turbine sites (Appendix R). Results from aerial surveys conducted by LimnoTech show that boating activity and recreational fishing effort occur closer to shore and well away from the proposed turbine sites (across all dates only 2 percent of the boats counted were found within the ODNR 5-minute block covering the proposed turbine sites (Appendix E, Figure 30). An aerial imagery inventory of recreational boat slips, also conducted by LimnoTech, showed that of the sailboats classified through the study, 99 percent had a minimum mast height below 65 feet, which is less than the proposed clearance between the lowest point of the turbine blade to the water of 20 meters (65.6 feet) (Appendix R).

The Cleveland USCG station is located on the south end of the Outer Harbor. The USCG provides search and rescue and pollution incident responses in the Proposed Project Area. USCG vessels would be expected to be present in the Proposed Project Area, as well as potentially research vessels used by NOAA and EPA.

Ice conditions and winter storms restrict navigation for vessels on Lake Erie. Typical ice formation in Lake Erie begins in the western basin in late December and spreads east across the lake with peak ice coverage in February (NOAA, 1987). Shipping restrictions can occur in the St. Lawrence Seaway from the middle of December to the beginning of April. Shipping among the Great Lakes and within Lake Erie can usually continue until January (or even longer) with assistance from USCG icebreakers so that a path is maintained along main vessel routes.

3.9.1.2 Terrestrial Transportation

The Proposed Project's components on land would be located in downtown Cleveland adjacent to numerous interstate, U.S., and state highways, as well as county and local roadway networks, in addition to freight rail lines and small airports.

Highways and Local Roadways

The main transportation route to the Proposed Project Area is Interstate 90 (I-90) (Cleveland Memorial Shoreway/Innerbelt), which runs adjacent to the Proposed Substation site. U.S. Route 20/State Route 2, the western branch designated the Cleveland Memorial Shoreway, runs adjacent to the Port, the location of the proposed O&M Center and main port to the turbines. I-77 and I-71 converge downtown from the south and southwest, respectively. U.S. Routes 480 and 271 provide bypass routes that avoid the congestion near downtown Cleveland. These and other primary routes facilitate transportation between the Proposed Project Area and the surrounding metropolitan areas.

Rail

Freight rail lines connect several of the municipalities throughout the Proposed Project Area, nearly all converging near the site of the proposed O&M Center in downtown Cleveland. CSX and Norfolk Southern operate the majority of Ohio's freight rail system, although smaller operators such as Amtrak, Rail America, and the Wheeling & Lake Erie Railway also operate in the area. Area municipalities connected to freight rail lines include the Cities of Cleveland and East Cleveland and the Villages of Bratenahl and Cuyahoga Heights.

Aviation

No airports or landing strips are located within 5 miles of the proposed turbine sites. The Proposed Substation is in proximity to the Cleveland Hopkins International Airport and the Cleveland Burke Lakefront Airport, the closest airport facilities to the Proposed Substation. Helipads and landing strips are also present within 5 miles of the Proposed Substation.

3.9.2 Environmental Impacts Related to Traffic and Transportation

3.9.2.1 Lake Transportation

Construction

Construction vessels would operate in accordance with USCG Navigational Rules and state navigation regulations that would help minimize lake traffic risks associated with the Proposed Project. Vessels involved in the construction of the Proposed Project would be properly marked, lighted, and outfitted with sound signals in accordance with applicable navigational rules. These regulations are detailed in the Navigational Risk Assessment (Appendix R).

Typical vessels that would be used in the installation of the Proposed Project include tugs, barges, jack-up rigs, supply and crew transport vessels, and cable-laying vessels. Vessels would be operating continually between the Port, proposed turbine locations, and Proposed Substation although construction activities would be restricted during adverse weather conditions. Table 3.9-1 lists weather constraints for different construction activities that would mitigate unnecessary risks to personnel, vessels, and the environment.

Table 3.9-1. Weather Limitations for Offshore Installation Activities

Operation	Vessel	Wind Limit (m/s)	Wave Limit (m)
Foundation transportation	Feeder barge	10	1.5 - 2
Turbine component transportation	Feeder barge	10	2
Transit to site	Feeder barge	10	1.5 – 2
Nacelle and tower sections installation (lift)	Jack-up vessel	10	1
Rotor installation	Jack-up vessel	8	1
Cable installation	Cable lay barge	10	1
Transport of personnel	Crew transport vessel	10	1.5 – 2
Transfer of personnel to turbine platform during cable installation and commissioning	Crew transport vessel	10	1.5

Source: Appendix R, Navigational Risk Assessment

During construction, safety avoidance zones would be requested as described in Section 3.8. In addition, security would be maintained by 24-hour presence of the site safety craft. Vessels would be warned to maintain a safe clearance from the work site by means of Notices to Mariners and radio navigational warnings broadcast by the USCG at regular intervals. These temporary construction exclusion areas have the potential to cause minor disturbance to vessel traffic. However, these exclusion areas would be a maximum of 500 meters (1,640 feet) in size and vessel traffic would be restored to normal upon completion of each component installation.

NOAA's Automated Wreck and Obstruction Information System (AWOIS) and Electronic Navigation Charts were consulted to identify submerged wrecks and obstructions in the Proposed Project Area (Appendix R, Figure 7). The obstructions closest to the Proposed Project (AWOIS 14295 and 14293) are both submerged pilings at a depth of at least 19 feet and are outside of the construction envelope for the proposed export cable determined from the results of the geotechnical surveys (NOAA, 2016c). The distance and depth of the obstructions are anticipated to be sufficient to ensure safe installation of the proposed cable line and construction personnel would be notified of the presence of these obstructions.

The number of vessels that would be used for construction of the Proposed Project would not be a significant increase over current vessels operating in the Proposed Project Area; however, any increase in vessels would potentially increase risks of collision or other interactions. The USCG would be notified of the construction schedule, location, type and number of vessels, and any Private Aids to Navigation (ATON) around the construction area, if needed. Preliminary Notices to Mariners and/or Radio Navigational Warnings would be broadcast prior to and during construction (U.S. Department of Homeland Security and USCG, 2005), and timely notices of project activities would be posted on the Proposed Project's website. Coordination between the USCG, harbormaster, and construction vessels would minimize risks.

The Proposed Project would have a short-term, minor adverse effect on lake traffic and transportation during construction.

Operation and Maintenance

Potential Impacts from Project Vessels

Once the Proposed Project is operational, project vessel traffic would be limited to maintenance vessels. The maintenance vessels and vessel operators would be held to the same standard as construction vessels. Vessels would be properly marked, lighted, and outfitted with sound signals in accordance with applicable navigational rules. The number and frequency of vessels used for maintenance of the Proposed Project would not be a significant increase over normal vessel traffic in the Proposed Project Area. The Proposed Project control center would remotely monitor and control the Proposed Project Area 24 hours a day and would collaborate with the USCG. Impacts to navigational safety from vessels used in operation and maintenance of the Proposed Project would be negligible.

Potential Obstructed Views from Proposed Turbines

The proposed design and spacing of the turbines would result in potentially obstructed views of the coastline, ATONs, and between vessels. However, the small number and the linear array of turbines would minimize potential obstruction in sightlines to the coastline and between vessels. In addition, there would be 756 meters (2,480 feet) of separation between each proposed turbine, which would result in large areas with some unobstructed lines of sight between each proposed turbine. The proposed turbines have the potential to block ATONs along the coastline from only very specific locations and not all ATONs along the coastline would be blocked by the turbines at once. Any vessels that experience blocked views of the coastline or ATONs would be at least 8 miles off the coast and would gain visibility as the vessel passes through the area. In addition, the navigational lights and fog horns that would be mounted on the turbine platforms would serve as ATONs.

Potential Vessel Avoidance of Proposed Turbines

Large commercial vessels, which typically use the shipping lanes, would not be affected by the Proposed Project because the only part of the Proposed Project that intersects shipping lanes would be the buried export cable. Because the export cable would be buried, it is not anticipated to cause disturbance to shipping commerce. However, recreational vessels (recreational fishing and passenger vessels) and smaller commercial vessels (commercial charter and commercial fishing) could access the proposed turbine sites. There would be adequate space around the proposed turbines for vessels to avoid the turbines while also maintaining a safe distance from other vessels and commercial shipping lanes. The Proposed Project would not result in any channel restrictions caused by the presence of the proposed turbines and the design and spacing are not expected to limit vessel use of the surrounding area. Therefore, effects from potential vessel avoidance of turbines are not anticipated.

Potential Vessel Collision with Proposed Turbines

The presence of the turbines would create a risk of potential vessel collision, as would be the case with the installation of any new structure. As described above, large commercial vessels using shipping lanes would not be affected by the proposed turbines, because they are not anticipated to pass through the proposed turbine sites. However, recreational and smaller commercial vessels could potentially be in the vicinity of the proposed turbines. In fact, recreational vessels may be attracted to the proposed turbines out of curiosity or to fish for species that may congregate around the proposed turbine foundations. A risk assessment for the Horns Rev II wind farm off the coast of Denmark concluded that the likelihood of ship-to-ship collision is “significantly higher” than the probability of a vessel colliding with a wind turbine. Additionally, at that same wind farm, approximately 48,000 boats pass through a shipping lane 8 km (5 miles) from the wind farm, and it was found to cause only minimal hindrance to commercial traffic (NREL, 2010).

There would be adequate space around the proposed turbines for smaller vessels to avoid the turbines, while also maintaining a safe distance from shipping lanes and other vessels. Electronic equipment, including GPS units, are widely available and commonly used by commercial and recreational boaters, and would serve to minimize the potential for a collision with the turbines. In addition, proposed turbines would be marked and lighted in accordance with navigational rules. During adverse weather including storm events, fog, or high winds, the potential for vessel collision with the turbines is increased. The notices to mariners, updates to NOAA navigational charts, and proposed turbine lighting, fog horns, and marking would help to minimize the potential risk of collisions under adverse weather conditions. Currents and velocities are low at the proposed turbine sites and would not aggravate the potential for a vessel collision with the turbines. In the case of vessel engine failure, a vessel could drift into a turbine, but because currents and water velocities are low near the proposed turbines, any collision from drifting is not anticipated to be significant. If a collision between a vessel and a turbine does occur, the structural integrity of the turbine would be investigated and verified and a report would be filed in accordance with the Marine Casualty Regulations in 46 CFR 4. The anticipated impacts of vessel collision with turbines from the Proposed Project are anticipated to be negligible.

Potential Impacts on Electronic Navigation and Communication Systems

Very high frequency (VHF) radio is the most frequently used radio and has designated channels for commercial ships to confirm passage and communicate actions, mayday distress calls, storm warnings, and boat-to-boat communication. VHF radios are required on vessels greater than 20 meters (65.6 feet) and, while not required, are common on smaller vessels as well. Studies on the Horns Rev wind turbines in Denmark and the North Hoyle wind turbines in the United Kingdom concluded that there were no significant effects on VHF communication in the vicinity of the wind turbines (Appendix R). Those wind turbine projects ranged from 30 to 80 turbines, compared to six turbines for the Proposed Project. It is anticipated that there would be a similar lack of effects on communication systems from the Proposed Project.

Radar technology remains one of the many tools used by vessel operators and is one of the more important instruments, particularly when visibility is reduced, in aiding a vessel operator to navigate safely and avoid collision (USCG, 2009). A study modeling the effect of offshore wind farms on marine radars typically installed on boats and shipping vessels found that wind farm signal scattering could produce a confusing navigational picture if a boat is inside a wind farm, but there would be minimal interference to tracking of vessels outside the wind farm (Ling, et al., 2013). For the Proposed Project, with only a single line of turbines, the effects on navigational radar on vessels from the proposed turbines would be minimal.

GPS technology includes 24 satellites that triangulate a user's position based on line of sight transmitted by multiple satellites (NOAA, 2017g). While objects, such as buildings or mountains, can block a satellite's line of sight, it is possible to receive only slightly degraded positions with only three satellites having line of sight (NOAA, 2017g). The proposed turbines would not obscure all satellites at the same time, given the proposed small diameter of the turbines, large distance between turbines, and single line array. Therefore, the Proposed Project's effect on GPS signal reception and accuracy are anticipated to be minimal.

The wind turbines are not anticipated to generate any EMFs; however, potential EMFs could be generated by the inter-array cable and export cables. The estimated magnetic field from the inter-array and export cables would be much less than the earth's naturally occurring background levels, and because these cables would be shielded and jacketed with an insulator, electric field impacts would not pose an issue to communications (Appendix O). Any effects from EMF fields are anticipated to be negligible.

Potential Ice Hazard

Because of the cold winters in Cleveland, and typical freezing conditions of Lake Erie, ice accumulations on and around the proposed turbines would be expected in some years. However, the presence of the proposed turbines would not be expected to exacerbate icing. Ice formation around the proposed turbine foundations would constrain access to the proposed turbines for operations and maintenance during winter months and may require a vessel with ice breaking capability. Research and modeling described in Appendix R were conducted to determine potential loadings and fatigue of the proposed turbines from ice cover in Lake Erie. These studies indicated that the proposed turbine foundation design is conservative and would be capable of withstanding forces from ice floes, ridges, and keels.

Blade icing and subsequent ice shedding or ice throw would be a potential hazard to vessels operating in the vicinity of the proposed turbines. There have been no reported injuries caused by ice being thrown from an operating wind turbine (Garrad Hassan Canada, Inc., 2007; Baring-Gould et al., 2012). Many factors affect the distance traveled by ice thrown from a blade, including position of the blade when the ice breaks off, the location of the ice on the blade, the rotational speed of the blade, the shape of the ice, and the prevailing wind speed. The potential for icing would be greatest in the winter months when recreational and commercial boating is limited. Marinas in the area close between October and November and do not reopen until April or May, so recreational boats on the water would be essentially non-existent when conditions are favorable for ice formation. Commercial boating is also limited when ice cover is present and the few commercial vessels on the lake during icing conditions would stay within the shipping lanes (over 2 miles from the proposed turbine sites). Therefore, the anticipated ice hazard effect to commercial and recreational vessels associated with the Proposed Project would be negligible.

Potential Impacts on USCG Search and Rescue

Based on the AIS vessel density data from 2013, while commercial and recreational vessels have been documented in the vicinity of the Proposed Project Area, they are found only in low densities around the proposed turbine sites (Appendix R). Because of the small number of turbines, the linear array, and the large distance between each turbine, the Proposed Project would not significantly affect USCG search and rescue operations. USCG marine assets would be able to operate in and around the proposed turbines with minimal impact. Additionally, the turbine platforms would serve as a refuge for stranded boaters in the vicinity.

Decommissioning

Decommissioning of the Proposed Project may result in an increase in the number of vessels operating in the area; however, similar to the effects described for the construction phase, they would be short-term, minor, adverse effects on lake traffic and transportation.

3.9.2.2 Terrestrial Transportation

The terrestrial components of the Proposed Project would be located in downtown Cleveland adjacent to numerous roadway networks, freight rail lines, and small airports. Construction and decommissioning activities, and to a lesser extent maintenance activities, would use the existing infrastructure networks, potentially increasing traffic, while operation of the Proposed Project would potentially affect use of the airports.

The Proposed Project intends to use locations and existing structures that currently have permanent road access; therefore, no access road construction would be required.

Construction materials that would not arrive by rail or barge would be carried on trailers. LEEDCo, working with Cuyahoga County and affected municipalities, would develop a road use agreement that would address

Proposed Project activity both during construction and decommissioning. The Proposed Project would need wide load, but no oversized/heavy load, permits for the substation transformer, control house, and crawler cranes. Any trucks needed to deliver components would meet weight requirements as posed by the Ohio Department of Transportation (ODOT). There would be no temporary or permanent road closures, lane closures, road access restrictions, or traffic control necessary for construction and operation of the Proposed Project.

Construction traffic bound for the Proposed Substation would likely use I-90 Exit 175 as the primary route, while traffic bound for the proposed O&M Center would most likely use the West 45th Street exits from U.S. Route 20/State Route 2. The Proposed Project would not be expected to cause any substantial disruption to major transportation corridors serving the Proposed Project Area, because most transportation of turbine components and equipment would occur by barge.

Depending on the selected manufacturer, the rail system would potentially be used for the transportation of turbine components and equipment other than the foundation, but no modifications to the system would be anticipated. Depending on the selected foundation fabricator, the foundations would arrive completely by barge, and never be off-loaded, or would arrive in pieces by barge and/or truck with final assembly at the Port. Similarly, depending on the selected cable supplier/installer, the cable would arrive completely by barge, and never be off-loaded, or it would arrive by rail and be off-loaded and staged at the Port. There would be no site preparation or reclamation for crane paths because the cranes would be transported to port by trucks on existing roads and assembled at the Port.

Airports, helipads, and landing strips within 5 miles of the Proposed Project Substation would be notified of the proposed construction. The Proposed Substation would be constructed alongside the Lake Road Substation, would not be any taller than existing substation facilities, and would therefore have no greater effect on these aviation facilities than currently exists. LEEDCo would work with ODOT Office of Aviation to ensure there would be no aviation effects as a result of the Proposed Project.

Wind turbines have the potential to create clutter interference and possibly significant Doppler interference with sensitive radars fielded by the FAA, Department of Defense, NOAA, and other agencies. Written notification of the Proposed Project was provided on August 11, 2016 to the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce (DOC), which then provides plans for the Proposed Project to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC), including the Department of Defense, the Department of Education, the Department of Justice, and the FAA. The NTIA then identifies any potential Project-related concerns detected by the IRAC during the review period. A NTIA response received on October 13, 2016 identified a DOC concern regarding the Proposed Project impacting its radar systems and the potential degradation of the detection of lake effect snow. Further consultation by LEEDCo with DOC determined there would be minimal impacts to the radar. There were no concerns from any other IRAC agencies.

The FAA conducted aeronautical studies of the proposed turbine layout under the provisions of 49 USC 44718, applicable 14 CFR 77, and Ohio Revised Code (ORC) Section 4561.32. The FAA can issue two types of determinations, one that identifies a hazard and another that identifies no hazard. Proposed structures over 200 feet must undergo an Obstruction Evaluation by the FAA and be permitted through a Form 7460-1 filing prior to construction. Form 7460-1 was submitted for the Proposed Project, with a determination of no hazard to air navigation from the FAA if the structure is marked and/or lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, *Obstruction Marking and Lighting*. Construction and operation of the Proposed Project would be designed according to FAA standards and would not result in any adverse effects to the regional air transportation network.

3.9.3 No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funds by LEEDCo in support of the Proposed Project. Any potential beneficial or adverse effects to the physical, natural, or socioeconomic resources would not be realized.

3.10 Cultural Resources

3.10.1 Affected Environment

The Proposed Project's review of cultural resources included archaeological resources and historic-architectural resources. Archaeological resources have the potential to be directly impacted through ground disturbing activities; indirect impacts to archaeological resources are not typically considered. Historic-architectural resources have the potential to be directly impacted through demolition or physical alteration, or indirectly through a change in the property's visual setting.

The Area of Potential Effect (APE) for direct effects includes all areas within the limits of disturbance for construction activities associated with the Proposed Project. For the lake-based area, this includes the proposed turbine sites and associated construction workspaces and the corridor of potential disturbance for the submerged transmission lines, while land-based areas include the Proposed Substation, corridor of potential disturbance for landfall of the submerged transmission line, laydown and staging areas, access roads, and operations and maintenance facilities.

The APE for indirect effects includes those areas where the Proposed Project (including wind turbines) would be visible and where there is a potential for a significant visual effect (a change in a historic property's visual setting). Aesthetics and Visual Resources are discussed in detail in Section 3.11.

3.10.1.1 Lake-Based Cultural Resources

An evaluation was completed of the Proposed Project's effect on submerged archaeological resources including an archaeological sensitivity evaluation of the Proposed Project's APE for direct effects for both Native American and historic-period archaeological resources by Gray & Pape (Appendix S). A geophysical survey of the proposed wind turbine sites was conducted by Alpine Ocean Seismic Survey, Inc. (Appendix F-1). VanZandt Engineering completed a geophysical survey review of the export cable route and evaluated the results according to Section 106 of the National Historic Preservation Act of 1966 (NHPA) requirements (Appendix T).

The Gray & Pape report includes an analysis of the potential for Native American archaeological sites to be identified within the APE for direct effects. The report considers the paleo-environmental setting of the Proposed Project Area, including the rise of lake levels and other landscape changes during the post-glacial period, the history and geomorphology of sedimentation and the movement of lake bottom deposits within the lake itself, as well as the distribution across the landscape of known Native American archaeological sites from various time periods. Based on this data, portions of the APE for direct effects were potentially habitable from about 12,000 years before present (BP) until between 5,400 and 4,750 BP (Appendices T and U). However, the report concludes that locating such archaeological sites, if present, would be difficult or impossible because natural lake sedimentation has covered such sites. The Gray & Pape report is provided as Appendix S for additional detail.

Submerged historic-period archaeological resources are typically shipwrecks. The NOAA maintains a record of vessel losses and obstructions to shipping, AWOIS. The NOAA AWOIS lists 13 wrecks and obstructions in the Cleveland area (Appendix S), two of which lay in Lake Erie beyond the outer breakwater of Cleveland harbor near the substation landfall for the proposed export cable, but outside of the cable route envelope.

VanZandt also consulted with the Ohio Historic Preservation Office online mapping system to locate any inventoried cultural resources identified within the APE for direct effects. This included a review of the Ohio Archaeological Inventory (OAI), Ohio Historic Inventory (OHI), National Register of Historic Places (NRHP), Ohio Sea Grant Shipwreck map, the Cleveland Underwater Explorers shipwreck database, and the Cleveland Underwater Explorers historical Lake Erie nautical chart collection. No properties or districts listed in the OAI, OHI, or NRHP are present within the APE for direct effects. Though four shipwrecks are located within 3.5 nautical miles of the APE for direct effects, no shipwrecks from the Ohio Sea Grant Shipwreck map, Cleveland Underwater Explorers Shipwreck Database, or Cleveland Underwater Explorers Historical Lake Erie Nautical chart collection are present within the APE for direct effects (Appendix T).

Data from a 2016 geophysical survey of the proposed cable route envelope was evaluated by VanZandt to determine whether the geophysical survey identified potential archaeological resources within the APE for direct effects (Appendix T). The areas evaluated included areas around the proposed turbine locations, the export cable, and the inner Cleveland Harbor. Sidescan sonar data, magnetometer data, and sub-bottom data analyses indicated that no historic structures (such as shipwrecks) or potentially significant artifacts were present within the APE for direct effects.

3.10.1.2 Land-Based Cultural Resources

No archaeological resources were identified associated within the APE for direct effects for the land-based project components. No historic-architectural resources were identified within the APE for direct effects, and the APE for indirect effects are discussed in Section 3.11.

3.10.2 Environmental Impacts Related to Cultural Resources

3.10.2.1 Lake-Based Cultural Resources

With respect to submerged archaeological resources, the studies conducted for the Proposed Project did not identify any potentially significant archaeological sites within the APE for direct effects and concluded that the Proposed Project was unlikely to impact significant archaeological resources. No further investigation nor need for mitigation was recommended (Appendices T and U). The Proposed Project would have no impact on lake-based cultural resources through construction, operations, maintenance, or decommissioning activities.

3.10.2.2 Land-Based Cultural Resources

There would be no impact, over the short- or long-term, to land-based archaeological resources that would result from construction, operations, maintenance, or decommissioning activities associated with the Proposed Project. Construction of the Proposed Project would not require the demolition or physical alteration of any buildings or other potential historic-architectural resources or properties; therefore, no direct physical effects to historic-architectural resources would occur as a result of the Proposed Project. The Proposed Project’s indirect effect on a given historic-architectural resource or property is discussed in detail in Section 3.11.

3.10.2.3 No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funds by LEEDCo in support of the Proposed Project. Any potential beneficial or adverse effects to the physical, natural, or socioeconomic resources would not be realized.

3.11 Aesthetics and Visual Resources

3.11.1 Affected Environment

Aesthetic and visual resources include the viewsheds and scenic view opportunities within the Proposed Project Area. Historic-architectural resources or properties have the potential to be indirectly affected through a change in the property's visual setting.

3.11.1.1 Visual Study Area

As discussed in Section 3.10 Cultural Resources, the Proposed Project's APE for indirect effects includes those areas where the Proposed Project (including wind turbines) would be visible and where there is a potential for a significant visual effect.

In Gray & Pape's literature review and analysis of historic properties for the Proposed Project (Appendix S), the report included preliminary recommendations regarding the extent of the APE for indirect effects and noted that because of the nature of a wind project sited along open water, it is challenging to determine precisely where visual impacts would occur from the lack of obstructions. Therefore, it was recommended that the APE for indirect effects include the area parallel to the shoreline for 29.6 miles on either side of the Proposed Project Area to ensure that navigation markers, lights, and traditional use areas within the lake that might have a view of the turbines are included. Because of the amount of development along the lake shore, views of the lake are fragmentary or non-existent beyond the first road south of the lake shore. Accordingly, the APE for indirect effects along the shore has been limited to the area immediately adjacent to the lake, as bounded by easily identifiable roads.

The report also noted that the APE for indirect effects should be "limited to areas where the Proposed Project can affect the characteristics of a historic property qualifying it for inclusion in or eligibility for the [NRHP]" (Appendix S). Therefore, the APE for indirect effects is not based solely on potential visibility of the Proposed Project, but also on the distance within which visibility of the Proposed Project could result in a significant effect on the visual setting of a given historic property. Previous visual studies have shown that significant visual effects of land-based wind power projects are generally concentrated within 3.5 miles of a project site (Eyre, 1995; Bishop, 2002). Based on viewer reaction to simulations of turbines at various distances (albeit substantially smaller turbines than those proposed for the Proposed Project), Bishop (2002) concluded that, in the absence of atmospheric reduction in contrast, turbine detection or recognition occurred for only about 5 percent of people at a distance of 18.6 miles and just 10 percent at 12.4 miles. Most of the reduction in turbine detection rates occurred between 5.0 and 7.4 miles in clear conditions and between 4.3 and 5.6 miles in light haze. Guidance for offshore wind projects in the United Kingdom suggests visual effects will be minor at distances over 15 miles, and that 22 miles generally represents the limit of visual impact (Enviros Consulting, 2005). A recent study concluded that offshore wind facilities were judged to be a major focus of visual attention at distances up to 10 miles; were noticeable to casual observers at distances of almost 18 miles; and were visible with extended or concentrated viewing at distances beyond 25 miles (Sullivan et al., 2013).

A Visual Impact Assessment (VIA) completed by Environmental Design & Research [EDR] for the Proposed Project evaluated a study area that encompassed a 10-mile radius from the proposed wind turbines

(Appendix U). Chapter 4906-4-08(D)(4) of the OAC, Certificate Applications for Electric Generation Facilities, indicates that visual impacts to recreational, scenic, and historic resources from a proposed facility should be evaluated within at least a 5-mile radius (OPSB, 2015), and any resources valued specifically for their scenic quality should be evaluated within a 10-mile radius. Because of the Proposed Project's location (approximately 8 miles from shore) and visibility from shoreline across open water, the VIA evaluated a 10-mile radius study area. Therefore, based on the recommendations in Chapter 4906-4-08(D)(4) of the OAC, the findings in the VIA, and supported by the findings of recent studies regarding the visibility and visual effect of offshore wind turbines (Sullivan et al., 2013), the APE for indirect effects for the Proposed Project includes those areas within 10 miles of the proposed turbines with potential visibility of the Proposed Project. This represents the area where introduction of the turbines into the visual setting of a given historic property has the potential to result in an adverse impact on the setting of the property.

The records review completed by Gray & Pape (Appendix S) documented the following previously identified historic and cultural resources that would potentially experience indirect (visual) effects from the Proposed Project. The review area was 1 mile from the coast of Lake Erie, purposefully large to include any adjacent significant properties and potential alteration of the APE, if needed.

- 39 sites individually listed in the NRHP, including one National Historic Landmark (NHL) (the United States Ship [USS] Cod submarine)
- 7 NRHP-listed historic districts
- 478 OHI properties
- 14 archaeological resources recorded in the OAI

Of the properties identified by Gray & Pape, those located within areas with potential visibility of the Proposed Project include 23 properties and districts listed in the NRHP (including the USS Cod submarine NHL) and 186 properties included in the OHI. Additional information about these resources can be found in Appendix S.

There are no state parks, state forests, national wildlife refuges, National Park Service (NPS) lands, national natural landmarks, state wildlife management areas, state nature preserves, federally designated trails, or state or federally designated wild, scenic, or recreational rivers within the visual study area. However, there is one national heritage area (Ohio & Erie Canalway National Heritage Area), two national scenic byways (Lake Erie Coastal Ohio Scenic Byway and Ohio & Erie Canalway Scenic Byway), one scenic overlook (Stinchcomb-Groth Memorial Scenic Overlook), and one state-designated bike trail (Ohio & Erie Canal Towpath Trail) that could also be considered resources of statewide significance. Additional information about these areas can be found in Appendix U.

3.11.2 Environmental Impacts Related to Aesthetics and Visual Resources

The Proposed Project's potential effect on a given historic property would be a change (resulting from the introduction of wind turbines) in the property's visual setting. As it pertains to historic properties, *setting* is defined as "the physical environment of a historic property" and is one of seven aspects of a property's *integrity*, which refers to the "ability of a property to convey its significance" (NPS, 1990). The other aspects of integrity include location, design, materials, workmanship, feeling, and association (NPS, 1990). The potential effect resulting from the introduction of wind turbines into the visual setting for any historic or architecturally significant property is dependent on several factors including distance, visual dominance, orientation of views, viewer context and activity, and the types and density of modern features in the existing view (Appendix V).

3.11.2.1 Construction

During construction of the Proposed Project, adverse impacts to aesthetics and visual resources would be short term and moderate. The presence of construction vessels and equipment during installation of the wind turbines and submerged electric collection cable would affect viewers from the shoreline and boaters in the vicinity of the Proposed Project. The presence of construction equipment at the Proposed Substation would affect viewers in a developed, industrial area, while the presence of construction equipment at the staging area would be typically for the Port location.

3.11.2.2 Operations and Maintenance

The proposed export cable would be submerged and therefore would have no permanent visual effects during operations. However, if maintenance or repair were needed, then adverse impacts to aesthetics and visual resources during operations would be short-term and moderate, similar to construction.

The proposed wind turbines and substation would be new, permanent visible structures. The Proposed Substation would be located in a developed, industrial area. Therefore, while adverse impacts to aesthetics and visual resources from operations of the Proposed Substation would be long-term, they would be minor.

A VIA including a viewshed analysis and field verification with visual simulations for the Proposed Project was completed by EDR (Appendix U). The results of this analysis are summarized as follows.

Visual Impact Assessment

As described in more detail in Appendix V, two 10-mile radius topographic viewsheds were mapped, one to illustrate “worst case” daytime visibility (based on a maximum blade tip height of 479 feet above the lake surface) and the other to illustrate potential nighttime visibility of FAA warning lights (based on an assumed warning light height of 282 feet above the lake surface and the conservative assumption that all turbines could be equipped with FAA warning lights). The viewshed analyses utilized Ohio Statewide Imagery Program’s 2006 Light Detection and Ranging (LiDAR) data for Cuyahoga County, which allowed for a second-level analysis that factors the screening effects of vegetation and structures, in addition to topography, into the analysis. A digital surface model (DSM) of the study area was created from the LiDAR data, which includes the elevations of buildings, trees, and other objects large enough to be resolved by LiDAR technology. This DSM was then used as a base layer for the viewshed analysis, as described above (using the blade tip and FAA warning light heights as input data). Once the viewshed analysis was completed, a conditional statement was used to set turbine visibility to zero in locations where the DSM elevation exceeded the bare earth elevation by 6 feet or more, except in locations of known bridges. This was done for two reasons; 1) because in locations where trees or structures are present in the DSM, the viewshed would reflect visibility from the vantage point of standing on the tree top or building roof, which is not the intent of this analysis and 2) to reflect the fact that ground-level vantage points within buildings or areas of vegetation exceeding 6 feet in height will generally be screened from views of the proposed turbines. However, where high rise buildings occur in areas indicated as being screened from views of the proposed turbines, views may be available from upper stories that currently have views of Lake Erie (Appendix V).

Because it accounts for the screening provided by structures and trees, this second-level analysis is a more accurate representation of potential turbine visibility. However, being within the viewshed does not necessarily equate to actual turbine visibility because characteristics of the proposed turbines that influence visibility (color, narrow profile, distance from viewer, etc.) are not taken into consideration in the viewshed analyses (Appendix V).

Field Verification – Visual Simulations

Field review by EDR confirmed that visibility of the proposed turbines would be largely restricted to the waterfront and open water portions of the visual study area, as suggested by the viewshed analysis. In residential areas in Westlake, Bay Village, and Cleveland, visibility of the proposed turbines would be fully or substantially screened from inland areas by densely situated homes and vegetation along the shoreline. In most cases, visibility does not extend beyond shoreline residences, except in circumstances where an undeveloped cul-de-sac or public right-of-way exists, making water views possible from public vantage points. These shoreline residences would all likely have some level of turbine visibility because they have been purposely situated to take advantage of lake views. Multiple parks and developed open spaces along the lake shore also capitalize on open water views and therefore would have views toward the proposed turbines, but again, vegetation and structures at these sites limit unobscured offshore views to the shoreline and immediate inland areas. In eastern Bay Village, several high-rise residential buildings are concentrated along the Lake Erie shore. These structures provide elevated views of the lake, but effectively block inland ground-level views.

Within the City of Cleveland, an abundance of waterfront facilities such as parks, marinas, and ports would generally have open views of the proposed turbines. Areas inland of the shoreline offered limited open water views from interceding features (buildings, industrial facilities, and vegetation) along the shoreline. However, elevated portions of I-90 and parks such as the City Mall would have intermittent framed views of the turbines. Additionally, many of the inland high-rise structures would have visibility of the turbines from upper floors. The field crew was able to visit two high-rise buildings within the City of Cleveland (the Key Building and the Hilton Hotel) and both had expansive lake views. From the elevated vantage points, it was also apparent that many other buildings were situated in such a way that views toward the proposed turbines from the upper floors would be available. The field review confirmed a general lack of visibility from street level views within the inland portion of downtown Cleveland (Appendix V).

Conclusions of Visual Impact Assessment

Photo simulations prepared as part of the VIA provide representative views of the Proposed Project from various distances and directions within the visual study area. Visual effects analyses based on this second-level DSM-based viewshed by a licensed EDR landscape architect indicates that the proposed turbine's overall contrast with the visual/aesthetic character of the area would range from insignificant to appreciable. Insignificant to moderate contrast was noted for viewpoints that included existing developed shoreline and offshore features. Moderate to appreciable contrast was noted where existing developed features were lacking in views of Lake Erie and at viewpoints in shoreline park and residential settings where the expansive open view of the lake is an important part of the viewer experience. More details on the conclusions drawn from the VIA and the photo simulations can be found in Appendix U. In summary, adverse impacts to aesthetics and visual resources from operations of the wind turbines would be long-term and minor.

Landmarks of Cultural Significance

The potential visibility of the proposed wind turbines from the identified historic resources (NRHP-listed and eligible resources, designated Cleveland Landmarks and OHI resources) are summarized in tables within Appendix V.

The majority of cultural resources that fall within the proposed wind turbines viewshed would have limited views from screening provided by intervening topography, vegetation, and/or structures. The proposed turbines are located greater than 7 miles from all cultural resources, where they would appear as background features in the view and the effects of distance would significantly attenuate the turbine's apparent size.

Cultural resources with greater than 50 percent wind turbine visibility would include Cleveland East and West Pierhead Lights (NRHP-listed and OHI), the USS Cod (NRHP-listed, NHL, OHI), Federal Knitting Mills (NRHP-listed), Main Avenue Bridge (NRHP-eligible), East 9th Street Pier (OHI), Buckeye Insulation (OHI), Burke Lakefront Airport (OHI), Bridges and Docks Office (Formerly Harbor Masters House; OHI), AB Bartoszewicz Block Building (Formerly A&P Grocery Building; OHI), Advanced OMS&S Co Building, Burke Lakefront Service Company Hangar (OHI), and Mall "C" Park (OHI). No Designated Cleveland Landmarks are anticipated to have greater than 50 percent Proposed Project visibility.

Full size images of all the simulations included in the VIA are included in Appendix U. The simulations that best represent the potential visual effect on historic resources or properties include the simulations from Viewpoints 7, 17, 19, and 52 included as Figures 3.11-1 to 3.11-4 with an evaluation of the Proposed Project's potential visual effect at each of these locations, as presented in the VIA (Appendix U).

Viewpoint 7 (Figure 3.11-1) would be located approximately 8.4 miles from the nearest turbine and would be the view from the USS Cod submarine, which is an NRHP-listed site, a NHL, and included in the OHI. Viewpoint 52 (Figure 3.11-2) would be 8.1 miles from the nearest turbine, and would be the view from USCG Cleveland Harbor Station, which is an NRHP-listed site, a Designated Cleveland Landmark, and an OHI site. Viewpoint 52 also includes the Cleveland East and West Pierhead Light, which are also listed on the NRHP and OHI. These sites are examples of historic resources that are associated with maritime themes, where the maritime setting (including views of the lake) contribute to the significance of the property. The VIA states that in the simulations of the proposed wind turbines from these viewpoints the wind turbines would be less of a focus in the view when compared to viewpoints from less developed locations, because the turbines appear relatively compact, and would be viewed in the context of other existing offshore features. The presence of existing built features in a view generally reduces the contrast presented by the Proposed Project, especially when the Proposed Project would be viewed at distances at excess of 8 miles as it would be from these two viewpoints. When viewed at these distances, the turbines would not appear out of scale with other built features in the view. In addition, the limited number of turbines, their clean, delicate lines, and their orderly arrangement would not significantly increase visual clutter, or decrease scenic quality. Additionally, under more overcast sky conditions, turbine visibility, color contrast, and competition as a focal point in these types of views would be further reduced (Appendix V).

Viewpoint 19 (Figure 3.11-3) would be located approximately 8.2 miles from the nearest turbine and would be the view from Bicentennial Park, which is adjacent to the East 9th Street Pier OHI site. Viewpoint 19 is classified as a "Developed Shoreline View" in the VIA, which is defined as a public vantage point in open space settings with some level of shoreline development in the immediate foreground. The VIA states that, from this location, the proposed wind turbines would add a relatively minor new developed feature to the existing views. Even though the turbines would be very large structures, when viewed at a distance of 7.5 miles they would appear relatively small compared to the other developed features along the shoreline and in the near-shore area. The turbines would interrupt the skyline and would be unexpected in an offshore setting. As such, the turbines would be a focal point in the view, but would also compete with other on shore and offshore features for viewer attention. Because they are viewed in the context of other developed features, their land use contrast and effect on scenic quality would be minimal. Due to their distant offshore setting, and the presence of competing features and activities occurring along the developed shoreline, the presence of the turbines should not adversely affect viewer activity or enjoyment of the view (Appendix V).

Figure 3.11-1. Visual Simulation from Viewpoint 7: USS Cod

Figure 3.11-2. Visual Simulation from Viewpoint 52: U.S. Coast Guard Cleveland Harbor Station

Figure 3.11-3. Visual Simulation from Viewpoint 19: Bicentennial Park.

Viewpoint 17 (Figure 3.11-4) would be located approximately 8.5 miles from the nearest turbine and would be the view from Cleveland Mall, which is an NRHP-listed site, a Designated Cleveland Landmark, and an OHI site. The VIA classifies this viewpoint as an "Elevated City View," which is defined as an elevated vantage point within the City of Cleveland that allows for open views of Lake Erie over the top of foreground development. Elevated city views include a variety of buildings and fabricated structures that define the landscape context as an urban setting. The presence of the lake in these views enhances scenic quality and adds interest. At the Cleveland Mall, a viewer is approximately 83 feet above lake level, and the lake is viewed as a mid-ground and background feature between and above developed foreground features that dominate the view. As illustrated in the simulated view from Viewpoint 17, under clear sky conditions and strong sunshine, the proposed turbines would be clearly visible on the horizon line. However, in this view, with an abundance of built features in the foreground (including a wind turbine) the Proposed Project would not present significant contrast in terms of line, form, color, or existing land use. The distance of the turbines from the viewer minimizes scale contrast, and the limited extent of open uninterrupted horizon visible from this viewpoint reduces the prominence of the turbines. Regardless of weather conditions, Proposed Project-related impacts on scenic quality and viewer activity from this vantage point would likely be minimal (Appendix V).

In general, the VIA states that the Proposed Project's overall contrast with the visual/aesthetic character of the area would range from insignificant to appreciable. Insignificant to moderate contrast was noted for viewpoints that included existing developed shoreline and offshore features. Moderate to appreciable contrast was noted where existing developed features were lacking in views of Lake Erie and at viewpoints in Shoreline Park and residential settings where the expansive open view of the lake is an important part of the viewer experience. However, the degree of visibility and contrast with the existing landscape would be substantially reduced under cloudy and partly cloudy conditions that occur on 82 percent of the days during a typical year in Cleveland.

Figure 3.11-4. Visual Simulation from Viewpoint 17: Cleveland Mall.

Additionally, visual setting may not be an important factor contributing to a given property's historic significance. For instance, some properties are typically determined NRHP-eligible because of their architectural design and/or association with a specific architect, builder, or style, and because they retain their overall integrity of design and materials. The visual setting for these properties – typically a developed urban neighborhood – often includes features from a variety of time periods (including modern features). While the setting provides context for these properties, it is not a prominent consideration in determinations of significance. In general, these properties would retain the characteristics that caused them to be recommended eligible after the introduction of modern features such as wind turbines into their visual settings. For these types of resources, the potential change in the setting resulting from the Proposed Project would not necessarily result in diminished public enjoyment and appreciation of a given historic property, or impair its character or quality (Appendix V).

As described previously, because of the screening effect of buildings and vegetation within the City of Cleveland, areas with potential visibility of the Proposed Project are generally restricted to areas along the Lake Erie waterfront. Many of the historic resources within the APE for indirect effects, such as the USS Cod and USCG Cleveland Harbor Station, are located on the waterfront because of their association with maritime activities, and the lake is therefore a significant feature in the visual setting for those properties. As noted in the VIA for the Proposed Project and herein, the proposed wind turbines would be a new modern feature in the visual setting of the lake. Because of their scale and novel form, they are likely to attract viewer attention. However, as noted in the VIA, the Proposed Project's distance from the shoreline viewpoints substantially mitigates this impact. The closest point to shore from the turbines is 7.1 miles. Even at this closest distance, the Proposed Project will occupy a relatively small portion of an expansive lakeward view, and thus will not dominate the horizon (EDR, 2017). Therefore, the small number of turbines, their distance from shore, and the relatively small area of the horizon occupied by the turbines all help to minimize the visual effect of the Proposed Project on the setting associated with historic resources located on the shoreline of Lake Erie (Appendix V). In summary, the Proposed Project's overall effect on the visual setting associated with historic properties would be a long-term, but relatively minor, impact.

Decommissioning

Decommissioning of the Proposed Project would have similar short-term, moderate adverse impacts as construction associated with vessels and equipment.

3.11.3 No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funds by LEEDCo in support of the Proposed Project. Any potential beneficial or adverse effects to the physical, natural, or socioeconomic resources would not be realized.

3.12 Noise

3.12.1 Affected Environment

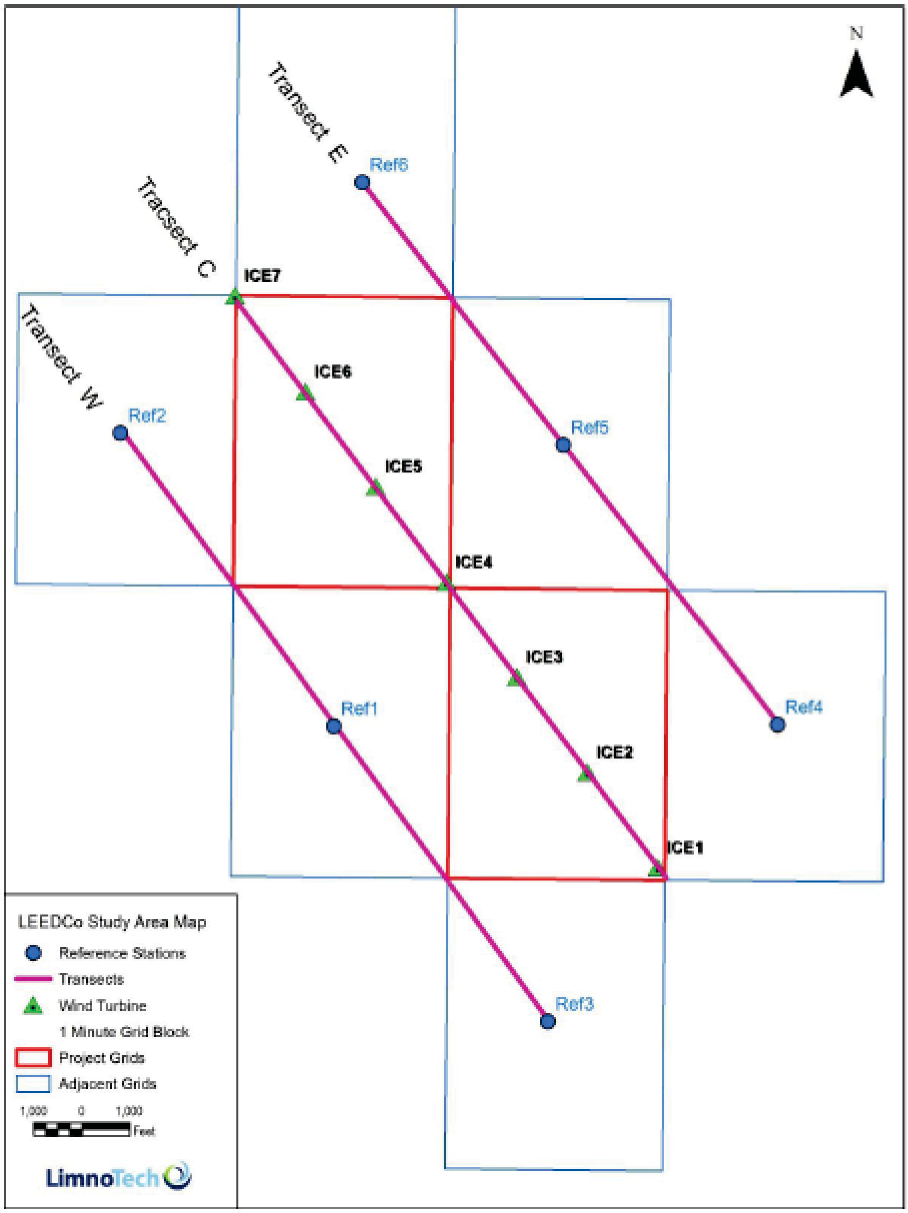
3.12.1.1 Above Water Sound

The offshore components of the Proposed Project would be located approximately 8 to 10 miles offshore of Cleveland. Existing noise in this area consists primarily of boat traffic from lake freighters, commercial shipping, commercial and recreational fishing, and recreational boaters.

The Proposed Substation, O&M Center, and the Port would be located within heavy industrial areas that are regularly exposed to industrial noise and elevated ambient sound levels. The Proposed Substation parcel would be located adjacent to I-90. The I-90 corridor near the Proposed Substation parcel has four lanes for westbound traffic and five lanes for eastbound traffic with two-lane roads adjacent to the north and south. In 2013, the annual average daily traffic count for I-90 was 114,280 vehicles (ODOT, 2013). In general, traffic noise increases with increasing traffic volume, higher speeds, and increasing numbers of trucks. The typical sound level of highway traffic is about 70 decibels (A-weighted scale; dBA) at a distance of 50 feet while heavy traffic sound levels are typically 85 dBA, and light traffic levels are approximately 53 dBA (DOI, 2008). Additionally, vehicle noise is produced by the engine, exhaust, and tires, and can be increased by faulty equipment. Traffic loudness typically drops about 3 dBA for every doubling of distance from the road (DOI, 2008). As the Proposed Substation parcel would be located immediately adjacent to two-lane roads and less than 100 feet from I-90, the area would be constantly exposed to elevated noise levels under existing conditions.

3.12.1.2 Underwater Sound

LimnoTech and Cornell Bioacoustics, in coordination with the ODNR, conducted site-specific assessments of underwater ambient noise levels. LimnoTech monitored underwater background noise continuously from May through October 2016. Two underwater sound recorders were deployed using Ocean Instruments Smart Hydrophone Soundtraps. One Soundtrap was installed at proposed turbine location 4 (ICE4) and the other was installed at a reference station, 1 mile west of the proposed turbine location (REF1), both 2 meters (6.5 feet) above the lake bottom. Figure 3.12-1 provides a layout of the Proposed Project and sampling stations. The Soundtraps recorded 30 minutes every hour at 72 kilohertz (kHz). This monitoring provides an assessment of underwater background noise at the proposed turbine location, which can be used as a comparative tool for any noise monitoring that would occur during and post-construction.

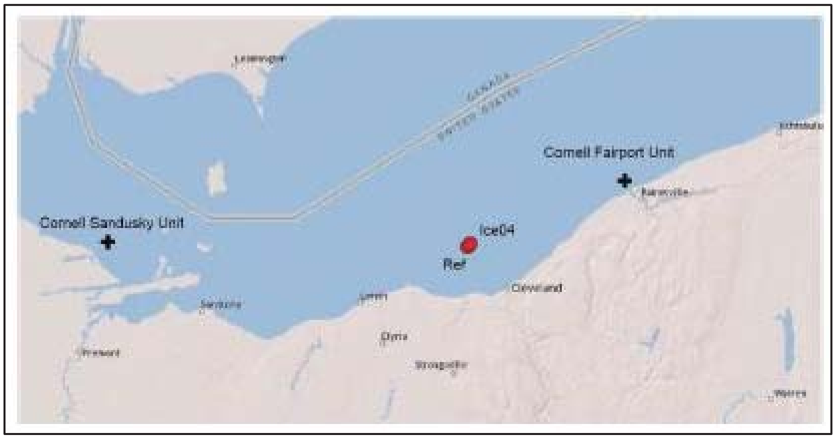


Source: LimnoTech, Appendix E

Figure 3.12-1. Map of Proposed Project Area with LimnoTech Sampling Stations and Transects

LimnoTech's final report with details of the preconstruction noise monitoring is provided in Appendix E. Using the preconstruction data, LimnoTech developed long-term spectral averages to show 24-hour or seasonal patterns in biological, human-influenced, and environmental acoustic activity that often cannot be seen at finer time scales. Relatively high levels of transient noise were observed throughout the study period, likely associated with passing ships or sporadic biological activity. ICE4 exhibited higher overall sound levels compared to REF1. Background noise was detected and varied in intensity and duration across the entire survey. Review of the long-term spectral averages over the entire survey period show considerable diversity between REF1 and ICE4 in their respective acoustic environments. A comparison was made to Cornell University deployed hydrophones located both east and west of the proposed turbine locations near Fairport and Sandusky, Ohio (Figure 3.12-2.) The Fairport survey was located in ODNR's Walleye/Perch

Habitat and the Sandusky survey in a Walleye Larval and Juvenile Production area. Cornell recorded seasonal chorusing events of freshwater drum (*Aplodinotus grunniens*) in June at both locations which were not seen in REF1 or ICE4 data. REF1 and ICE4 are located in the Lake Erie Dead Zone, indicated by LimnoTech's DO data collection, and less than 1 mile from a Walleye/Perch Habitat.



Source: LimnoTech Final Report, Appendix E

Figure 3.12-2. Recording Locations of 2016 ICE04 and REF1 Locations (red circles), Relative to Previous Cornell Acoustic Recordings in 2014 (black crosses).

3.12.2 Environmental Impacts Related to Noise

3.12.2.1 Above Water Sound

Construction

Offshore Construction

Construction of turbines would primarily take place at the turbine site, 8 to 10 miles offshore in Lake Erie. Consequently, there are no anticipated noise impacts to the nearest onshore property associated with turbine construction. The inter-array and export cable would be installed underwater, requiring construction vessels offshore outside the Cleveland Harbor breakwater where the HDD exits to the turbine site, and, as such, there are no anticipated noise impacts to the nearest onshore property.

People who could be aware of noise during construction include recreational boaters on Lake Erie or individuals on public-use areas along the shoreline. Exposure to construction-based noise to boaters would be short-term and minor. In addition, boaters could choose to avoid the area during periods of elevated construction noise.

Nearshore and Onshore Construction

Construction of the Proposed Substation would occur at the Lake Road Substation site, an industrialized area. The equipment to be used for the construction of the Proposed Substation would be varied. Some of the louder pieces of equipment are shown in Table 3.12-1, along with the approximate maximum sound pressure levels at 50 feet (Resource Systems Group, 2013). However, the Lake Road Substation and adjacent parcels are located within a heavily urbanized and industrial area that is regularly exposed to elevated ambient sound levels. Additionally, the area also experiences high levels of ambient noise because of traffic from nearby I-90. In addition, existing heavy traffic areas are adjacent to the onshore areas, which contribute to the current elevated noise levels. No residents are located near the proposed onshore or nearshore activities. The nearest property owner is the City of Cleveland, whose Lake Road Substation will serve as the interconnection point for this project. Therefore, construction noise is expected to be negligible at the nearest residential property boundary.

Table 3.12-1. Maximum Sound Levels from Various Construction Equipment

Equipment	Sound Pressure Level at 50 feet (dBA)
Excavator	83
Dump Truck Being Loaded	86
Dump Truck at 25 mph accelerating	76
Tractor Trailer at 25 mph accelerating	80
Concrete Truck	81
Bulldozer	85
Rock Drill	100
Loader	80
Backhoe	80

Elevated construction noise would be expected during the HDD construction of the proposed export cable conduit. Potential sources of sound resulting from the HDD are included in Table 3.12-2 (Stantec, 2012). However, the HDD construction of the proposed export cable conduit would also occur on the Lake Road Substation site that is regularly exposed to elevated ambient noise and construction noise is expected to be negligible at the nearest residential property boundary.

Table 3.12-2. Sound Levels from HDD

Equipment	Sound Pressure Level (dBA)
Drilling Rig	104
Rig HPU	115
Mud Pumps/Generator Engines	112
Engine Exhausts	109
Mud Pump	98
Mud Cleaner	102
Shaker	108

The Port would be used for staging during construction of the Proposed Project. The Port includes 80 acres of owned and leased property including 10 berths, 11 docks, and 3 warehouses located east of the Cuyahoga River that handle general cargo operations, as well as the 44-acre Cleveland Bulk Terminal, which is located west of the river and primarily handles iron ore and limestone. Construction noise from use of the staging area would likely mix with typical ambient noise at the Port.

Based on this information, noise-related impacts from construction would be short-term and minor.

Operation and Maintenance

Offshore Operation and Maintenance
There would be no operational noise impacts from the proposed wind turbines at the nearest land property boundary because the turbines would be sited 8 to 10 miles offshore and operational noise would not be detectable above ambient noise levels at approximately 1 mile from each of the proposed turbines.

On Lake Erie, boaters could hear the turbines as they approached the proposed turbine sites. Above water noise from operating turbines is approximately 50 dB at a distance of 100 meters (328 feet) from the turbine, dropping to approximately 38 dB at 500 meters (0.3 mile) away, and not detectable above ambient noise levels 1 mile away. As a comparison, a mid-size window air conditioner can reach 50 dB of noise, and a refrigerator about 40 dB. In most places, ambient or background noise levels range from 40 to 45 dB, or 30 dB in most rural areas (General Electric, 2014). At ambient noise levels, noise from the turbines over the water would not cause interference with sound signals from vessels or ATONs near the proposed turbine sites nor pose health concerns to passing vessel crews. In addition, because the proposed wind turbines would be located at least 7 miles from land, there would be minimal, short-term affects to the majority of boaters that tend to stay closer to shore (Appendix E).

Nearshore and Onshore Operation and Maintenance
Some noise would be generated by the Proposed Substation transformers. Transformer noise is generally described as a low humming, and is generated at a rate dependent on transformer dimensions, voltage rating, and design. The nearest noise sensitive area, an area that because of its use by humans or other sensitive species and the importance of reduced noise levels to such use, is designated for management to limit the noise level from long-term or continuous noise producing sources, to the Proposed Substation would be Kirtland Park, located approximately 900 feet to the southwest of the Proposed Substation. I-90 passes between the Proposed Substation and the park, and as such, noise impacts to Kirtland Park from the Proposed Substation would be anticipated to be negligible.

There would be minimal road traffic associated with operation of the Proposed Substation. The onshore areas, including the Proposed Substation and the Port, associated with the Proposed Project are located within heavy industrial areas and are regularly exposed to industrial noise and elevated ambient sound levels. In addition, existing heavy traffic areas would be adjacent to the onshore areas (e.g., I-90), which contribute to the current elevated noise levels.

Because of the highly urbanized and industrialized areas around the Proposed Substation and the Port, the expected high ambient noise levels, and the lack of noise sensitive areas nearby, operation and maintenance activities at the Proposed Substation and the Port would not be anticipated to result in adverse noise impacts.

Decommissioning

Noise-related impacts from decommissioning of the Proposed Project would be short-term and minor with similar activities as construction. The export cable would be abandoned in-place and therefore would not result in noise-related impacts.

3.12.2.2 Underwater Sound

Construction

Sound propagation underwater differs from that of sound in the air because of differences in the density and impedance of the medium (Ingemansson Technology, 2003). To date, most of the research surrounding underwater sound levels has been done to investigate pile driving. However, gravity foundations like the proposed MB foundations do not require pile driving and result in considerably lower noise levels. As described in Section 3.4.2.2, fish may react to the low intensity noises associated with gravity foundation installations by leaving the area, but the intensity of disturbance is low, and animals are likely to return soon after exposure has ended (Bergstrom et al., 2014).

There would be additional boat traffic associated with construction of the proposed turbine foundations, inter-array cable, and export cable. However, noise levels during construction would be temporary and similar to noise levels experienced consistently in the region by lake freighters traveling into and out of the Port annually. Therefore, the additional noise-related effects to aquatic communities from a temporary increase in boat traffic would be expected to be negligible.

There would be no anticipated noise effects on fish or other organisms from HDD construction operations associated with the proposed export cable installation because the noise generating equipment would be located onshore, except for the drill bit and string, which would be located approximately 12 feet below the lakebed (Xodus, 2015). Noise generated from HDD would be short-term with impacts occurring only during actual HDD activities, which would be expected to last approximately one month.

Operation and Maintenance

The underwater sound from operating wind turbines is mainly generated by vibrations in the tower. The towers have a large contact area with water, which transmits the sound propagation effectively (Ingemansson Technology, 2003). Underwater sound from operating turbines would also be influenced by the turbine's coupling with the bottom. Gravity foundations, such as the proposed MB foundations, are expected to emit sound within a lower interval of frequency than monopile foundations (Hammar et al., 2014).

Section 3.4.2.2 summarizes a review of the current knowledge of fish detection and reaction to underwater sound conducted by Wahlberg and Westerberg (2005). There was no evidence that wind turbine noise causes temporary hearing loss in fish even at a distance of a few meters. Wahlberg and Westerberg (2005) reported that wind turbines produce sound intensities that may cause permanent avoidance by fish within ranges of approximately 4 meters (13.1 feet), but only at high wind speeds and that wind turbine noise may have a significant impact on the maximum acoustic signaling distances by fish. However, the authors state that it is not known to what degree this reduces the fitness of the fish (Wahlberg and Westerberg, 2005).

Wind turbine type has a large effect on the sound intensities generated during operation, and, therefore, on the range at which fish may be affected. Additional factors, especially the number of wind turbines, water depth, and bottom type may cause the detection and masking ranges calculated to vary considerably between different wind turbine sites (Wahlberg and Westerberg, 2005). Overall, it is most likely that noise impacts to fish are limited to high wind speeds at short distances from the turbine foundation (Bergstrom et al., 2014).

Shipping causes considerably higher sound intensities than operating wind turbines (Wahlberg and Westerberg, 2005). Commercial ships are a dominant source of radiated underwater noise at frequencies less than 200 Hz, which is within the hearing range of many fish (Hildebrand, 2009; Slabbekoorn et al., 2010). Offshore wind farms create low-frequency noise at moderate source levels during their operation (Hildebrand, 2009). An operating wind turbine will produce a source level of 151 dB re 1 μPa at 1 meter (3.3 feet) compared to a cargo vessel (173 meters in length, at 16 knots) and a small boat outboard engine (at 20 knots), which will produce source levels of 192 dB re 1 μPa and 160 dB re 1 μPa at 1 meter (3.3 feet), respectively (Hildebrand, 2009). Therefore, underwater sound generated from the operation of the proposed turbines would be less than routine vessel sounds that occur in the Proposed Project Area and are not anticipated to have an adverse impact to aquatic species.

There would be increased boat traffic from maintenance activities at the proposed turbines. However, because Lake Erie experiences frequent boat traffic from commercial shipping and fishing and recreation, no significant additional underwater noise impacts would be anticipated from maintenance activities.

Based on the information above and LimnoTech's pre-construction monitoring of ambient underwater sound levels, operation of the Proposed Project would result in long-term minor impacts to aquatic animals from underwater noise.

Decommissioning

Noise levels during decommissioning of the Proposed Project would be temporary and similar to noise levels experienced during construction; therefore, the additional effects to people or aquatic communities would be expected to be negligible.

3.12.3 No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funds by LEEDCo in support of the Proposed Project. Any potential beneficial or adverse effects to the physical, natural, or socioeconomic resources would not be realized.

3.13 Economics and Socioeconomics

Information provided in this section was obtained primarily from the *Socioeconomic Report,* prepared by EDR (Appendix W). Unless noted otherwise, the study area for the report includes the following seven municipalities in Cuyahoga County which are found wholly or partially within a 5-mile radius of the Proposed Substation (the Study Area[8]):

- City of Cleveland
- City of Cleveland Heights
- City of East Cleveland
- City of Shaker Heights
- Village of Bratenahl
- Village of Cuyahoga Heights
- Village of Newburgh Heights

Figure 3.13-1 depicts the study area.

[8] The 5-mile study radius is based on OPSB regulations.

Figure 3.13-1. Proposed Project Study Area

3.13.1 Affected Environment

3.13.1.1 Population

As shown in Table 3.13-1, the total population of Cuyahoga County was 1,280,122 in 2010, marking a decrease of 9 percent over the course of the previous two decades. Populations decreased each of the two decades across 1990 to 2010, with the sharpest decrease occurring between the years of 2000 and 2010, at a rate of -8.2 percent.

Table 3.13-1. Countywide Population Trends

County	1990 Population	2000 Population	2010 Population	% Change 1990-2010
Cuyahoga County	1,412,140	1,393,978	1,280,122	-9.3%

Source: U.S. Census Bureau, 2017a

Populations in the villages and cities within the Study Area mostly decreased between 2000 and 2010. Of the seven municipalities, only the Village of Bratenahl experienced a population increase (+2 percent) over the same span. The City of Cleveland is the largest of these municipalities, and along with the City of East Cleveland, has experienced the greatest decline of growth of all the affected municipalities (Table 3.13-2).

Table 3.13-2. Population Projections

Jurisdiction within 5-Miles Radius of Proposed Substation	2000 Pop.	2010 Pop.	% Change 2000-2010	Est. 2020 Pop.	Est. 2030 Pop.	% Change 2010-2030
Cuyahoga County	1,393,978	1,280,122	-8.2%	1,209,550	1,179,030	-8%
City of Cleveland	478,403	409,221	-14%	350,043	290866	-29%
City of Cleveland Heights	49,958	46,797	-6%	43,836	40875	-13%
City of Shaker Heights	29,405	28,458	-3%	27,541	26625	-6%
City of East Cleveland	27,217	19,426	-29%	13,865	8304	-57%
Village of Cuyahoga Heights	599	547	-9%	500	452	-17%
Village of Newburgh Heights	2,389	2,108	-12%	1,860	1612	-24%
Village of Bratenahl	1,337	1,369	2%	1,402	1435	5%
Total	**589,308**	**507,926**	**-14%**	**439,047**	**370,169**	**-27%**

Sources: U.S. Census Bureau, 2017a; Ohio Development Services Agency, 2017
Notes:
Totals calculated by formula, may reflect rounding errors.
Municipality projections based on their respective 2000-2010 growth rates.

Over the next decade, the population within the Study Area is projected to decrease by 27 percent between 2020 and 2030, from 439,047 to 370,169. Meanwhile, county population projections are only expected to decline 8 percent between the same time span, from 1,209,550 in 2020 to 1,179,030 in 2030 (Table 3.13-2).

3.13.1.2 Employment

Table 3.13-3 details the local labor force and unemployment rate within Cuyahoga County and the State of Ohio. The total annual unemployment rate for Cuyahoga County has been relatively consistent with that of the state over the past two years, and average annual unemployment rates have decreased both county- and state-wide from 2013 to 2015.

Table 3.13-3. Local Labor Force and Unemployment

Place	Labor Force	Employed	Unemployed	Unemployment Rate	Unemployment Rate, 2014 (annual)	Unemployment Rate, 2013 (annual)
Cuyahoga County	610,000	579,500	30,500	5.0	6.2	7.0
State total	5,700,000	5,423,000	277,000	4.9	6.2	7.5

Note: Not Seasonally Adjusted; Source: U.S. Department of Labor, Bureau of Labor Statistics, 2015.

Table 3.13-4 details employment by sector in Cuyahoga County for 2014, the latest available data at the time of the report.

Table 3.13-4. Employment and Payroll by NAICS Sector in Cuyahoga County

NAICS code description	Paid Employees for Pay Period Including March 12, 2014	First-quarter Payroll ($1,000)	Annual Payroll ($1,000)	Total Establishments
Total for all sectors	664,773	8,386,436	33,123,486	33,016
Agriculture, Forestry, Fishing and Hunting	7	53	284	4
Mining, quarrying, and oil and gas extraction	c	D	D	13
Utilities	g	D	D	37
Construction	18,865	245,150	1,217,312	1,977
Manufacturing	69,685	1,109,037	4,338,234	1,811
Wholesale trade	39,107	597,972	2,405,537	2,323
Retail trade	62,232	365,641	1,534,962	4,262
Transportation and warehousing	17,422	209,500	839,754	793
Information	13,931	232,766	889,751	533
Finance and insurance	45,335	1,082,683	3,671,479	2,622
Real estate and rental and leasing	15,330	222,299	804,169	1,544
Professional, scientific, and technical services	40,735	684,135	2,912,475	4,014
Management of companies and enterprises	30,098	851,856	2,697,960	329

Table 3.13-4. Employment and Payroll by NAICS Sector in Cuyahoga County

NAICS code description	Paid Employees for Pay Period Including March 12, 2014	First-quarter Payroll ($1,000)	Annual Payroll ($1,000)	Total Establishments
Administrative and support and waste management and remediation services	43,286	321,610	1,389,774	1,870
Educational services	30,595	196,006	814,393	510
Health care and social assistance	141,315	1,671,570	6,962,513	3,601
Arts, entertainment, and recreation	10,375	130,713	729,613	423
Accommodation and food services	56,795	217,643	928,508	3,034
Other services (except public administration)	27,681	198,250	822,274	3,273
Industries not classified	58	374	1,662	43

c = 100-249 employees
g = 1,000-2,499 employees

D = Withheld to avoid disclosing data for individual companies; data are included in higher level totals.

Source: U.S. Census Bureau, 2016

The regional economy surrounding the Study Area is shaped in large part by the metropolitan economy of Cuyahoga County, including, but not limited to the City of Cleveland. Although the post-industrial economy within this region has seen significant changes in the past several years, the area has made substantial progress toward stabilization and growth as it emerges from the recent recession.

3.13.1.3 Housing

As with all sectors of the economy, the housing market throughout the region surrounding the Study Area has felt the impact of population loss. In the local region, the housing unit vacancy rate is higher for rental properties than those that are owner-occupied. Owner-occupied vacancy rates in this region are slightly higher than the statewide average (0.3 percent higher), while the 8.5 percent rental vacancy rate in Cuyahoga County is substantially higher than the statewide average of 7.2 percent.

In Cuyahoga County, the median monthly gross rent is $736, which is above the statewide average of $729/month, and a higher proportion of renters (44.1 percent) whose rent accounts for more than 35 percent of their household income than statewide (41.1 percent). In addition, Cuyahoga County's median housing value of $123,300 is below the statewide average of $129,600. For more detailed housing information for each of the municipalities within the Study Area, refer to Table 5 of Appendix W.

3.13.1.4 Local Tax Revenue

Property tax receipts, based on assessed value, for Cuyahoga County have remained relatively steady since Fiscal Year 2012 with general fund property tax receipts of $14.8 million in Fiscal Year 2012, $13.9 million in Fiscal Year 2013, $14.0 million in 2014 and $14.1 million in 2015 (County of Cuyahoga, 2016).

3.13.1.5 Commercial and Recreational Fisheries

Lake Erie provides a valuable commercial and sport fishery. According to the Great Lakes Wind Energy Center Feasibility Study, in 2006, over 1.25 million recreational fishing licenses were sold in Ohio with close to one-third of the licenses sold in counties that border the lakeshore. Over $1 billion in recreational fisheries retail sales were recorded in Ohio in 2006 with close to half from fishing in Lake Erie. The 2006 USFWS survey shows that recreational fishing throughout the Great Lakes is most popular on Lake Erie. As reported, 37 percent of all Great Lakes anglers focused their efforts on Lake Erie. Although Lake Erie is the smallest of the Great Lakes, it boasts the greatest commercial harvest. Annually, there are more fish harvested from Lake Erie than all the other Great Lakes combined. Harvests from Lake Erie make up 61 percent of the total Great Lakes commercial fishery. With most of the catch coming from Canadian waters, Lake Erie commercial fishermen harvested close to 30.2 million pounds of fish in 2008. Yellow perch and walleye are the most lucrative species, as Canadian commercial operators received $6.1 million for their catch of yellow perch (4.8 million pounds) and $7.8 million for their catch of walleye (4.8 million pounds). (Michigan Sea Grant, 2017).

Ohio commercial fisheries harvested 4.6 million pounds of fish in 2015 with a dockside value of $4.9 million. Yellow perch, freshwater drum, and white bass were the three primary fish harvested accounting for 28, 20, and 17 percent of the total commercial harvest, respectively (ODNR, 2016a).

Throughout the Great Lakes, charter fishing has been a major economic contributor. From 1990 to 2009, more than 37,000 charter trips were reported to have left from Lake Erie ports, contributing an economic impact of more than $47.5 million to coastal communities (Michigan Sea Grant, 2017).

3.13.2 Environmental Impacts Related to Economics and Socioeconomics

In the evaluation of economic impacts within the *Socioeconomic Report*, EDR used the Job and Economic Development Impact (JEDI) model (version OSW08.19.16), specifically designed to assess economic impacts of wind-powered electric generation facilities and created by the NREL. This model allows impacts to be estimated for both the construction and operation phases of the Proposed Project at a state-wide level. The JEDI model requires project-specific data input (such as year of construction, size of project, turbine size, and location), and then calculates the economic impacts using state-specific multipliers. For more details on the methodology refer to Appendix W.

3.13.2.1 Population

Construction

Construction of the Proposed Project is anticipated to take approximately 6 months to complete; therefore, impacts to population would be short-term and minor.

Operations and Maintenance

As described below, under employment impacts, based on JEDI model calculations, the operations and maintenance of the Proposed Project is estimated to generate nine full-time equivalent jobs. This is a small addition of potential new residents compared to the overall population in this region. Therefore, the Proposed Project would not be anticipated to generate impacts to population growth within the area.

Decommissioning

Similar to construction, decommissioning of the Proposed Project would be short-term and therefore not anticipated to impact population.

3.13.2.2 Employment

Construction

Based upon JEDI model computations, it is anticipated that construction of the Proposed Project would directly generate employment of an estimated 159 onsite construction and development personnel. Local employment would primarily benefit those in the construction trades, including equipment operators, barge drivers, laborers, and electricians. Proposed Project construction would also require workers with specialized skills, such as crane operators, turbine assemblers, specialized excavators, and high voltage electrical workers. It is anticipated that many of the highly specialized workers would come from outside the area and would remain only for the duration of construction. The JEDI model also estimates that the Proposed Project could generate an estimated 187 jobs over the course of construction for supply chain industries and Proposed Project construction could induce demand for 150 jobs through the spending of additional household income. The total impact of 496 new jobs could result in up to approximately $41.2 million of earnings, assuming a 2018 to 2020 construction start and wage rates consistent with statewide averages.

Operations and Maintenance

Based upon JEDI model computations, the operation and maintenance of the Proposed Project is estimated to generate nine full-time equivalent jobs with estimated annual earnings of approximately $0.6 million. The Proposed Project would also generate an estimated 11 jobs with annual earnings of around $0.7 million over the course of operations and maintenance for supply chain industries. In addition, it is estimated that eight jobs with associated annual earnings of $0.4 million could be induced through the increased household spending associated with operation of the Proposed Project.

Decommissioning

The decommissioning of the Proposed Project would generate employment similar to construction.

3.13.2.3 Housing

Construction

It is estimated that more than 85,142 housing units within Cuyahoga County are currently vacant. Given these figures, it is not expected that the development of the Proposed Project would have an impact on the regional housing market. The high availability of vacant rental housing also indicates that the Proposed Project should not have a destabilizing effect on current renters.

Operations and Maintenance

Because of the small number of full-time equivalent jobs associated with the operation and maintenance of the Proposed Project, long-term effects on housing would be negligible.

Decommissioning

Available housing and population at the time of decommissioning is unknown; however, given current trends, it is not expected that decommissioning would have an impact on the housing market, or have a destabilizing effect on renters.

3.13.2.4 Local Tax Revenue

Construction

Local tax revenue streams are diverse, ranging from sales taxes to income taxes and beyond. The JEDI model does not account for these tax revenues and there are too many variables and associated uncertainty to accurately assess a local tax impact during the construction period. However, any local tax revenue generated during construction of the Proposed Project would be short-term and minor associated with construction (building materials, wages, and other goods and services including food and lodging).

Operations and Maintenance

LEEDCo anticipates that it would pay real and personal property taxes between the minimum and maximum rate set under ORC Section 5727.75, between $6,000 to $9,000 per MW of nameplate capacity per year during the life of the Proposed Project. Assuming an aggregate nameplate capacity of 20.7 MW, the increase in local tax revenues would be between $124,200 and $186,300 annually for the Proposed Project. Additionally, the Proposed Project would make few, if any, demands on local government services. Therefore, payments made to local taxing jurisdictions would be net positive gains, and represent an economic benefit to the local tax base, including local school districts and other taxing districts that service the area where the Proposed Project is to be located, specifically the City of Cleveland and the Cleveland Municipal School District.

Decommissioning

Similar to construction, impacts to local tax revenue during decommissioning would be short-term and minor.

3.13.2.5 Commercial and Recreational Fisheries

Construction

Short-term impacts to commercial and recreational fisheries during construction would include the potential for temporary displacement of fish and the temporary impacts to fishing vessels from the presence of construction equipment on the lake. Because of the limited timeframe associated with construction and the small scale of the Proposed Project, any economic impacts to commercial and recreational fisheries would be negligible.

Additional information on commercial and recreational fisheries vessel movement can be found in Section 3.8, Lake Use.

Operations and Maintenance

The operations and maintenance of the Proposed Project would not restrict commercial or recreational fishing activity. It is possible that the proposed turbines would develop into areas of reef habitat that aquatic organisms would be likely to settle in and around as has been observed within the Gulf of Mexico and on the Pacific Coast around fixed oil rigs. The growth of invertebrates and algae on the foundations would likely lead to increased densities of certain species of fish which could have a positive economic benefit to the commercial and recreational fishing industry. Other aspects of Proposed Project operation and maintenance would have negligible to no economic effects on commercial and recreational fisheries.

Decommissioning

Similar to construction, because of the limited timeframe associated with decommissioning and the small scale of the Proposed Project, any economic impacts to commercial and recreational fisheries during decommissioning would be negligible.

3.13.3 No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funds by LEEDCo in support of the Proposed Project. Any potential beneficial or adverse effects to the physical, natural, or socioeconomic resources would not be realized.

3.14 Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629), directs federal agencies to identify and address, as appropriate, any disproportionate adverse human health or environmental effects of their actions on minority and low-income populations. Minority populations are those identified in census data as Native American or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; Hispanic; some other race; or two or more races (CEQ, 1997). Low-income populations are those identified as living at or below the U.S. poverty level.

3.14.1 Affected Environment

The onshore components of the Proposed Project, including an overhead cable, Proposed Substation, and O&M Center would be located in the City of Cleveland. Additionally, construction would be supported by the temporary use of the Port for staging. Cuyahoga County, with a population of 1,280,122, has a minority population of 38.6 percent while the City of Cleveland, with a population of 396,815, has a minority population of 66.6 percent. Table 3.14-1 details the minority population of the county and city.

Table 3.14-1. Cuyahoga County and City of Cleveland Population Hispanic or Latino and Race

Subject	Number	Percent	Number	Percent
	Cuyahoga County		City of Cleveland	
Total population	**1,280,122**	**100.0**	**396,815**	**100.0**
Hispanic or Latino	61,270	4.8	39,534	10.0
White alone	28,126	2.2	15,219	3.8
Black or African American alone	5,230	0.4	3,464	0.9
American Indian and Alaska Native alone	560	0.0	343	0.1
Asian alone	268	0.0	114	0.0
Native Hawaiian and Other Pacific Islander alone	68	0.0	50	0.0
Some Other Race alone	21,497	1.7	16,903	4.3
Two or More Races	5,521	0.4	3,441	0.9
Not Hispanic or Latino	1,218,852	95.2	357,281	90.0
White alone	785,977	61.4	132,710	33.4

Table 3.14-1. Cuyahoga County and City of Cleveland Population Hispanic or Latino and Race

Subject	Number	Percent	Number	Percent
	Cuyahoga County		City of Cleveland	
Black or African American alone	374,968	29.3	208,208	52.5
American Indian and Alaska Native alone	2,018	0.2	997	0.3
Asian alone	32,615	2.5	7,213	1.8
Native Hawaiian and Other Pacific Islander alone	217	0.0	70	0.0
Some Other Race alone	1,842	0.1	599	0.2
Two or More Races	21,215	1.7	7,484	1.9

Source: U.S. Census Bureau, 2017a

The median income of Cuyahoga County and the City of Cleveland is $44,190 and $26,150 respectively. For Cuyahoga County, the percentage of families and people whose income in the past 12 months was below the poverty level is 14.5 and 18.7 respectively while for the City of Cleveland, the percentage of families and people whose income in the past 12 months was below the poverty level is 31.4 and 36.2, respectively (U.S. Census Bureau, 2017b).

3.14.2 Environmental Impacts Related to Environmental Justice

Construction

No adverse impacts to minority or low income populations are anticipated during construction because work would occur offshore in an unpopulated area and within existing facilities for the onshore portions. Additionally, an economic benefit to the local economy from the Proposed Project would be anticipated from the short-term hiring of construction workers.

Operations and Maintenance

The Proposed Project would have minor impacts to aesthetics and visual resources from operations of the wind turbines (refer to Section 3.11, Aesthetics and Visual Resources); however, it would not be expected to adversely impact property values. Wind turbines generate electricity without releasing pollutants into the atmosphere; therefore, the Proposed Project would not contribute to air pollution in the city, and no impacts to water quality or water supply would be expected. Overall, no adverse impacts to minority or low income populations would be expected during operations and maintenance.

Decommissioning

Similar to construction, no adverse impacts would be expected and an economic benefit through short-term construction hiring would be anticipated from decommissioning of the Proposed Project.

3.14.3 No-Action Alternative

Under the No-Action Alternative, DOE would not authorize the expenditure of federal funds by LEEDCo in support of the Proposed Project. Any potential beneficial or adverse effects to the physical, natural, or socioeconomic resources would not be realized.

3.15 Summary of Impacts

A summary of impacts by resource area is provided in Table 3.15-1. The table details the severity and duration of impacts for each resource area analyzed within this EA. The No Action Alternative would result in no impacts to resources; therefore, the table summarizes the impacts from the Proposed Action only.

Table 3.15-1. Summary of Impacts

Resource Area	Level of Expected Impact
Physical Resources	
Lake-Based Geology and Sediments	No Impact
Land-Based Geology and Soils	No Impact
Water Resources	
Lake Water Quality	Minor, Short-term Adverse Impact
Drinking Water Supply and Quality	No impacts
Biological Resources	
Benthos	Moderate, Short-term Adverse Impact
Fish Resources	Minor, Short-term Adverse Impact
Insects (Butterflies)	Negligible, Short-term Adverse Impact
Birds and Bats	Minor, Short-term and Long-term Adverse Impacts
Aquatic and Terrestrial Protected Species	Negligible, Short-term Adverse Impact
Health and Safety	
Waste Management	Negligible Impact
Hazardous Materials	Negligible Impact
Public Health and Safety	Minor, Short-term Adverse Impact
Air Quality	Minor, Short-term Adverse Impact
Climate Change	Negligible Impact
Lake Use	Minor, Short-term Adverse Impact
Traffic and Transportation	Minor, Short-term Adverse Impact
Cultural Resources	Minor, Long-term Adverse Impact

Table 3.15-1. Summary of Impacts

Resource Area	Level of Expected Impact
Aesthetic and Visual Resources	Minor, Long-term Adverse Impact
Noise	Minor, Short-term Adverse Impact
Economics and Socioeconomics	Negligible with Some Short-Term Beneficial Impacts
Environmental Justice	No impact

3.16 Irreversible and Irretrievable Commitments of Resources

An irreversible commitment of resources is defined as the loss of future options. The term applies primarily to the effects of use of nonrenewable resources such as minerals or cultural resources. It could also apply to the loss of an experience as an indirect effect of a permanent change in the nature or character of the land. An irretrievable commitment of resources is defined as the loss of production, harvest, or use of natural resources. The amount of production foregone is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume production (DOE, 2011). Irreversible commitments of resources would be those consumed during construction, operations, maintenance, and decommissioning of the Proposed Project. These resources would include fossil fuels and construction materials, which would be committed for the life of the Proposed Project (DOE, 2011). Non-renewable fossil fuels would be lost using gasoline and diesel-powered construction equipment during all phases of the Proposed Project. The Proposed Project is not expected to create any long-term or permanent losses of unique or irreplaceable areas. Any impacts resulting from the construction and operation of the Proposed Project are temporary and have been minimized to the extent practicable with MB foundations for the turbines and a combination of jet-plowing and HDD for the proposed export cable. Removal of the turbines would restore the Proposed Project Area for alternative uses, including all current uses. No loss of future lake use options would occur.

3.17 The Relationship between Local Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity

Short-term use of the environment, as the term is used in this document, is that used during the life of the Proposed Project, whereas long-term productivity refers to the period after the Proposed Project has been decommissioned and the equipment removed. The short-term use of the proposed turbine sites, export cable, and substation for the Proposed Project would not affect the long-term productivity of the overall Proposed Project Area. When operation of the Proposed Project would be no longer practicable, it would be decommissioned, removed, and the areas used for the Proposed Project could be reclaimed for pre-project uses.

SECTION 4 CUMULATIVE IMPACTS

Cumulative impacts to environmental resources result from the addition of incremental impacts from a proposed action to other past, present, and reasonably foreseeable future actions regardless of what agency, industry, or person undertakes the other actions (CEQ regulations 40 CFR Part 1508.7). In accordance with the NEPA, a discussion of potential cumulative impacts resulting from projects proposed, under construction, recently completed, or reasonably anticipated to be implemented is required. The Proposed Project would have the potential to result in long-term minor impacts to biological resources (fish species, birds, and bats), public health and safety (navigational risk), and aesthetics and visual resources including historic resources based on the operation and maintenance of the proposed wind turbines. All other long-term adverse impacts resulting from implementation of the Proposed Project would be negligible. Further, implementation of the Proposed Project would result in no major short-term adverse impacts.

Cumulative impacts were considered by first identifying other actions (proposed, under construction, recently completed, or reasonably foreseeable), and then by analyzing those actions together with the Proposed Action.

4.1 Cumulative Projects

To develop a list of proposed, under construction, recently completed, or reasonably anticipated to be implemented projects for the cumulative impacts analysis, cooperating agencies were consulted (USACE and USCG) and publicly available resources were reviewed (ODOT, 2017; OEPA, 2017b; City of Cleveland, 2017). No wind energy projects beyond this Proposed Project were identified within the onshore, nearshore, or offshore environment.

4.1.1 Onshore and Nearshore Projects

The City of Cleveland continually undertakes construction, reconstruction, and renovation of City-owned facilities, buildings, roads, bridges, and infrastructure. New or renovated private buildings, and institutional development, renovation, and expansion are common within the city.

Projects to install, maintain, and repair dock facilities, breakwalls, or piles, and associated dredging activities have been previously permitted by yacht and sail clubs, the Port, or other waterfront industries in proximity to the Proposed Substation (within 2 miles) (Krawczyk, 2017, pers. comm.). These types of activities would also be reasonably anticipated in the future.

The ODOT, as part of the Cleveland Urban Core projects, is currently working on and plans continued work on projects in proximity to the Proposed Project substation (within 2 miles).

- Cleveland Innerbelt Modernization Plan focuses on improving safety, reducing congestion and traffic delays, and modernizing interstate travel along I-71, I-77, and I-90 through downtown Cleveland. The projects will rehabilitate and reconstruct about 5 miles of interstate roadways including construction of two new bridges to carry I-90 traffic and address operational, design, safety, and access shortcomings.
- Lakefront West Project is working to connect Cleveland's west side neighborhoods with the lakefront by creating multi-modal connections along the West Shoreway between West Boulevard and the Main Avenue Bridge. It will increase access to Lake Erie along a 2-mile stretch; improve

green space, biking, and pedestrian facilities; increase development potential; and simplify connections along the now limited-access freeway.

4.1.2 Offshore Projects

There are no known or reasonably foreseeable offshore projects or offshore wind projects in Lake Erie in the area of the Proposed Project.

Activities likely to occur offshore in Lake Erie during the life of the Proposed Project and in the area of the proposed wind turbines include commercial shipping, commercial and recreational boating and fishing, and dredging of shipping lanes.

As mentioned previously in the Draft EA, the LEC Project is located approximately 80 miles east of the Proposed Project and consists of an approximately 35-mile submerged cable route within Lake Erie. Because of the distance and its limited action of a buried cable within Lake Erie, there would be no geographic or temporal overlap of impacts to resources with the Proposed Project.

4.2 Cumulative Impacts

The Proposed Project's onshore facilities (Substation, O&M Center, and Port staging area) would be located in existing, developed areas, and nearshore facilities would be limited to a submerged cable. The Proposed Project would have negligible long-term adverse impacts and no major short-term adverse impacts to resources onshore and nearshore; therefore, onshore and nearshore cumulative impacts were not further analyzed.

The cumulative impacts analysis of the Proposed Project combined with ongoing offshore activities likely to occur in the vicinity of the Proposed Project (commercial shipping, commercial and recreational boating and fishing, and dredging of shipping lanes) was conducted at geographic ranges in accordance with the resources and potential for impacts. This analysis included the resources with anticipated long-term minor impacts resulting from the proposed wind turbines together with activities likely to occur offshore in Lake Erie.

Biological Resources – Fish
Overall, long-term adverse impacts to fish species from operations and maintenance of the proposed wind turbines would be minor. These long-term minor impacts include loss of approximately 0.3 acre of existing substrate habitat from the proposed turbine foundations and potential noise impacts to fish limited to high wind speeds at short distances from the turbine foundation. Cumulative impacts would also be expected to be minor as identified offshore activities in Lake Erie currently do not and are not anticipated to significantly impact fish.

Biological Resources – Birds and Bats
Long-term, minor adverse impacts to birds and bats would result from potential behavioral avoidance or attraction to the wind turbines and potential collision with the wind turbines. As no other offshore projects were identified and offshore activities from the Proposed Project would have negligible impacts to birds and bats, cumulative impacts to birds and bats would be expected to be negligible.

Public Health and Safety
Adverse impacts to health and safety from the proposed wind turbines would be long-term and minor during operation and maintenance. A Navigational Risk Assessment for the Proposed Project has been prepared in coordination with the USCG to ensure potential navigational hazards are appropriately addressed. Identified

and potential future offshore activities currently coordinate or would be required to coordinate with the USCG to minimize navigational hazards; therefore, cumulative impacts to public health and safety would be minor.

Aesthetics and Visual Resources

The proposed wind turbines would be new, permanent visible structures. The small number of turbines, their distance from shore, and the relatively small area of the horizon occupied by the turbines all help to minimize the visual effect on the setting associated with historic resources located on the shoreline of Lake Erie. Activities which are likely to occur within Lake Erie currently do not and would not be anticipated to contribute adverse impacts to aesthetics and visual resources; therefore, cumulative impacts would be minor.

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Division of Water
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September 22, 2017

Ms. Beth A. Nagusky
Director of Sustainable Development
Lake Erie Energy Development Corporation
1938 Euclid Avenue, Suite 200
Cleveland, Ohio 44115

Dear Ms. Nagusky:

Cleveland Water offers this letter to summarize our meeting on August 24th, 2017 at your office. The meeting was between LEEDCo, CWD, and LimnoTech to discuss the planned construction of wind turbines located offshore from Cleveland and potential, if unlikely, impacts on raw water quality for two of our four plants, specifically the Morgan and Baldwin plants.

Construction of the 7-mile length of parallel lines is the portion of the project we are most interested in. Since it has been determined by LEEDCo that no known areas of toxic material or areas of open lake placement for dredging material exists in the construction corridor, turbidity is the contaminant of concern to Cleveland Water. While we believe this potential to be low, LEEDCo has agreed to the following to ensure the safety of the raw water:

- LEEDCo will provide Cleveland Water a minimum three-day notice before commencing construction of the export cable.
- LEEDCo will communicate with Cleveland Water on a daily basis during the cable laying operations. This construction is anticipated to last approximately one week in the area of concern.
- The cables will not be placed in any area of open lake placement.
- LEEDCo or their agent will monitor for turbidity during construction activities and will provide turbidity sensors for the Morgan buoy/sonde installation. The turbidity sensors will be located at the surface and at the bottom elevations.

Based upon our review of historical turbidity levels in Lake Erie, we have observed natural, storm-induced turbidity spikes up to 300 Nephelometric Turbidity Units

(NTU). Therefore, if turbidity is observed to exceed 300 NTU during construction-related activities, we would have to attribute this to LEEDCo activities. It is likely we would seek some type of relief if significant treatment adjustments are required to meet regulatory limits for potable water. For a number of reasons we discussed during the meeting, we do not anticipate this being a realistic concern.

Finally, as a matter of policy, we request LEEDCo refrain from identifying exact locations of key infrastructure near this project. While we understand much of this information is in the public realm, we try to protect this information at every opportunity. Specifically, we request you refrain from identifying the location of our submerged crib for the Morgan water plant and the locations/direction of the raw water intake tunnels extending from the Kirtland Crib and the Morgan Crib. These tunnels are inconsequential to the overall project and should not be identified.

We appreciate the opportunity to work with LEEDCo, LimnoTech, and your partners on this very important project. If you have any questions, please feel free to contact Maggie Rodgers at 216-664-2444 x75584 or Scott Moegling at 215-664-2444 x75583.

Sincerely,

Alex Margevicius, P.E.
Commissioner
Cleveland Water

ec: Maggie Rodgers, Plant Operations Manager
Scott Moegling, Water Quality Manager

Icebreaker Windpower, Inc.
Case No. 16-1871-EL-BGN
Data Responses to Staff's 2nd Set of Interrogatories
October 2, 2017

Attachment C-1
Gravity Foundation

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Attachment C-2
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Attachment C-3
Nysted Farm Foundation

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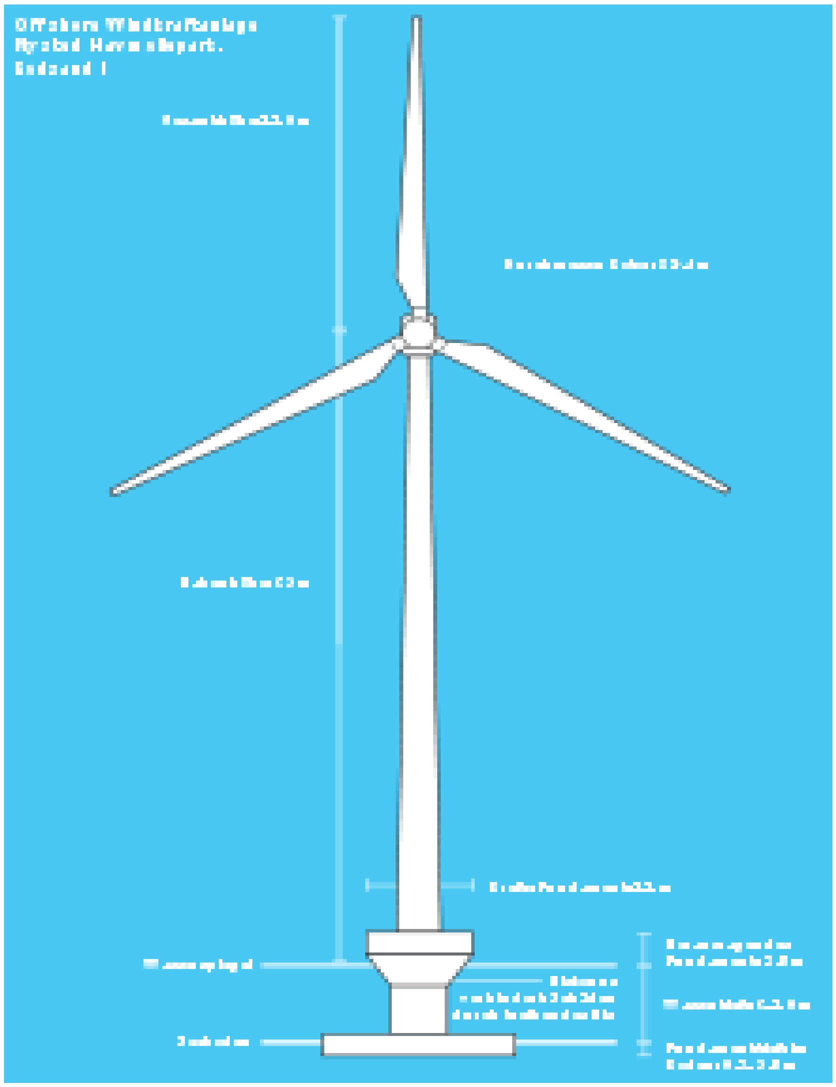
Icebreaker Windpower, Inc.
Case No. 16-1871-EL-BGN
Data Responses to Staff's 2nd Set of Interrogatories
October 2, 2017



Icebreaker Windpower, Inc.
Case No. 16-1871-EL-BGN
Data Responses to Staff's 2nd Set of Interrogatories
October 2, 2017

Attachment C-4
Middlegrunden Wind Farm

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Icebreaker Windpower, Inc.
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October 2, 2017

Icebreaker Windpower, Inc.
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October 2, 2017

Attachment C-5
Pelee Passage Light

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Figure 10: Pelee Passage Light (Lake Erie)

Icebreaker Windpower, Inc.
Case No. 16-1871-EL-BGN
Data Responses to Staff's 2nd Set of Interrogatories
October 2, 2017

Attachment C-6
Prince Shoal Light

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Figure 11: Prince Shoal Light (River Ontario just off Lake Ontario)

Figure 12: Prince Shoal Light (River Ontario just off Lake Ontario)

Icebreaker Windpower, Inc.
Case No. 16-1871-EL-BGN
Data Responses to Staff's 2nd Set of Interrogatories
October 2, 2017

Attachment C-7
Cone Geometry
by Allyn & Croasdale

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Appendix A Cone Geometry

The top and bottom of the cone is located using the following input:

- The water levels of setting the cone are for the 1 in 50 year water levels:
  - The lowest winter water level is 0.1 m (CD), LWWL.
  - The highest winter water level is 1.53 m (CD), HWWL.

- An arbitrary "construction/uncertainty" allowance of 0.75 m is added to the top of the cone and 0.25 m is added to the bottom of the cone. (See separate discussion on water level and consolidated layer level uncertainties).

- A 1 in 50 year consolidation layer thickness of 1.11 m is used as per the CRREL report.

The vertical location of waterline diameter of the cone is conservatively set as follows:

- For the downward breaking cone the maximum waterline diameter is set at the 1 in 50 year highest winter water level of 1.53 m (CD).

- For the upward breaking cone the maximum waterline diameter is set at the 1 in 50 year lowest winter water level of 0.1 m (CD).

Downward Breaking Cone Dimensions

The bottom of the cone is set one thickness of the Consolidated Layer (CL) of 1.11 m as below LWWL as per the recommendation in DNV, to which is added a construction allowance:

- Elevation of bottom of the cone = +0.1 m – 1.11 m -0.25 m = -1.26 m (CD).

The top of the cone is set as the freeboard of the CL thickness plus a construction allowance above HWWL:

- Freeboard of CL is set at 0.1 of CL or 0.11 m

- Elevation of top of cone = 1.53 m +0.11 m + 0.75 m = 2.39 m (CD).

The height of the downward breaking cone is therefore:

- Hdb cone = 1.26 m + 2.39 m = 3.65 m

Upward Breaking Cone Dimensions

The bottom of the cone is set such that the draft of the CL, which is 0.9 m, clears the bottom of the cone at LWWL, including the construction allowance of 0.25 m:

- Elevation of the bottom of the cone = 0.1 m – 1.0 m -0.25 m = -1.15 m (CD)

The top of the cone is set as the thickness of the CL for ride-up above the point where the keel of the CL contact the cone, which is 1.0 m below HWWL, plus the construction allowance of 0.75 m:

- Elevation of the top of the cone = 1.53 m + 1.11 m +0.75 m -1.0 m = 2.39 m (CD)

But for added contingency and consistency, the elevation of the top of the cone is set at +2.5 m (same as downward cone).

The height of the upward breaking cone is therefore:

- Hub cone = 1.15 m + 2.5 m = 3.65 m

The height of the two types of cones is conservatively set at 3.65 m, which is 0.05 m larger than as shown on Figure 1.1.

Widths of Cones for Calculating Ice Loads for Flexural Failure of CL

For the downward breaking cone, the maximum waterline diameter is at HWWL, and the height of this above the bottom of the cone, which has a diameter of 5 m, is 1.26 m + 1.53 m = 2.79 m. For varying angle θ, measured from horizontal the width of the cone at HWWL is given by the equation:

- Wwl = 5 m + 2x(2.79/tan(θ)

The widths for varying angle are provided in Table A.1.

Table A.1: Width of Downward Breaking Cone at HWWL

Angle in degrees, measured from horizontal	Width, Wwl (m)
52	9.4
60	8.2

For the upward breaking cone, the maximum waterline diameter is at LWWL, and the distance from this water level to the top of the cone, which has a diameter of 4.5 m, is -0.1 m + 2.39 m = 2.29 m. For varying angle θ, measured from horizontal the width of the cone at LWWL is given by the equation:

- Wwl = 4.5 m + 2x(2.29/tan(θ))

The widths for varying angle are provided in Table A.1.

Table A.2: Width of Upward Breaking Cone at LWWL

Angle in degrees, measured from horizontal	Width (m)
52	8.1
60	7.1

The following figures show the cones for which ice loads are provided in this report:

- Figure A.1 shows the downward breaking cone as provided in the Basis for Design and in Figure 1.1 above.
- Figure A.2 shows a cone similar to what was used for the Confederation Bridge piers, but downward breaking and smaller.
- Figure A.3 shows a cone similar to the one shown in the Basis of Design, but for upward breaking.
- Figure A.4 shows an upward breaking cone similar to what was used on the Confederation Bridge piers, but smaller.

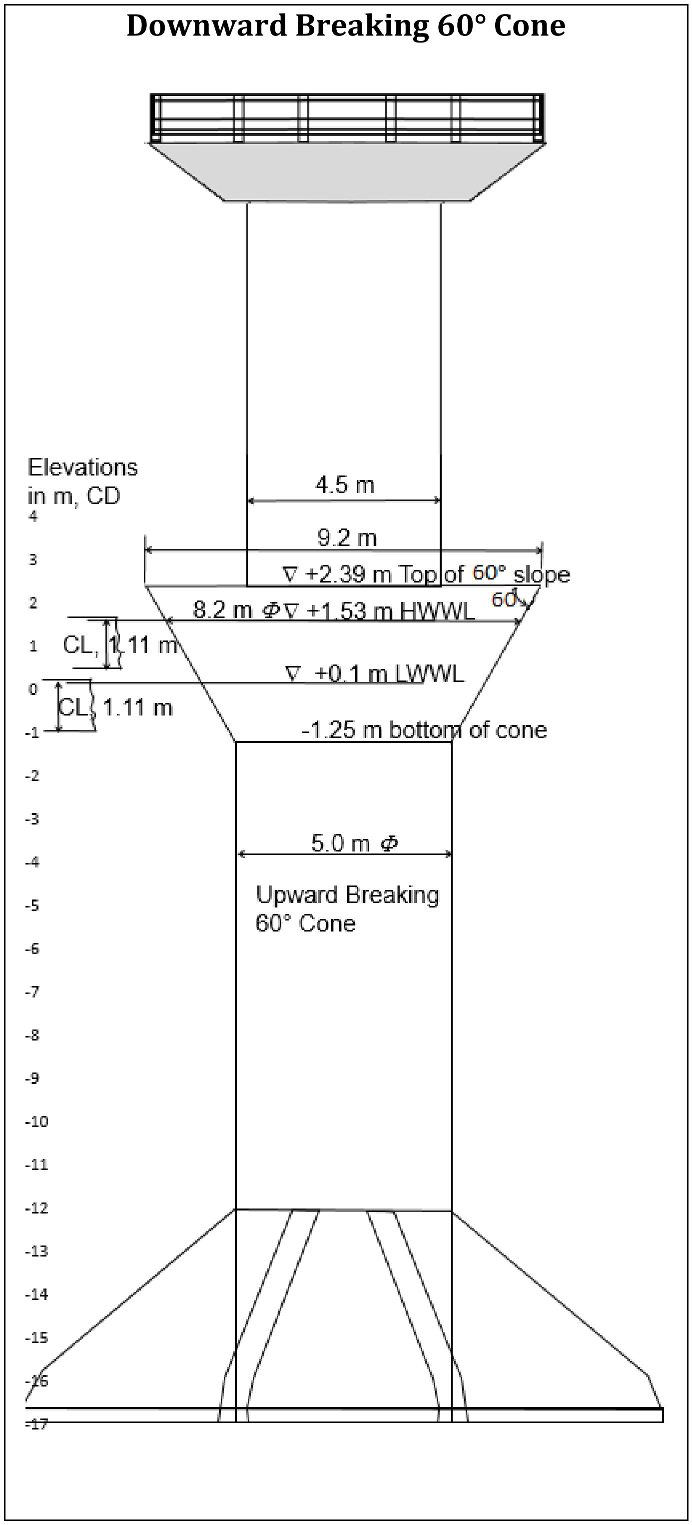

Figure A.1: Downward breaking cone as provided in the Basis for Design and in Figure 1.1 above.

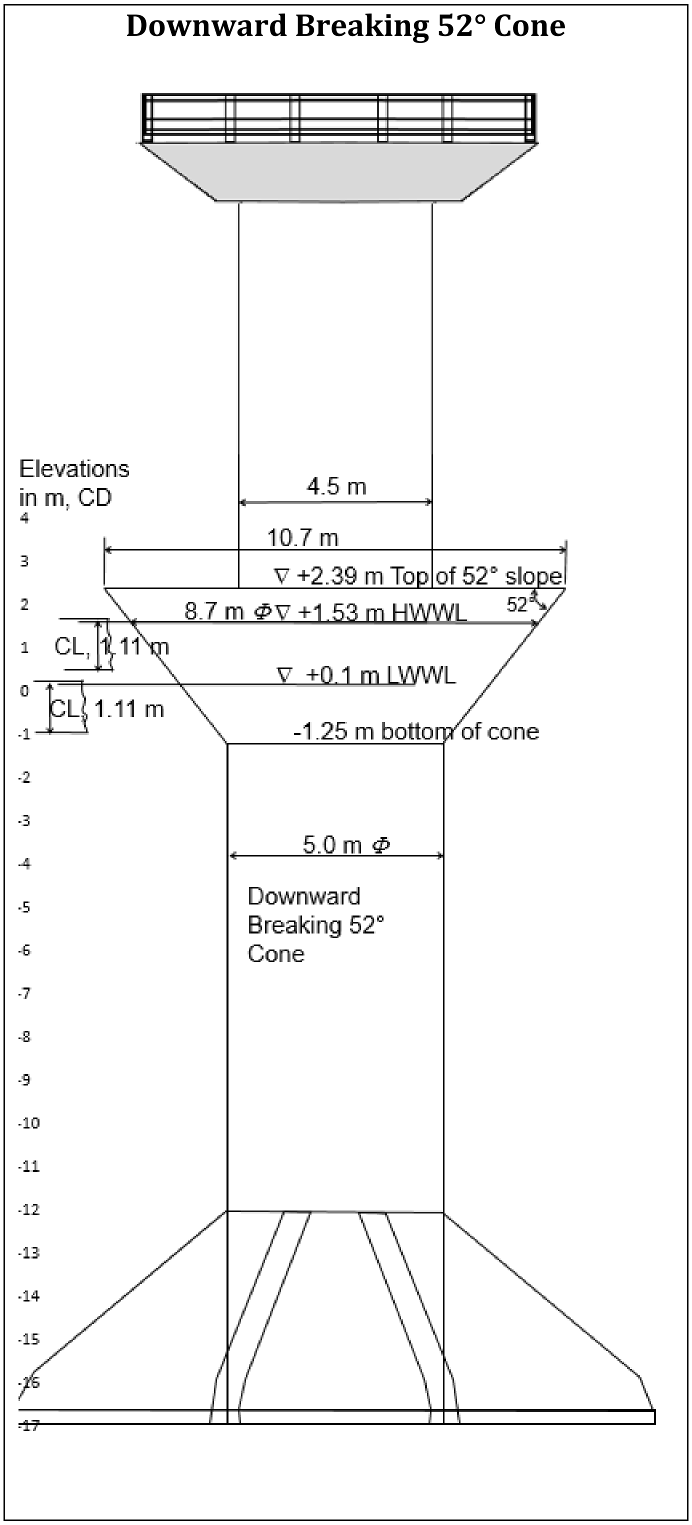

Figure A.2: Downward breaking cone similar to what was used for the Confederation Bridge piers, but downward breaking and smaller.

Upward Breaking 60° Cone

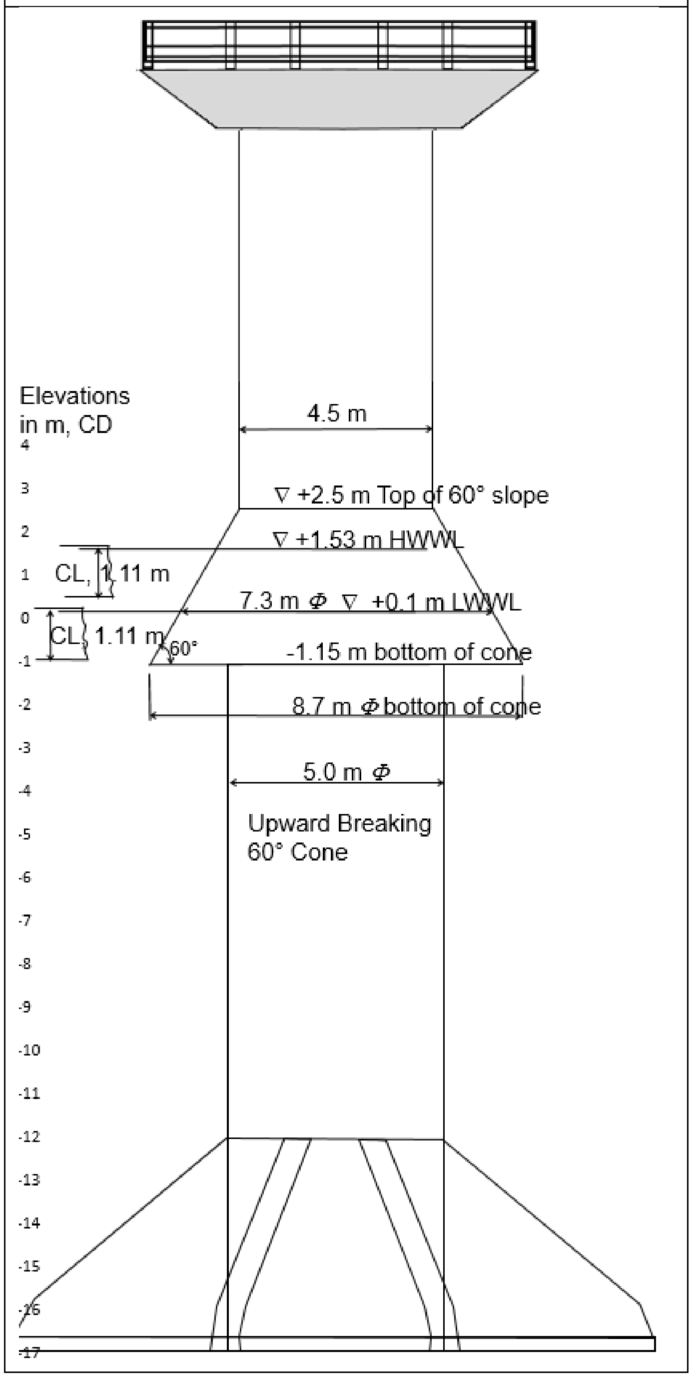

Figure A.3: Upward breaking cone similar to the one shown in the Basis of Design, but for upward breaking.

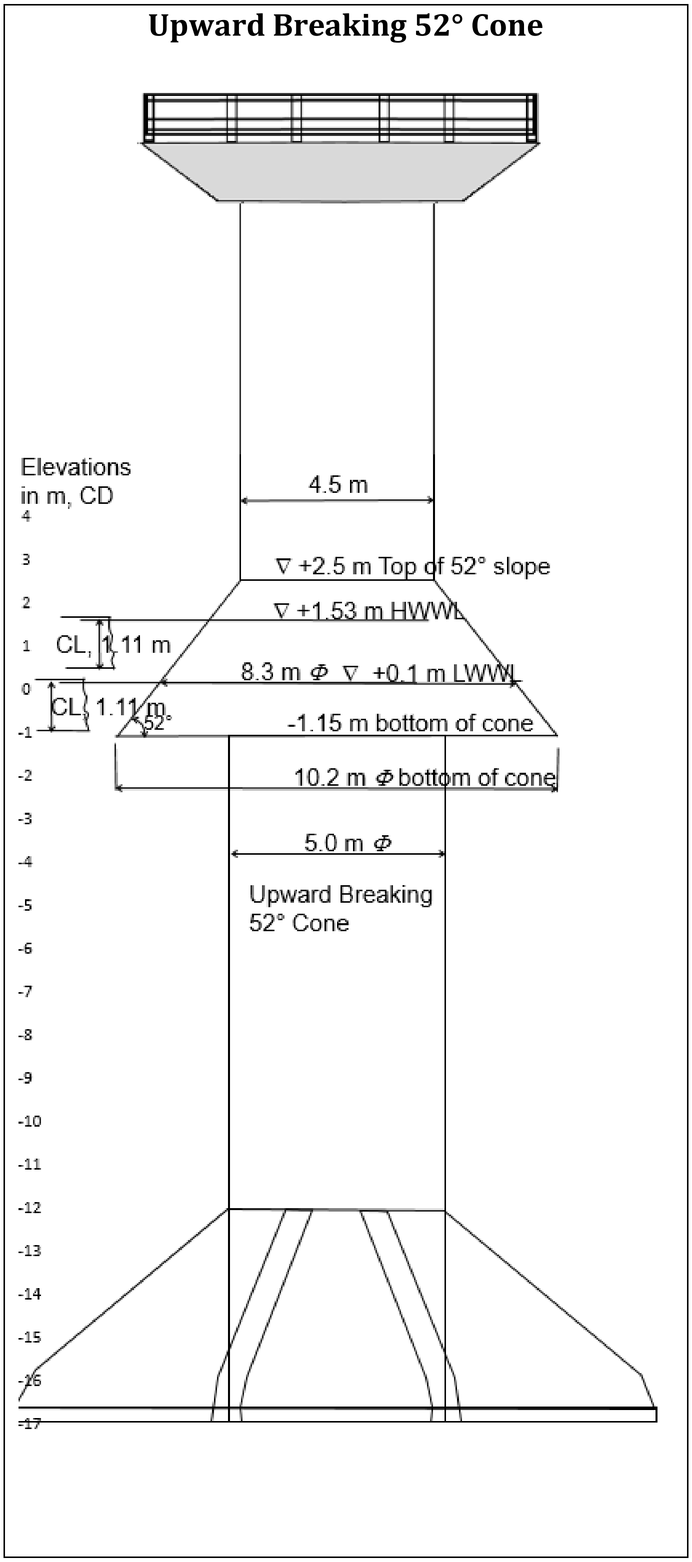

Figure A.4: Upward breaking cone similar to what was used on the Confederation Bridge piers, but smaller.

Attachment D
Navigational Risk Assessment
July 2017
Draft Environmental Assessment Appendix R

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Appendix R
Navigational Risk Assessment

Navigational Risk Assessment

Icebreaker Wind

Lake Erie, City of Cleveland,

Cuyahoga County, Ohio

Prepared for:

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July 2017

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1.0 INTRODUCTION

This Navigational Risk Assessment (Assessment) has been prepared in support of the Icebreaker Wind Project (the Project), a demonstration-scale offshore wind facility in Lake Erie, being proposed by Icebreaker Wind, Incorporated (the Applicant). The design and permitting portions of this Project are being pursued under a grant provided by the U.S. Department of Energy (DOE). Construction of the Project is anticipated to begin in the spring of 2019. For the purpose of this NRA, the term “Project Site” refers to the specific area where the turbines, electric collection cables, and associated infrastructure will be erected. The “Project Area” means generally those portions of the waters of Lake Erie, the Cleveland Harbor, and the Port of Cleveland that may be impacted by the construction or operation of the Project.

The Project will consist of six 3.45 megawatt (MW) wind turbine generators, a buried submarine cable connecting the turbines (inter-array cable), and a buried submarine cable from the turbine closest to shore to the Project Substation located onshore in the City of Cleveland (export cable), totaling approximately 12 miles. The turbines will be in approximately 8 to 10 miles off the coast of Cleveland, Ohio (Figure 1).

The document has been prepared in general accordance with the United States Coast Guard (USCG) guidance for Offshore Renewable Energy Installations (OREIs) contained in the *Navigation and Vessel Inspection Circular No. 02-07* and the *Risk-Based Decision-Making Guidelines for Preliminary Hazard Analysis* from the USCG (USCG 2007, USCG 2010). A change analysis, based on the USCG’s *Risk-Based Decision-Making Guidelines*, is used to assess the risk effects and proper management strategies in situations where change is occurring. This Assessment is a qualitative risk assessment, based on a change analysis (Appendix A) that determines the current and future conditions related to navigational safety, evaluates the navigational risk due to the construction and operation of the Project, and where applicable, makes recommendations for mitigation.

The Applicant has consulted with various agencies regarding the Project’s potential to pose risks to navigation, including the Cleveland Cuyahoga County Port Authority, USCG, United States Army Corps of Engineers (USACE), National Oceanic and Atmospheric Administration (NOAA), Federal Aviation Administration (FAA), and Ohio Department of Transportation (ODOT). Coordination with these agencies is anticipated to continue throughout construction and operation of the Project. Icebreaker Windpower Inc. has applied and will continue to apply for various permits related to navigation including, but not limited to:

- USCG Permit for Private Aid to Navigation application (Form CG-2554) to identify new navigational aids that will be used;
- USACE Section 408 Permit to Alter or Use a Federal Navigation Project to coordinate activities near the navigation channel and the harbor breakwater;

- USACE Section 10 Permit for work conducted in navigable waters of the United States for installation of cables and turbines in Lake Erie; and
- FAA Notice of Proposed Construction or Alteration with concurrence from ODOT (Form 7460-1) to address aircraft warning lighting (Determination of No Hazard received from the FAA on February 23rd, 2017).

In addition, the Applicant will notify the NOAA Office of Coast Survey prior to and upon completion of construction so that navigational charts may be updated.

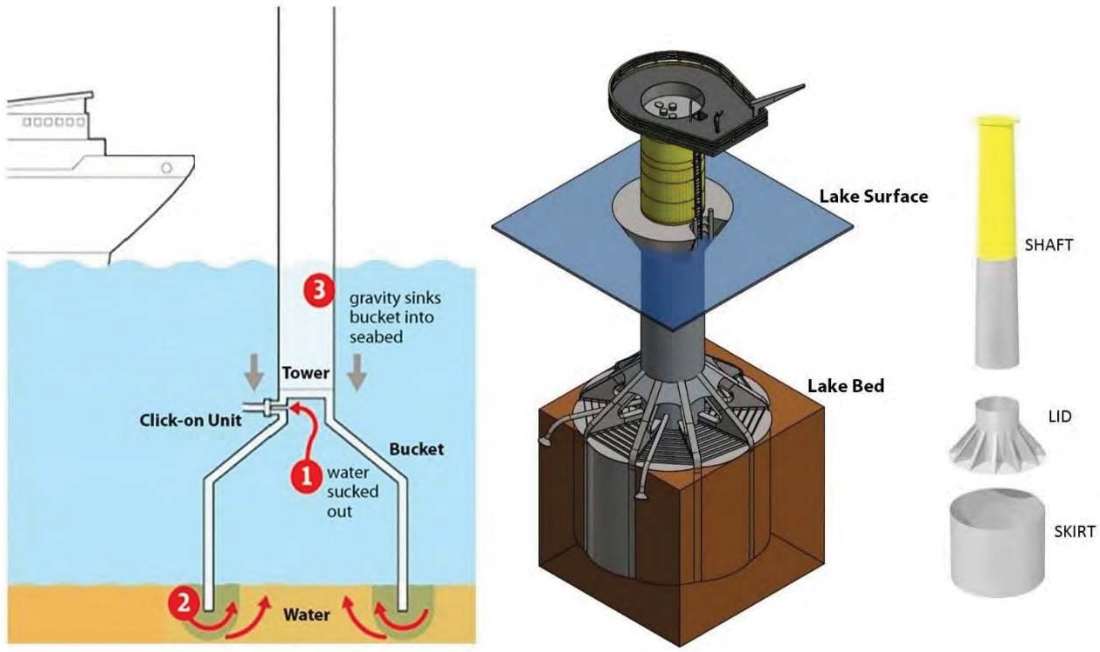
2.0 PROJECT DESCRIPTION

The Project will include six wind turbines, five submerged inter-array cables interconnecting the turbines (with a total length of approximately 2.8 miles), an approximately 9-mile long submerged export cable connecting the turbines to the Project Substation, a new Project Substation located adjacent to the Cleveland Public Power (CPP) Lake Road Substation in Cleveland, Ohio, and approximately 150 feet of new transmission cable installed in an underground concrete duct bank to transmit electricity from the Project Substation to the CPP Substation (Figure 2).

The Project turbines will be Mitsubishi Heavy Industries Vestas Offshore Wind (MVOW) – Vestas 3.45 MW offshore wind turbines, supported by Mono Bucket (MB) foundations. The turbines will be located in Lake Erie, approximately 8 to 10 miles off the coast of Cleveland, Ohio and will be arranged in a single row, generally oriented southeast to northwest, with approximately 756 meters (2,480 feet) between each turbine. Geotechnical surveys were conducted around seven potential turbine sites, and six of those sites will be selected as locations for the turbines. Each turbine will be constructed with an 83-meter hub height (272.3 feet), a rotor diameter of 126 meters (413 feet) and blade length of 62.9 meters (206 feet). The lowest point of the blades will reach 20 meters (66 feet) above the surface of the water and the highest will be 146 meters (479 feet) above the surface of the water (Figure 3). The majority of the turbine, including the blades, will be painted light gray.

The MB foundation combines elements of a gravity base, a monopile, and a suction bucket. It is a suction installed caisson or an "all-in-one" steel foundation system to support offshore wind turbines. The approximate depth of the water at the proposed turbine sites is 19 meters (62 feet). The interface with the lakebed is accomplished by means of an approximately 17.0-meter (55.8 feet) diameter steel skirt that penetrates the lakebed. The skirt is welded to an upper steel lid which then transitions to a shaft, 4.5 meters (14.8 feet) in diameter above the mudline, that resembles the elements of a standard monopile (see Inset 1). The overall height of the foundation will be approximately 36.9 meters (121 feet) and the portion of the foundation above the water line (39 feet [12 meters]) will be painted yellow.

Since the foundation will use suction technology, there will be no lakebed preparation necessary (dredging or drilling) for installation. Additionally, the foundation installation will not require pile driving.



Inset 1. MonoBucket General Design

A combined boat landing/ice cone will be constructed around each turbine to provide access for turbine maintenance crews, to lower the ice loads during the winter, and also potentially to serve as a safe haven for recreational boaters in an emergency (Figure 3). Above the boat landing, there will be a 10 meter (32.8 feet) access ladder to a work platform. The access ladder may be lighted with a small down shielded light, if necessary. Two amber flashing navigation lights will be affixed near the work platform of all six turbines to provide 360º visibility around the turbines. On turbine platforms 2 through 5, the amber lights will have a visibility of 4 nautical miles and a synchronous flash rate of 20 flashes per minute. Synchronously flashing (flash pattern to be determined) amber lights, visible up to 5 nautical miles, will be installed on Turbines 1 and 6 at each end of the turbine string. In addition, Turbines 1 and 6 will have fog horns (and visibility sensors) audible for at least 2 nautical miles.

The proposed inter-array cables and export cable will be 3-conductor, single armored, underwater power cables, with an approximate overall diameter of 4.5 inches and rated at 34.5 kilovolts (kV). The cables will be composed of a 3-core copper conductor with cross-linked polyethylene (XLPE) or ethylene propylene rubber (EPR) insulation. Optical fibers for data transmission will be embedded between the cores, and all of the separate cables will be protected by steel armor and multiple layers of waterproof material. The cables will be buried in the lakebed at a targeted minimum depth of 1.5 meters (4.9 feet). Geophysical and geotechnical surveys were performed in 2016 along a cable route envelope. The cable route will be finalized upon selection of an installer for the Project.

The export cable will extend from Turbine 1 (ICE1) in a southeasterly direction underneath the Cleveland Harbor Breakwater and under the remaining portion of the Harbor to the Project Substation in Cleveland, Ohio (Figure 4). The proposed cable will be brought ashore entirely under the Harbor and the breakwater through a duct installed using horizontal directional drilling (HDD). The exact location of the cable will be determined by subsurface conditions and installation techniques that have not been finalized at the time of this report. However, the cable will be installed within the envelope surveyed during the geotechnical investigations (Figure 4).

The launch pit for the HDD will be located adjacent to the CPP Lake Road Substation. For this Project, following drilling of the initial pilot hole, the “bottom hole assembly” (the drill bit and the non-magnetic drill pipe encasing the survey instrument at the end of the drill string) will be lifted to the deck of a work barge and removed. At this point, the hole will be “pre-reamed” to approximately 12 inches larger than the outside diameter of the proposed high density polyethylene (HDPE) conduit (i.e., to approximately 28 to 30 inches in diameter). The driller will most likely do this by progressing the reamer (a 30 inch diameter cutter) through the drilled hole from the onshore end towards the offshore “exit.” By going in that direction, the majority of the pre-ream cuttings and drilling fluid will be transmitted back to the land surface at the onshore drill site, rather than being emitted at the “exit.” The HDPE conduit would be prefabricated in a single string prior to it being pulled back through the drilled and reamed hole. The driller anticipates the HDPE string being towed out to the exit point where, on the deck of the barge, it will be attached to the drill pipe by way of a pull-head at the front of the HDPE pipe, along with a swivel and a reamer. That assembly will be lowered overboard and the onshore drilling rig will then pull the HDPE pipe through the drilled and reamed hole and into the drilling pit onshore. The electric cable would be installed from outside the Breakwater toward the shore through the conduit using the pull-string previously placed in the conduit.

Drilling operations will use drilling fluids to stabilize the bore hole and to lubricate the drilling process. The proposed drilling mud (a clay-based compound such as Bentonite) will be National Sanitary Foundations (NSF) approved for drinking water applications such as water wells. Spent drilling fluids containing solely bentonite clay are considered “earthen material” and may be buried or land applied on-location within the right-of-way of the drilling operation or at a designated property. Drill cuttings resulting from HDD using solely bentonite clay and water are also considered “earthen material” and may be managed similarly. Though precautions will be taken to minimize or avoid a drilling fluid leak, an Inadvertent Return Contingency Plan (“Frac-out” Plan) has been prepared by the Applicant to address the potential risk of an inadvertent release of drilling fluids (Appendix B). The plan describes the procedure the Applicant and the contractors will implement to avoid, minimize, and remediate potential environmental impacts that could result from an inadvertent release.

The remainder of the export cable will be installed using a deck barge with a cable installation and burial spread mobilized on board. The proposed approach for the export cable is bury-while-lay (simultaneous burial). The cables will be buried by using a jetting tool or a cable plow. A plow is a tool that typically sits on skids (skis) and is pulled by a vessel. The plow's share cuts into the soil forming a trench into which the cable is laid. Alternatively, a jetting tool equipped with high-pressure water jets would accomplish the burial process by fluidizing the sediments within a narrow trench into which the cable is lowered. The installation of the cables would result in short-term localized sediment suspension. Sediments would be disturbed along the approximately 12-mile length of the cable route disturbed by the process. Sediments would subsequently settle back on the lakebed, providing a degree of back-fill. As mentioned above, the exact location of the cable will be determined by subsurface conditions and will be installed within the envelope surveyed during the 2016 geotechnical investigations (Figure 2).

The onshore components of the Project, including the Project Substation, onshore interconnection cable, fiber optic cables, and interconnection facilities will be located in Cleveland, Ohio. Construction activities will be supported by a proposed construction staging area at the lakeshore within the Port of Cleveland (Figure 2). The Great Lakes Towing (GLT) facility on the Old River in Cleveland, Ohio, approximately 1.6 km from the Cleveland outer harbor, is proposed as the location for the Operations and Maintenance (O&M) Center (Figure 2).

3.0 WATERWAY CHARACTERISTICS

Navigational operations in Lake Erie near the Project Area are affected by meteorological conditions, water quality and hydrodynamics, channel size and configuration, obstructions, and aids to navigation (ATONs). Each of these factors is addressed in the following subsections.

3.1 Meteorological Conditions

In general, Cleveland Ohio is characterized by a humid temperate climate with seasonal temperature variations including hot summers and cold winters. Temperatures average in the low 70s in the summer and upper 20s to low 30s in the winter (Table 1). On average, Cleveland experiences 156 days of precipitation per year, with June and July being the wettest months (average of 3.5 inches) and February being the driest month (average of 2.2 inches of precipitation) (NOAA, 2016d). The months with greatest snowfall include December, January, and February, all with average monthly snowfall of at least 12.0 inches (Table 1; NOAA, 2016d). Thunderstorms are responsible for some of the strongest winds on the Lake and typically occur April through September, but are most frequent during the months of June and July (NOAA, 2016d). Onshore, thunderstorms typically occur 25 to 30 days, a year (NOAA, 2016d). The prevailing wind direction in Cleveland is southwest (NOAA, 2016d). Between 2005 and 2013, overall average wind speed at the Cleveland Crib (at a height of 50 meters) was 7.37 meters/second (16.5 mph) (CWRU, 2014).

Table 1. Average Monthly Air Temperature and Precipitation in Cleveland, Ohio

Month	Temperature (°F)			Precipitation (in)	
	Low	Mean	High	Rain	Snow
January	19.1	26.6	33.5	2.5	13.5
February	20.5	28.5	36.0	2.2	12.2
March	28.5	37.3	45.6	3.0	10.6
April	38.5	48.7	58.4	3.4	2.3
May	48.3	59.1	69.4	3.4	0.1
June	57.7	68.4	78.7	3.5	0.0
July	62.3	72.8	82.7	3.5	0.0
August	61.0	71.2	81.0	3.4	0.0
September	54.2	64.4	74.1	3.1	0.0
October	43.9	53.7	63.0	2.5	0.7
November	34.7	42.5	49.9	3.2	5.3
December	24.6	31.5	37.9	2.9	12.0

Cleveland typically averages 148 days with fog per year. Fog occurs throughout the year with a slight maximum in August (NOAA, 2016d). Over the past year, average monthly visibility at the Cleveland Hopkins International Airport (approximately 9 miles southwest of the Project Site) has ranged from 8.6 miles to 13.7 miles, with a daily minimum of 1.4 miles (Diebel et al., 2016). According to the National Weather Service (NOAA et al., 2015), the City of Cleveland has an average of 66 days per year that are clear (0-30% cloud cover), 97 days that are partly cloudy (40-70% cloud cover), and 202 days that are cloudy (80-100% cloud cover). Thus, clear skies occur approximately 18% of the time, while cloudy/overcast conditions typically occur about 55% of the time.

3.1.1 Lake Erie Water Conditions

The elevation of Lake Erie's surface varies year to year due to changes in lake volume and effects of wind. A strong seasonal pattern is typically seen, with the lowest elevation occurring during the winter and the highest in the summer (NOAA, 2016d). Between 1860 and 2015, Lake Erie's annual average water level ranged from approximately 173 meters (568 feet) above mean sea level (AMSL) to 175 meters (574 feet) AMSL with an average water level of approximately 174 meters AMSL (NOAA, 2016c). Wind gusts can create sudden changes in water level. Fluctuations as great as 10 feet and lasting as long as 12 hours have been observed; however, along the south shore, fluctuations caused by winds are generally less than 1 foot above or below normal (NOAA, 2016d).

Wave climatology of the lake is closely coupled with wind climatology. An analysis of waves in the Project Area was performed by BMT Argoss. The report provided wave criteria for input into the basis of design. The analyses were based on the Wave Information Studies, a USACE sponsored project that generates consistent, hourly, long-term wave climatology along all U.S. coastlines. Data from WIS station 92070, located approximately 4 miles from the City of Cleveland shoreline, indicated extreme wave criteria for maximum wave height for a one year return period was 6.2 meters (20 feet) and 8.2 meters (27 feet) for a 50 year return period. However, mean significant wave height, defined by the NOAA National Data Buoy Center as the average of the highest one-third of all the wave heights during a 20-minute sampling period, was determined to be 0.5 meters (1.6 feet; BMT Argoss, 2016).

Due to the high surface area to depth ratio and the shallowness of Lake Erie, lake temperatures are much more responsive to seasonal changes in air temperature when compared to the other Great Lakes. Lake Erie is usually at its coldest in January and February (when it can be icebound, or just above freezing), and at its warmest in August, with temperatures generally in the low to mid 70s (NOAA, 1987). Additionally, the difference in temperature between the water surface and the lake bottom can be substantial in the summer months, and varies considerably over the basins (Western, Central, Eastern) (Schertzer et al., 1987). Typical ice formation in Lake Erie begins in the western basin in late December and spreads east across the lake with peak ice coverage typical in February (NOAA, 1987). Historically, there has been a large variation in ice cover in Lake Erie, ranging from less than 25% cover in a mild year to 100% cover during severe winters (Daly, 2016). The Applicant contracted with Eranti Engineering to analyze dynamic ice forces and the significance of ice loads on the fatigue limit design of the turbine foundations. Ice is present at the Project Area an average between zero and 20 weeks per year, with an average of 10 weeks per year.

Ice conditions and winter storms restrict navigation for vessels on Lake Erie. Ice thickness and percent coverage on the lake are important factors determining navigation restrictions. In addition, icing of vessels themselves can add significant weight and instability to the vessel. Although shipping restrictions can occur in the St. Lawrence Seaway from the middle of December to the beginning of April, shipping among the Great Lakes and within Lake Erie can usually continue until January (or even longer) with assistance from USCG icebreakers. The icebreakers can maintain a clear path along main vessel routes.

3.2 Channel Size and Configuration

Within Lake Erie, the Project will be located in the Central Basin, in an area of relatively uniform lakebed topography that slopes downward from southeast to northwest. Water depth increases linearly with increasing distance from shore. In the Project Area, depth of Lake Erie ranges from 0 feet at the Cleveland shoreline to approximately 62 feet (19 meters) at the proposed turbine furthest from shore (Figure 5).

The Cleveland Harbor consists of an outer harbor formed by breakwaters, and an inner harbor made up of the Cuyahoga River and the Old River (Figure 6). The outer harbor is formed by a series of breakwaters that run parallel to the shore and extend about 1 mile west and 4 miles east of the mouth of the Cuyahoga River. The harbor is approximately 1,600 to 2,400 feet wide and approximately 1,300 acres in total size (USACE, 2009). The main entrance to the harbor is a dredged channel opposite the mouth of the Cuyahoga River. Additional entrances to the harbor include one at the east end and one at the west end for small craft. The inner harbor consists of dredged channels that lead upstream into the Cuyahoga River and the Old River. Depths in the outer harbor are 29 feet in the approach of the entrance from deeper water in the lake, 28 feet through the entrance channel to the mouth of the river and in the west basin, 28-27 feet in the east basin, and 25 feet in the airport range. Additional dimensions of the outer harbor channel dimensions are listed in Table 2. The outer harbor is separated into an east and west basin by the Cuyahoga River. In the inner harbor, depths are 27 feet in the Cuyahoga River from the mouth to the junction with Old River, 23 feet in the upstream limit, and 27 feet in Old River (NOAA, 2016d). Federal regulations limit speed in the outer harbor to 10 mph (8.7 knots) and 6 mph (5.2 knots) in the inner harbor. However, the City of Cleveland has adopted a more conservative no wake limit of 4 mph (3.5 knots), in the Cuyahoga and Old Rivers. During periods of fog or when a blue light or flag is shown from any pier, wharf, or bridge, a speed limit of 2 mph (1.7 knots) is enforced (NOAA, 2016d).

There are extensive waterfront facilities in the Cleveland outer harbor and along the banks of the Cuyahoga River and Old River. Facilities in the Cleveland Harbor are listed in U.S. Coastal Pilot.[1] During the closed navigation season, many of the piers, wharves, and docks are available for winter mooring of vessels. The harbormaster, who has control of the waters for the anchorages, generally orders vessels to anchor outside the harbor. Deep-draft vessels normally anchor approximately 2 miles southwest or 3 miles east of Cleveland Waterworks Intake Crib Light. The water depth in this area is approximately 40 to 48 feet, with a clay and gravel bottom. Additionally, vessels are prohibited from anchoring within 2,000 feet west of the main entrance channel (NOAA, 2016d). Within the harbor, general anchorages are located in the northwest part of the west basin and south of the dredged channel in the east part of the east basin. An explosives anchorage (for loading or unloading explosives or munitions away from the port) is located on the

[1] https://www.nauticalcharts.noaa.gov/nsd/coastpilot/files/cp6/CPB6_E46_20170106_1811_WEB.pdf

northwest side of the east breakwater. The west basin anchorage has a sand and mud bottom, and is used only occasionally. The east basin and explosives anchorage have not been used since approximately 1967 (NOAA, 2016d).

The Cleveland-Cuyahoga County Port Authority operates the Port of Cleveland in the Cleveland Harbor. The Port of Cleveland has cargo terminals with 12 docks to the east and west of the Cuyahoga River along the Lake Erie shoreline. Major commodities handled at the port include iron, steel, and aluminum products, limestone, iron ore, sand, stone, salt, and other minerals, petroleum products and other liquid bulk cargo, and general and containerized cargo in the foreign trade (NOAA, 2016b). The port includes 80 acres of owned and leased property including 10 berths, 12 docks, and three warehouses located east of the Cuyahoga River that handle general cargo operations (Port of Cleveland, 2016). The Port of Cleveland also includes the Cleveland Bulk Terminal (CBT), which is approximately 44 acres in size and located west of the river. The CBT primarily handles iron ore and limestone. In 2014, the Port of Cleveland handled over 4.2 million tons of cargo, and 221 vessels (Port of Cleveland, 2016). About 90% of cargo that comes into the Port of Cleveland is imported, with the other 10% coming from within the Great Lakes. The port occasionally handles project cargoes that are produced locally and exported (Port of Cleveland, 2016). The port leases dock facilities to companies for regional distribution of cement and other bulk construction materials (Port of Cleveland, 2011). Terminal operators and tenants include Federal Marine Terminals, Carmeuse Lime & Stone, Essroc, and Kenmore Construction (Port of Cleveland, 2016).

Table 2. Cleveland Harbor Channel Dimensions

Name of Channel	Controlling Depths from Seward (Feet at Great Lakes LWD[2])					Project Dimensions		
	Left Outside Quarter	Left Inside Quarter	Right Inside Quarter	Right Outside Quarter	Date of Survey[1]	Width (feet)	Length (feet)	Depth LWD[2] (feet)
Harbor Entrance	25.8	28.5	27.1	22.8	9,10-2015	600-700	1,150	29
Basins & Cuyahoga River Entrance	23.4	26.9	27.7	24.8	9,10-2015	230-760	1,200	28
West Basin								
Main Section	18.9	22.9	22.2	13.0	9,10-2015	800-1,560	4,400	28
Westerly 400 Feet	14.5	13.2	12.3	10.1	9,10-2015	330-800	400	28
East Basin								
West Section	16.9	23.3	16.6	16.7	9,10-2015	1,560	1,300	28
Middle Section	12.1	20.5	21.2	19.8	9,10-2015	1,270-1560	3,800	27
East Section	18.7	22.0	21.9	13.8	9,10-2015	500	14,600	25
Nicholson Approach	22.4	22.4	22.2	22.0	9,10-2015	400-1,600	1,300	25

[1] Tabulated from surveys by the Corps of Engineers – Report of October 2015 and surveys to October 2015.
[2] LWD = Low Water Datum
Source: NOAA, 201

3.3 Obstructions

NOAA's Automated Wreck and Obstruction Information System (AWOIS) and Electronic Navigation Charts (ENC) were consulted to identify submerged wrecks and obstructions in the Project Area (Figure 7). The obstructions closest to the Project Site (AWOIS 14295 and 14293) are both submerged pilings at a depth of at least 5.8 meters (19 feet) and are located approximately 350 feet to the west of the cable route envelope (Figure 7; NOAA, 2016a). The distance from the cable route envelope and depth of the obstructions (5.8 meters) are anticipated to be sufficient to ensure safe installation of the cable line, as the cable will be installed at a targeted depth of approximately 1.5 meters (5 feet). Construction personnel will be notified of the presence of these obstructions. The NOAA navigational charts (Chart #14839 and #14826) were used to determine additional obstructions including water intakes, dredged disposal areas, shipping lanes, and reefs (Figure 8). All of the structures shown on the charts are located within the Project Area, but outside the Project Site, and are not expected to be impacted by Project construction or operation.

3.4 Current Aids to Navigation

Upon approaching Cleveland Harbor, the most prominent visual markers are the Municipal Stadium (0.7 miles east of the mouth of the Cuyahoga River), the Federal Office Building, Key Tower, and the Erieview Plaza Tower (approximately 1.1 miles east of the mouth), the Terminal Tower (1 mile southeast of the mouth), and the lighted *W* sign (3.3 miles west of the mouth on the lakefront; NOAA, 2016d). Three prominent ATONs are located offshore of the Cleveland Harbor: the Cleveland Waterworks Intake Crib Light, the Cleveland Waterworks East Entrance Light 2, and the Cleveland Harbor Main Entrance Light. The light at the Intake Crib is approximately 55 feet above the water and located 3.3 miles northwest of the harbor entrance. East Entrance Light 2 is located 59 feet above the water on a skeleton tower at the end of the outer harbor breakwater. The Main Entrance light is 63 feet above the water on a white conical tower with attached building on the west side of the main entrance to the Harbor (NOAA, 2016). Additionally, sound signals are at the Intake Crib and Main Entrance lights (NOAA, 2016d). Additional ATONs are included in the U.S. Department of Homeland Security and USCG Light List[2].

4.0 VESSEL CHARACTERISTICS AND TRAFFIC

The waterways in the Project Area experience traffic from a variety of both commercial and recreational vessels, both of which operate in increased numbers during the boating season.

[2] http://www.navcen.uscg.gov/pdf/lightLists/LightList%20V7.pdf

4.1 Commercial Vessels

Commercial vessels in the Great Lakes typically include bulk freighters, self-unloaders, integrated tug barges, chemical carriers, cement carriers, tugs, and barges (Haberly and Stalikas, 2013). The CBT is the main Port of Cleveland facility located to the west of the Cuyahoga River. The facility accommodates around 150 vessel movements per year from self-unloading vessels delivering bulk commodities. Iron ore shipments to the CBT are shipped on Class 7 through 10 vessels and loaded on to Class 5 vessels (USACE, 2009). The inner harbor accommodates around 700 commercial vessels per year. This results in 1,400 vessel transits per season and averages approximately four transits per day during March through December. Commercial vessels in the Cuyahoga River are typically greater than 600 feet in length and are mainly Class 5 vessels.

Annual vessel calls and associated cargo tonnage in the Cleveland Harbor are variable, as summarized in Table 3. From 2005 to 2014, vessel calls ranged from 84 in 2009 to 1,005 in 2006, and tonnage varied from 1,108,239 in 2009 to 31,070,642 in 2010 (Port of Cleveland, 2016).

Table 3. Yearly Total Vessel Calls and Cargo Tonnage at the Port of Cleveland

Year	Vessel Calls	Cargo Tonnage
2005	959	12,847,552
2006	1,005	14,172,792
2007	718	9,659,233
2008	218	2,822,704
2009	84	1,108,239
2010	296	31,070,642
2011	357	3,295,326
2012	411	3,677,751
2013	440	3,638,103
2014	221	4,335,553

Source: ODNR, 2016b

The Ohio Department of Natural Resources (ODNR) manages sport and commercial fisheries in 2.24 million acres of Lake Erie. Ohio commercial fisheries harvested 4.6 million pounds of fish in 2015 with a dockside value of $4.9 million (ODNR, 2016b). Harvest included burbot, freshwater drum, gizzard shad, lake whitefish, buffalo, bullhead, common carp, channel catfish, goldfish, quillback, suckers, white bass, white perch, and yellow perch. Yellow perch, freshwater drum, and white bass were the three primary fish harvested, accounting for 28, 20, and 17% of the total commercial harvest, respectively (ODNR, 2016b). The proposed location of the turbines would be in ODNR management units that comprised less than 3% of total commercial fishery nets pulled in Lake Erie from 2011 to 2015 (Figure 9). The more heavily fished areas are to the west of the Project.

There are no transportation passenger ferry routes that operate out of the Cleveland Harbor or navigate around the Project Area (ODNR, 2007). However, there are numerous commercial passenger cruises including Nautica Queen Adventures, Majestic, and Goodtime III (Donahue, 2016). Additionally, charter boats can be rented for activities including fishing and diving.

Vessel traffic data, or Automatic Identification System (AIS) data, collected by the USCG, are available for the Great Lakes region. While AIS is not a precise indicator of the entire range of vessel traffic that may traverse the area, it does provide a relative indicator of where vessel traffic is heaviest. AIS data for 2013 vessel density, including cargo vessels, tug and towing vessels, passenger vessels, and pleasure craft and sailing, are available from https://marinecadastre.gov/ for the Project Area (Marine Cadastre, 2016). These data indicate that cargo vessels have the greatest density of all commercial vessels in the Project Area (Figure 10). The vessel traffic is concentrated within the inner and outer Cleveland Harbors, and within the 2 miles leading to the main harbor entrance. As distance from port increases, the cargo traffic density decreases, as vessel traffic spreads out over the shipping channels. Tug and towing vessels follow a similar pattern, with higher concentrations at the main entrance to the harbor, in the inner and outer harbors, and decreasing concentrations as distance from port increases. Tug and towing vessels have traveled in the vicinity of the proposed turbines, but at a low density (Figure 11). Passenger vessels follow five general tracks into the main entrance of the Cleveland Harbor and one track into the east entrance. Density is low throughout the Project Area and while passenger traffic will cross the proposed transmission line, it does not intersect with the turbines (Figure 12). Commercial pleasure craft and sailing vessels, like other vessels, are concentrated within the harbor and near the entrances. However, there is no pattern followed by pleasure craft and sailing vessels outside of the harbor, and vessel density is low around the Project Site (Figure 13). While cargo, tug and towing, passenger, pleasure craft and sailing vessels occur at times in the vicinity of the Project Area, they are only present in low densities around the Project Site (Figures 10 through 13; Marine Cadastre, 2016). Any vessels that have routes that will cross the submerged cables will not be affected by the operation of the Project. The Lake Carriers Association, which represents U.S.-flag operators of the Great Lakes, has not raised any concerns with the Project. There may be some minor disruption to these vessel routes during the Project construction, but such impacts will be temporary.

4.2 Recreational Vessels

The Cleveland Harbor hosts a large number of recreational vessels, including yachts, sailboats, power boats, and private fishing boats. In 2015, over 474,000 boats were registered in Ohio (ODNR, 2016a). Of those registrations, there were a total of 393,385 recreational vessels, 416 commercial vessels, 69,027 alternative registrations, 2,438 documented vessels, and 8,735 livery vessels (USCG & DOT, 2016). The majority of those boats (159,522) were between 16 and 26 feet in length (USCG and DOT, 2016). Recreational craft usage in the inner harbor typically peaks in June, July, and August and tends to be higher on the weekends and when weather conditions are favorable. Marinas in the inner harbor provide access to the Cuyahoga River and Lake Erie for over 800 recreational craft (USACE, 2009). Marinas in the Cleveland Harbor are listed in Table 4, below.

Table 4. Cleveland Harbor Marinas

Name	Owned	# Slips[1]	Slip Material	Vessel Length (ft)	Harbor
Edgewater Yacht Club	Private	378	Steel/Wood	55	Outer
Edgewater Marine	Private	275	Steel/Wood	40	Outer
Whiskey Island Marina	Private	225	Steel/Wood	32	Outer
Lakeside Yacht Club	Private	212	Concrete/Steel/Aluminum	200	Outer
Forest City Yacht Club	Private	130	Steel/Wood	40	Outer
E 55th Street Marina	State	355 seasonal (22 transient)	Wood	40	Outer
Intercity Yacht Club	Private	100	Steel/Aluminum	50	Outer
Olde River Yacht Club	Private	193	N/A	70+	Inner
Channel Park Marina	Private	60	N/A	40	Inner

[1]Slips are representative of in-water slips. Does not include rack and winter storage.
Source: USACE, 2016; Olde River Yacht Club, 2016, Ivancic Marine, 2016.

A recreational boat study was conducted by LimnoTech in 2016 to count and classify power and sail boats in recreational harbors, marinas, and yacht clubs in Lorain, Cuyahoga, and Lake Counties (Appendix C). Aerial imagery from Wednesday, August 3, 2016 was used to inventory a total of 6,057 boat slips across 16 marinas. Weather on August 3rd was warm (81ºF), dry, and clear with a visibility of 10 miles (Weather Underground, 2017). Boat type and length were also determined using aerial imagery (Table 5). Estimates of sail boat mast heights were determined based on common sail boat specifications in each sail boat range on http://sailboatdata.com (Table 5). Of the sailboats classified through the LimnoTech study, 99% had a mast height less than the proposed clearance between the lowest point of the turbine blade to the water of 20 meters (66 feet). Signage will also be posted on turbines advising boaters as to the maximum safe clearance and safe distance approach. The Applicant will also recommend for NOAA to indicate the turbine locations on navigational charts.

Table 5. Summary of Boat Lengths and Estimated Mast Heights Above Water

Percentile	Power Boat Length (feet)	Sailboats		
		Length (feet)	# of Boats ≥	Mast Height (feet)
25	23	26	586	41
50	27	29	396	45
75	31	33	191	48
90	36	36	74	50
95	39	38	47	54
97	42	40	20	58
99	48	45	8	65

The ODNR prepared a sport fishery effort map during the creation of their Offshore Wind Turbine Placement Favorability Analysis. In the sport fishery effort map, the 10-minute quadrangle that included the proposed turbine locations was determined to receive 106,000 to 700,00 hours of average hours targeting walleye and yellow perch from 2000 to 2006. This represented the greatest concentration of sport fishery effort. However, in 2016, LimnoTech conducted aerial surveys of the 5-minute quadrangles in the Cleveland area to count boats on 12 different days between May and October. Across all dates, only 2% of the boats counted were in the vicinity of the proposed turbines. These data indicate that recreational boating (including recreational fishing) occurs closer to shore than suggested by the ODNR developed sport fishery effort maps. The ODNR sport fishery effort maps are based on data from 10-minute survey grids, which are likely too coarse to evaluate expected fishing effort in the immediate vicinity of the proposed turbines (LimnoTech, 2016b). Due to the lack of traffic at the Project Site, there will be no anticipated impacts to recreational or sport fisheries as a result of the proposed Project.

4.3 <u>Other</u>

A variety of marine events take place in Lake Erie waters off the coast of Cleveland, including: sailing boat races, festivals, boat shows and exhibitions, and fireworks displays. The most prevalent marine events in the Project Area are sailing regattas. The majority of the regattas in the Project Area are hosted by the Cleveland Sailing Association. Buoys for race courses are marked on Figure 8. There were 13 sailing events conducted by the Cleveland Sailing Association in 2016. Races took place from June 4, 2016 to September 10, 2016 and ranged in participation from four to 23 boats of different sizes. The size and location of race courses are variable, and while some occur in the vicinity of the Project Area, they do not overlap with the Project Site. Yachting organizations including, but not limited to the Lakeside Yacht Club, Edgewater Yacht Club, and Cleveland Yacht Racing Association will be consulted to ensure minimal impacts from the project.

Major boat shows, exhibitions, and festivals in the Cleveland Harbor include the North Coast Harbor Boating and Fishing Fest and the Tall Ships Festival. The North Coast Harbor Boating and Fishing Fest occurs in early June and includes power and sailboat rides and fishing trips in Lake Erie (North Coast Boating and Fishing Fest, 2016). The Tall Ships Festival is hosted every 3 years in the Great Lakes. While the 2016 festival had to be moved to the Fairport Harbor (in Ohio) due to a conflict, the festival has been held in the Cleveland Harbor since 2001 (Glaser, 2016). The festival includes approximately 10 invited tall ships for tours and demonstrations. Firework displays over Lake Erie include 4th of July festivities and are shot from the Flats at the mouth of the Cuyahoga River (Fireworks in Ohio, 2016). The Applicant will coordinate with event organizers to avoid conflicts to the events due to Project construction. No anticipated impacts to events are anticipated once the Project is operational.

The Cleveland Coast Guard station is located on the south end of the outer harbor near Burke Lakefront Airport. USCG vessels are expected to be present in the Project Area. Additionally, research vessels such as those used by NOAA and the Environmental Protection Agency (EPA) may be present around the Project Area. As the Project moves closer to the construction phase, the USCG will provide a detailed list of events that may impact the construction. Pre-planning will be conducted prior to construction to avoid conflicts with these events to the maximum extent practicable.

5.0 POTENTIAL EFFECTS ON SAFE NAVIGATION AND MITIGATION

The construction and operation of Icebreaker Wind in Lake Erie, 8 to 10 miles off the coast of Cleveland, has the potential to adversely affect navigation in and around the Project Site if not carefully managed. These potential impacts are summarized in the Change Analysis included in Appendix A, and discussed in detail below. Safe navigation relies on vessel operator diligence and advisement from agencies such as the USCG.

5.1 Navigational Rules

The Ports and Waterways Safety Act of 1972, and amendments from the Port and Tanker Safety Act of 1978, deemed increased supervision of vessel and port operations by the USCG necessary to 1) reduce the possibility of vessel or cargo loss, 2) reduce damage to life, property or the marine environment, and 3) ensure that the handling of dangerous articles and substances on the structures in, on, or immediately adjacent to the navigable waters of the United States is conducted in accordance with established standards and requirements (NOAA, 2012). Vessels should operate in accordance with USCG Navigational Rules including, but not limited to:

- 33 Code of Federal Regulations (CFR) 110 anchorage grounds – indicates acceptable anchorage areas;
- 33 CFR 162 inland waterways navigation – designates speed limits within the harbor;
- 33 CFR 165 regulated navigation areas and limited access areas – establishing controlled access and regulated navigation areas and requirements; and
- 33 CFR 166 shipping safety fairways – establish and designate shipping safety fairways and anchorages to provide unobstructed approaches for vessels using U.S. ports (GPO, 2016).

State of Ohio navigational rules and regulations for vessel operators often overlap with federal regulations and should serve to mitigate risk posed to safe navigation by the construction and operation of the Project. Navigational Rules listed in the Ohio Administrative Code (OAC) include, but are not limited to:

- OAC 1501:47-2-05: "Every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision;"
- OAC 1501:47-2-06: "Every vessel shall proceed at a safe speed so that it can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions;"
- OAC 1501:47-2-07: "Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists;" and
- OAC 1501:47-2-08: "Any action taken to avoid collision shall be positive and made in ample time and with due regard to good seamanship. Any alteration of course or speed shall be substantial to be readily apparent to another vessel observing visually or by radar. Action taken shall result in passing at a safe distance. If necessary to avoid collision, a vessel shall slacken speed, stop or reverse."

5.2 Construction Phase

Offshore installation of the turbines and submerged cables is anticipated to begin in the spring of 2019 with a targeted completion of fall of 2019. Construction activities are proposed to proceed in the following sequence, though multiple activities may be performed concurrently: HDD conduit installation, substation construction, mobilize floating equipment, transport MB foundations from port to site, installation of MB foundations, installation of export cable, installation of inter-array cables, transport towers, installation of towers, transport nacelles and blades, installation of nacelles and blades, commission of turbines, and commission landside power into grid. Prior to any installation, a full mobilization of all vessels will be conducted, including installation of necessary grillage and sea fastening.

The construction phase will use vessels for the transport and installation of foundations, cables, and turbine components. Typical vessels used in the installation of offshore wind projects normally include tugs, barges, jack-up rigs, supply and crew transport vessels, and cable-laying vessels. Vessels will be operating continually between the port, the turbine siting area, and the Project Substation. During periods of adverse weather conditions, construction activities will be restricted to reduce any unnecessary risks to personnel and vessels. Table 6 lists weather constraint guidelines for different phases of the construction process that will mitigate any unnecessary risks to personnel, vessels, and the environment. Ultimately, it will be up to the individual vessel captains and the project management team to make decisions regarding safe operations during construction.

Table 6. Weather Limitations for Offshore Installation Activities

Operation	Vessel	Wind Limit (m/s)	Wave Limit (m)
Foundation transportation	Feeder Barge	10	1.5 – 2
Turbine component transportation	Feeder Barge	10	2
Transit to site	Feeder Barge	10	1.5 - 2
Nacelle and tower sections installation (lift)	Jack-up Vessel	10	1
Rotor installation	Jack-up Vessel	8	1
Cable installation	Cable Lay Barge	10	1
Transport of personnel	Crew Transport Vessel	10	1.5 - 2
Transfer of personnel to turbine platform during cable installation and commissioning	Crew Transport Vessel	10	1.5

The vessels involved in the construction phase will be properly marked, lighted, and outfitted with sound signals in accordance with applicable navigational rules for the vessel's specific location and activity. Fully trained, licensed vessel operators will be employed for the Project and will adhere to navigational rules and regulations to mitigate any potential safety issues with vessels during the construction phase of the Project. Additionally, a 500 meter safety zone around each foundation will potentially be requested during construction. A temporary exclusion area of up to 500 meters around the vessel installing the inter-array and export cables will also potentially be requested. This will provide clearance of 500 meters from laid cables until burial is confirmed, to prevent any potential interaction with anchors.

The number of vessels to be used for construction of the Project will not be a significant increase over current vessels operating in the Project Area. However, any increase in vessels could increase the risk of vessel collisions, environmental spills due to marine accidents, personnel injury, transit delays, and communication delays due to increased radio traffic. Coordination between construction vessels, the harbormaster, and the USCG will be implemented to ensure safe traffic operations. The USCG will be notified of the construction schedule, location, type and number of vessels, and any private ATONs around the construction area, if needed. Preliminary Notices to Mariners and/or Radio Navigational Warnings will be broadcast prior to and during construction (USDHS & USCG, 2005), and daily notices will be posted on the Project's website. Construction of the Project also has the potential to cause minor disturbance to vessel traffic due to the presence of construction exclusion areas. However, as mentioned above, any exclusion areas that are requested will only be 500-meters in size, and vessel traffic will be restored to normal upon completion of component installation.

5.3 Operational Phase

The portion of the turbine foundations above the water line and the base of the tower, to a height of approximately 39 feet (12 meters) or to at least the height of the ATON, if applicable, will be painted yellow in accordance with the regulations for OREIs in the Aids to Navigation Manual (USDHS & USCG, 2005). Turbines will be marked with visible unique identification characters, either illuminated by a low intensity light, or more likely, coated in a reflective material. As discussed in Section 2.0 of this Navigational Risk Assessment, lighting and fog horns will be installed on the proposed turbines, consistent with USCG and FAA regulations.

A control center capable of remotely monitoring and controlling the Project will be manned 24 hours a day. The control center will be staffed by trained personnel and contain charts indicating GPS position and identification numbers of all Project components, which will also be provided to the USCG. Icebreaker Windpower Inc. will collaborate with the Ninth USCG District, as well as local and state law enforcement/fire departments, to provide necessary contact information and to facilitate emergency response.

During normal operations, all turbines will be equipped with control mechanisms that will allow the operations center personnel to fix and maintain the position of the blades. Nacelles will be capable of being opened from the outside for rescue and maintenance operations when seaborne approaches are not feasible; however, when the turbines are unmanned, all safety hatches and doors to turbine towers and nacelles will be secured and locked.

The USCG may consider establishing a Limited Access Area around the turbines, which will restrict vessel access. However, upon approval from the U.S. Department of Homeland Security (USDHS) and the USCG, the turbine boat landing could potentially be used as a safe harbor for stranded boaters during emergency situations (USDHS & USCG, 2005). Upon the implementation of the measures noted above, no adverse effects or disruptions to normal maritime traffic in the Project Area are anticipated.

5.3.1 Potential for Impacts from Project Vessels

Once the Project is operational, vessel traffic associated with the Project will be minimal. Maintenance vessels will operate in the Project Area as necessary. As with construction vessels, maintenance vessel operators will be fully trained and licensed, and will be expected to adhere to navigational rules and exercise sound judgment and awareness of potential hazards. These vessels will also be properly marked, lighted, and outfitted with a sound signal in accordance with navigational rules and regulations. As with construction vessels, the number and frequency of maintenance vessels and trips will not represent a significant increase over normal vessel traffic in the Project Area. Impacts to navigational safety from the vessels used in the operational phase of the Project will be negligible.

5.3.2 Potential Obstructed Views from Turbines

The proposed design and spacing of the turbines will result in potentially obstructed views of the coastline, ATONs, and between vessels. However, the small number and the linear array of turbines mitigate potential hindrance in sightlines to the coastline and between vessels. In addition to the linear array, there will be 756 meters (2,480 feet) between each turbine, which will result in large areas with some unobstructed lines of sight between each turbine. The turbines have the potential to block ATONs along the coastline from only very specific locations. Additionally, not all ATONs along the coastline will be blocked by the turbines at once. The small number of turbines, their linear array, and the large distance between each turbine will allow for fairly unobstructed views of the coastline, ATONs, and between vessels. Any vessels that experience blocked views of the coastline or ATONs will be at least 8 miles off the coast and will gain visibility as the vessel passes through the area. Moreover, the navigational lights and fog horns that will be mounted on the turbine platforms (as mentioned in Section 2.0) will serve as ATONs.

5.3.3 Potential Vessel Avoidance of Turbines

Large commercial vessels, which typically use the shipping lanes, will not be affected by the Project as the only part of the Project that intersects shipping lanes will be the buried export cable. However, recreational vessels and smaller commercial vessels are not likely to travel any one particular route. These vessels, including commercial fishing vessels and recreational fishing vessels, commercial charter vessels, and recreational passenger vessels, will be the most likely to access the Project Site. There will also be Project maintenance vessels that access the site. However, there will not be a significant increase in traffic due to maintenance vessels. There will be adequate space around the Project Area for any vessel to avoid the turbines while also maintaining a safe distance from other vessels and commercial shipping lanes. The Project will not result in any channel restrictions caused by the presence of the turbines, and the design and spacing are not expected to limit visibility between vessels. Additionally, AIS will be installed on each turbine. This tracking system will allow ships to “see” turbines on their monitoring equipment, thereby reducing potential impacts. Therefore, impacts from potential vessel avoidance of turbines are not anticipated.

5.3.4 Potential Vessel Collision with Turbines

During the planning phase of the Project, multiple locations were considered and the proposed turbine and cable layout was selected to minimize impacts, including those to maritime activities and navigational safety. However, the presence of the turbines will create a risk of potential vessel collision, as will be the case with the installation of any new structure. As described in Section 5.3.3, large commercial vessels using shipping lanes will not be affected by the Project, as they are not anticipated to pass through the Project Site. However, recreational and smaller commercial vessels could potentially be in the vicinity of the turbines. Recreational vessels may be attracted to the turbines if there is any increase in fish presence, or out of curiosity. A risk assessment for the Horns Rev II wind farm off the coast of

Denmark concluded that the collision frequency (vessels to turbines) in the operational phase of the base case scenario was 0.0043 collisions per year (DONG Energy, 2006). Additionally, at that same windfarm, approximately 48,000 boats pass through a shipping lane 8 kilometers (5 miles) from the wind farm, and it was found to cause only minimal hindrance to commercial traffic (NREL, 2010).

There will be adequate space around the Project Site for smaller vessels to avoid the turbines, while also maintaining a safe distance from shipping lanes and other vessels. Electronic equipment, including GPS units, are widely available and commonly used by commercial and recreational boaters, and would serve to mitigate the potential for a collision with the turbines. Additionally, turbines will be marked and lighted in accordance with navigational rules and agreement with fish and wildlife agencies. During adverse weather including storm events, fog, or high winds, the potential for vessel collision with the turbines is increased. The notice to mariners (NTMs), updates to NOAA navigational charts, and proposed turbine lighting, fog horns, and marking will help to mitigate the potential risk of collisions. Measurements around the Project Site indicated that water at the Project Site does not have a specific current or direction (LimnoTech, 2017). The currents and velocities would not aggravate the potential for a vessel collision with the turbines. In the case of vessel engine failure, a vessel could drift into a turbine, but since currents and water velocities are low in the Project Area, any collision due to drifting is not anticipated to be significant.

The Project foundations will be designed to withstand loads from accidental collisions. The design criteria were set for the normal design case load, in which secondary structural parts of the foundation structure will not lose their function, and the abnormal design load case, in which the secondary structural parts are allowed to become torn off. During final design of the foundation, impacts will be considered at the accidental and ultimate limit states. A preliminary analysis included a vertical extent of the collision zone that was assessed between 3 meters (9.8 feet) above and 5 meters (16.4 feet) below the mean water level (MWL). The foundation design will consider an 18-meter (59-foot) vessel with a maximum vessel displacement of 50 metric tons, drifting at a speed of 0.5 m/s for normal design load cases and 2.0 m/s for abnormal design load case. The design will address energy absorption distribution between the vessel and the structure. Vessel impacts and collision design loads will be in accordance with IEC 61400-3 (IEC, 2009), based on design guidelines of ISO 19902 (ISO, 2013) and DNV-OS-J101 (DNV, 2014).

If a collision between a vessel and a turbine does occur, the Applicant will investigate and verify the structural integrity of the turbine and a report will be filed in accordance with the Marine Casualty Regulations in 46 CFR Part 4. Once the Project is operational, the USCG will consider publishing a Regulated Navigational Area (RNA) limiting access for vessels with air drafts greater than 60 feet and limiting the maximum speed through the Special Local Regulation (SLR). This would leave a 6-foot clearance for vessel air draft (66-foot rotor blade clearance above the water surface) and increase safety by slowing vessels transiting the area. The anticipated impacts of vessel collision with turbines from the proposed Project are anticipated to be negligible.

5.3.5 Potential Increased Incidence of Lightning

There is some potential for increased lightning strikes at turbine locations, which could increase potential hazards to nearby vessels. Vessels should maintain a safe distance from turbines and exercise sound judgment in accordance with navigational rules, especially in times of adverse weather. The Horns Rev II offshore wind power plant experienced 289 lightning strikes from June 2009 to September 2012. However, due to a lightning protection system, there were no turbine failures, and all turbines remained operational (Siemens, 2012). Lightning protection is mandatory for land-based and offshore wind power generating systems and, as such, will be included for the Project (NREL, 2010). Additionally, vessel traffic is typically lower during periods of adverse weather. Due to the lightning protection system and lack of vessel traffic likely to be 8 to 10 miles offshore during periods of lightning, no significant impacts due to increased potential for lightning strikes are anticipated. As a point of reference the meteorological tower at the Cleveland Water Intake Crib has been struck by lightning numerous times over the last 12 years and still functions as intended.

In addition, all components on the supporting structure will be designed to be protected against potential differences, stray currents, and lightning by providing appropriate grounding. The grounding will meet standards defined in IEC 62305-1 (British Standard, 2006) and IEC 61400-24 (IEC, 2010).

5.3.6 Potential Ice Hazard

Due to the cold winters in Cleveland, and typical freezing conditions of Lake Erie, as described in Section 3.1.1, ice accumulations on and around the turbines will be expected. However, the presence of the proposed turbines will not be expected to significantly mitigate or exacerbate icing. Research and modeling studies were conducted by the USACE Cold Regions Engineering Research Laboratory, Eranti Engineering, Allyn & Croasdale, and DNV GL to determine potential loadings and fatigue of Project turbines from ice cover in Lake Erie. These studies indicated that the proposed turbine foundation design is conservative and will be capable of withstanding forces from ice floes and, more importantly, from ice ridges and keels. Ice forces and associated dynamic responses will be cut by up to an order of magnitude with the help of the downward icebreaking cone that is proposed to be installed on the turbine foundation.

Blade icing also has the potential to create a hazardous condition. Freezing rain may result in ice build-up on the rotor blades and/or sensors, which could lead to ice shedding or ice throw. Ice shedding occurs as air temperature rises and ice on the blades begins to thaw and ice fragments may drop off the rotors and land near the base of the turbine.

Ice could potentially be thrown when ice begins to melt and stationary turbine blades begin to rotate again. There have been no reported injuries caused by ice being thrown from an operating land-based or offshore wind turbine (Garrad Hassan, 2007; Baring-Gould et al., 2012). The distance traveled by ice thrown from a blade depends on a number of factors, including the position of the blade when the ice breaks off, the location of the ice on the blade when it breaks off, the rotational speed of the blade, the shape of the ice, and the prevailing wind speed.

The risk of ice landing at a specific location drops dramatically as the distance from the turbine increases. *Wind Energy Production in Cold Climate* determined that a safe distance between turbine and occupied structures, roads, or public use areas in regards to ice throw will be equal to 1.5 times the sum of the hub height and rotor diameter (Tammelin, et al., 1998). Based on this calculation, a conservative "safe" distance during periods of ice accumulation around the Project turbines will be 313 meters (1,027 feet). The primary risk from ice throw would be related to commercial and recreational uses of Lake Erie. However, there is minimal recreational boating in Lake Erie between December 1st and April 1st. Marinas in the area close between October and November and do not reopen until April or May, so the number of recreational boats on the water when conditions are favorable for ice formation would be minimal (essentially non-existent). Commercial boating is also limited due to ice cover on Lake Erie. As the few commercial vessels on the lake during icing conditions will stay within the shipping lanes (over 2 miles from the turbines), the anticipated ice hazard impact associated with the Project will be negligible.

5.4 Potential Aids to Navigation

All potential Private ATONs for the construction and operation of the Project will be selected in consultation with the USCG, FAA, and ODOT. In addition, NOAA will be notified prior to and following construction so that the nautical charts can be updated accordingly.

Potential Private ATONs during construction include lighting and notices to mariners (NTM) and airmen (NOTAM). Flashing lights will be placed at the top of any tall cranes used for construction, and NTMs and radio navigational warnings (NOTAM) will be issued prior to and during construction. In accordance with 33 CFR 165 (mentioned in Section 5.1), the USCG may prohibit or restrict vessel access around the turbines during construction.

As mentioned previously, potential ATONs on the turbines during operation will include the following (USDHS AND USCG, 2005):

- Aircraft warning lighting: One red flashing light will be mounted on the nacelle of each turbine and the lights on each turbine will flash synchronously.
- Navigation lighting: Amber, synchronous flashing lights will be mounted on the work platform. Turbines 1 and 6 will be the special periphery structures (SPS) and as such will have amber lights visible up to 5 nautical

miles. Turbines 2 through 5 will be the intermediate periphery structure (IPS) and will have amber flashing lights installed on each turbine platform visible to 4 nautical miles. Each SPS and IPS will have 2 flashing lights installed on each platform to allow 360-degree visibility from all directions. Lights on Turbines 2 through 5 will flash at a rate of 20 flashes per minute, while lights on Turbines 1 and 6 will have a quick flash, with the rhythm still to be decided.

- Turbines 1 and 6 will have fog signals and visibility sensors installed that sounded at 670 MHz. The fog signal will sound once every 30 seconds at Turbine 1 and twice every 30 seconds at Turbine 6.
- Signs and markings: each turbine will be marked with its respective turbine number (ICE1 - ICE6) in large black numbering. Markings will be located on each turbine in the vicinity of the work platform and be visible at a distance of at least 150 yards (450 feet) from the turbines.

Marking and lighting of the turbines will be subject to regular inspections by Project maintenance crews. Any light outages will be corrected as soon as possible. Neither Radar Beacons (racon) nor an Automatic Identification System (AIS) transponders are proposed for the Project. The lighting and marking of the turbines will have no impact on existing ATONs.

6.0 POTENTIAL EFFECTS ON ELECTRONIC NAVIGATION AND COMMUNICATIONS SYSTEMS

6.1 Communications Systems

The USCG recommends that boaters purchase a very high frequency (VHF) marine radio before purchasing anything else for their boats (USCG, 2016). VHF radios are required on vessels greater than 20 meters (65.6 feet) and while not required, are common on smaller vessels as well. VHF radio is the most frequently used radio and has designated channels for commercial ships to confirm passage and communicate actions, mayday distress calls, storm warnings and boat to boat communication. Studies on the Horns Rev wind farm in Denmark and the North Hoyle wind farm in the United Kingdom concluded that there were no significant effects on VHF communication in the vicinity of the wind farms. Those wind farms ranged from 30 to 80 turbines (Elsam, 2004; MCA and QinetiQ, 2004). Additionally, a modeling study by the University of Texas at Austin confirmed that the effect of wind farms on communication systems, including VHF, is anticipated to be low (Ling et al., 2013).

In comparison to the Horns Rev and North Hoyle wind farms, the proposed Project is a much smaller wind farm, with only six turbines. It is anticipated that there will be a similar lack of effects on communication systems from the Project.

6.2 ***Radar***

Radar technology is one of the more important instruments in aiding a vessel operator to navigate safely and avoid collision, particularly when visibility is reduced (USCG, 2009). Wind turbines have the potential to create clutter interference and possibly significant Doppler interference with sensitive radars fielded by the FAA, Department of Defense (DOD), NOAA, and other agencies. Comsearch was contracted to send written notification of the proposed Project to the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce. Upon receipt of notification, the NTIA provides plans for the proposed Project to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC), which includes the DOD, the Department of Education, the Department of Justice, and the FAA. The NTIA then identifies any Project-related concerns detected by the IRAC during the review period. The notification letter was sent to NTIA on August 11, 2016 and a response was received on October 13, 2016. Only the DOC identified concerns regarding the Project impacting its radar systems. The DOD's concern was the potential degradation of the detection of lake effect snow. However, DOC proposed a mitigation strategy whereby the Applicant shares near-real time wind turbine meteorological tower data to compensate contaminated radar data with "ground truth" wind and precipitation data. The Applicant has consulted with DOC and received notice that there will be minimal impacts to the radar. There were no concerns from any other IRAC agencies.

The study from the University of Texas at Austin, mentioned above, modeled the effect of offshore wind farms on marine radars typically installed on boats and shipping vessels. It was found that wind farm signal scattering could produce a confusing navigational picture if a boat is inside a wind farm, but there will be minimal interference to tracking of vessels operating outside the wind farm (Ling, et al. 2013). Additionally, the USCG determined that vessels operating around the Cape Wind Energy Project, a 130 turbine wind farm off the coast of Cape Cod, Massachusetts, will be able to navigate safely within and in the vicinity of the proposed wind farm and that the impact of the proposed wind farm on navigation safety would be "moderate" (USCG, 2009). For Icebreaker Wind, a much smaller project with a single line of turbines, the impacts on navigational radar on vessels from the turbines will be minimal. Also, the Applicant has filed a FAA Notice of Alteration or Obstruction form (7460-1), which will trigger the DOD Siting Clearinghouse Review to confirm that military radars will not be adversely impacted. Form 7460-1 was submitted by the Applicant on July 22, 2016, and the application status was updated in December 2016. The FAA issued its Determination of No Hazard to Air Navigation on February 22, 2017 and is included as Appendix D.

6.3 **Positioning Systems**

Global Positioning Systems (GPS) are becoming more frequently used by commercial and recreational boaters as they are easily available and affordable. GPS provides the fastest and most accurate method for mariners to navigate, measure speed, and determine location, enabling increased levels of safety for vessel operators. GPS is also playing an increasingly important role in the management of port facilities. GPS technology includes 24 satellites that triangulate a user's position based on line of sight transmitted by multiple satellites (NOAA, 2014). While objects, such as buildings or mountains, can block a satellite's line of sight, it is possible to receive only slightly degraded positions with only three satellites having line of sight (NOAA, 2014). The Project turbines will not obscure all satellites at the same time, given the proposed small diameter of the turbines, large distance between turbines, and single line array. Therefore, the Project's impact on GPS signal reception and accuracy are anticipated to be minimal.

6.4 Electromagnetic Interference

The wind turbines are not anticipated to generate any electromagnetic fields (EMFs), however potential EMFs could be generated by the inter-array cable and export cables. Very little, if any, magnetic field is produced by three-core cables, as interference among the three phases cancel each other out (Sharples, 2011). In addition, any potential EMF effects will be mitigated by the bundling, armor, insulation and targeted burial depth of at least 1.5 meters (4.9 feet). Electromagnetic fields produced by electrical cables tend to be restricted to an area of several meters from the cable. The estimated magnetic field from the Project export cable will be much less than the earth's naturally occurring background levels, and because the cable will be shielded and jacketed with an insulator, electric field impacts will not post an issue to communications (LimnoTech, 2016a). Any impacts from EMF fields are anticipated to be negligible.

6.5 Noise Generation and Sonar Interference

The majority of noise generated by the Project will occur during the construction phase. People who could be aware of noise during construction include recreational boaters on Lake Erie or people on public-use areas along the shoreline. Due to the relatively short duration of construction exposure to construction-based noise to boaters would be short-term and minor. In addition, boaters could choose to avoid the area during periods of elevated construction noise. Therefore, impacts on vessels are not expected. During the operational phase, a slight increase in noise will be expected in the vicinity of the turbines. In the frequency bandwidths used by marine sonar systems, such as commercial and recreational fish finders, the amount of sound energy generated by turbines is orders of magnitude lower than the sonar systems (Lurton, 2002). Modeling studies have determined that, due to the virtual absence of noise exceeding background levels radiated underwater by wind turbines at frequencies above 1 kilohertz (kHz), interference with underwater acoustical systems will be unlikely. Below 1 kHz tones radiated underwater could potentially cause interference when in close proximity to a wind farm (Ling et al., 2013). At these volumes and frequencies, no impacts on typical marine communication systems will be anticipated. Above water the noise from operating turbines is approximately 50 decibels at a distance of 100 meters (328 feet) from the turbine. That level is comparable to ambient noise levels (General Electric, 2014). At ambient noise levels, noise from the turbines over the water will not cause interference with sound signals from vessels or ATONs near the Project Site, nor pose health concerns to passing vessel crews.

7.0 POTENTIAL IMPACT ON USCG MISSIONS

The Applicant will ensure that all applicable USCG command centers be provided the GPS position and identification number of each wind turbine. Additionally, the contact number of the control center will be provided to USCG command centers. Any distress call received by the USCG Search and Rescue Mission Coordinator will be passed to the Project's control center. A shutdown procedure will be initiated until the Search and Rescue Mission Coordinator notifies the control center that it is safe to restart the turbines.

The USCG provided search and rescue (SAR) and pollution incidents in the Project Area from the Marine Information for Safety and Law Enforcement (MISLE) database. An analysis of the past 10 years of data (2006 through 2016) was performed for this assessment to assess any potential impacts the Project may have on the ability of the USCG to conduct and respond to SAR and pollution incidents. MISLE activities include all USCG activities such as SAR cases, boardings, pollution, and marine casualty investigations. MISLE IIA activities are specific to pollution and marine casualty investigation activities, which require a response and an investigation. In the past 10 years (2006 through 2016) there have been 187 MISLE IIA activities around the Project Area (Figure 14; Table 7). Appendix E contains detailed MISLE IIA activities from the past 10 years in the vicinity of the Project.

In all but one case, the responding unit was the USCG Marine Safety Unit located in the Cleveland Harbor. There were no data available on time of day or weather conditions during these incidents, but the months with the greatest numbers of incidents were May (19 incidents), June (23 incidents), and July (28 incidents) when recreational boating activity is high. The month of October had a high number of incidents (33) due to Super Storm Sandy on October 30, 2012, which resulted in 21 incidents. The majority of cases occurred within the Cleveland Harbor, and no incidents occurred in the direct vicinity of the proposed turbine site for Icebreaker Wind (Figure 14). Specific data regarding commercial salvors and helicopter hoists in response to the incidences were not available.

Table 7. MISLE IIA Activities in the Vicinity of the Project

Activity	Year											Grand Total
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
Allision	2	5	3	1	3	3	1		1	4	1	**24**
Discharge/Release – Pollution	1	3	4	5	10	13	34	12	3	9	3	**37**

Activity	Year											Grand Total
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
Fire – Initial					1							**1**
Flooding – Initial				1			1		1			**3**
Flooding – Progressive									1			**1**
Grounding	1											**1**
Loss of Electrical Power			1					2	2			**5**
Loss/Reduction of Vessel Propulsion/Steering			1		4	3	1	2	2	2	1	**16**
Material Failure/Malfunction			1	1	5	1	1	4	5	4		**22**
Personnel Casualty – Injury	2	1		3	1	4						**11**
Sinking			1	2		2						**5**
Vessel Maneuver								1				**1**
Grand Total	**6**	**9**	**11**	**13**	**24**	**26**	**38**	**21**	**15**	**19**	**5**	**187**

Discharge/release of pollution incidents range from significant oil and gas leaks to a sheen on the water from vessels, nearby traffic, and industry at the Cleveland Harbor (Figure 14). There were 37 incidents related directly to the discharge/release of pollutants in the past 10 years.

USCG responders are trained in safe navigation and are prepared to handle all conditions that may be encountered in the environment of the Project Area. As previously described, due to the small number of turbines, their linear array, and the large distance between each turbine, the Project will not significantly affect SAR operations in the vicinity of the Project. Based on the windfarm design including a 20 meter (66 foot) blade tip clearance over the water level, the USCG marine assets should be able to operate in and around the turbines with minimal impact to their operation. While the Project will not cause any delays in response time, the turbines may pose a risk or delay to rescue helicopter missions near the turbine sites until emergency shutdown procedures can be implemented. Once the emergency shutdown is implemented, it will take less than 30 seconds for the turbines to shut down. The turbines will not obstruct cruising helicopters, as the cruising altitude of the helicopters is approximately 1,500 feet above mean sea level, approximately 1,000 feet above the highest point of the turbines (M. Collet, personal communication, 2017). However, the flight for the search pattern will be approximately 300 feet above water level, which is within the rotor area. Pilots should exercise caution when flying near turbines during search patterns.

Visibility of the turbine blades to SAR helicopters will be reduced at nighttime. If pilots cannot make a visual determination on the position of the turbine blades, they should assume that the rotor could be oriented in any direction in a 360 degree circle. This would define a spherical “no fly” zone around each turbine, within which the helicopter should not operate unless he/she can make a visual determination that it is safe to do so. However, for SAR missions, USCG helicopter crews are equipped with night vision goggles and a large external search light on the aircraft known as the “Night Sun” (M. Collet, personal communication, 2017). The technology available to the helicopter crew will provide an increased visibility of the turbine blade position. Additionally, helicopters will not typically be used during periods of low visibility. If visibility is under ¼ statue mile, heavy consideration whether to fly will be taken by the crew, Aircraft Commanders, and Operations Officer prior to flying. If technicians are available in the turbine, the rotor can be pinned in a specific position. If technicians are not available, the parking brake can hold the rotor for a limited amount of time in a random rotational position. The coordinates of the turbines will be available to the helicopter pilots. The largest helicopter that would be used by the USCG for rescue missions in Lake Erie would be the MH60T, with a rotor diameter of 53 feet, 8 inches (M. Collet, personal communication, 2017). The distance between each turbine is approximately 2,480 feet. This distance would provide room for helicopters to safely navigate between turbines. Therefore, helicopter pilots should use caution when approaching turbines and only operate near the turbine when they have made a determination that it is safe to do so. Technology aboard the helicopters will help to increase the visibility of the turbine blades, increasing safety for air crew members.

Additionally, the turbine platforms may be used as a way for stranded boaters to get out of the water, or a mooring for drifting vessels.

As described for SAR incidents above, the Project is not anticipated to result in any additional pollution cases, nor is it anticipated to impede or cause a delay in response to pollution spill incidents. In order to make sure that no discharges of any fluids (oil, hydraulic, cooling, etc.) occur even under abnormal circumstances, the turbine is designed for three levels of containment. Each primary system, i.e. gearbox, is a sealed system with multiple sensors that monitor fluid performance and containment, with each of these inspected at regular maintenance intervals. The secondary system is in the nacelle itself, where fluid containment reservoirs are designed to capture any leaks from a primary system failure. In the event that both primary and secondary containment fails, the bottom of the tower has a reservoir to contain any fluids originating from the nacelle. In the extremely rare incidence of failure of all three containment systems, any fluid that may leak into the environment will be inherently biodegradable. Also, service vessels will be equipped with oil spill handling materials adequate to control or clean up any accidental spill. Additional traffic often heightens the potential for a pollution incident. However, there will not be a significant increase in vessel traffic during construction or operation of the Project. Additionally, the risk of collision between boats and the turbines will be negligible (see section 5.3.3) and no oil or hazardous materials will be stored at the turbines. Vessels involved in the construction phase of the Project will have a variety of oils or other materials on board that may have a risk of release. The vessels will be navigated by fully trained, licensed vessel operators who will adhere to navigational rules and regulations, to all state laws regarding the safe handling of hazardous materials and reporting and response requirements in the event of a spill.

8.0 ICEBREAKER WIND SHUTDOWN PROCEDURES

A control center capable of remotely monitoring and controlling the Project will be manned 24 hours a day. The control center will be staffed by trained personnel and contain charts indicating GPS position and identification numbers of all Project components, which will also be provided to the USCG. During normal operations, all turbines will be equipped with control mechanisms that will allow the operations center personnel to fix and maintain the position of the blades. Control room personnel will be able to shut down turbine operation in the event of an emergency.

A shutdown procedure will be developed by Icebreaker Windpower Inc. as part of an emergency response plan. This plan will be shared with the local USCG office and first responders. In addition to the response plan, Icebreaker Windpower Inc. will work with the USCG, first responders, and other local authorities to carry out communication and shutdown procedure training in response to emergency situations related to the Project. Any distress call received by the USCG Search and Rescue Mission Coordinator will be passed to the Project's O&M and control center. The shutdown procedure will be initiated until the Search and Rescue Mission Coordinator notifies the control center that it is safe to restart the turbines. The communication and shutdown procedures will be tested by the Applicant at least twice per year.

9.0 MITIGATION STRATEGIES

As described throughout this report, the construction and operation of the Project may increase risk to navigation safety in the area. However, through the use of appropriate mitigation strategies, the risk to navigational safety from the Project is expected to be minimal.

Throughout the construction phase there will be a slight increase in vessel traffic at the turbine and cable route sites, between the Port of Cleveland and these sites, and within the Cleveland Harbor. However, the Project Area (including the Cleveland Harbor and Port of Cleveland) frequently experience high vessel traffic, and the additional traffic generated as a result of Project construction will be negligible. Nonetheless, increased traffic could result in an increased chance of vessel collisions, environmental spills due to marine accidents, personnel injury, transit delays within the port, and communication delays as a result of increased marine radio traffic. Mitigation strategies proposed for the Project include requesting designated safety zones and exclusion areas around the turbine sites and cable routes, and publishing and broadcasting NTMs and radio navigational warnings. Even though the traffic increase due to Project construction is expected to be minor, these mitigation strategies will help further reduce any risk to navigational safety from Project construction.

During the operational phase, risks to navigational safety could result from the addition of new obstructions (turbines) and some increased turbine maintenance vessel traffic. This could potentially lead to increased risk of collisions with turbines and between vessels, environmental spills or personnel injury due to a marine accident, interference with USCG operations, and confusion to mariners. Due to the small scale of the Project, and large spacing between turbines, these risks are considered to be minimal. However, mitigation strategies to further minimize risk include publishing and broadcasting NTMs and radio navigational warnings, working with NOAA to update navigational charts, markings and lights on turbines and platforms consistent with USCG guidelines, and coordination with the local USCG office and first responders for emergency preparedness. Due to the low level of risk and additional mitigation strategies proposed, the risk to navigational safety is expected to be negligible.

10.0 CONCLUSIONS

A change analysis, based on the USCG's Risk-Based Decision-Making Guidelines, is used to assess the risk effects and proper management strategies in situations where change is occurring. To assess risk to navigational safety, a change analysis was performed for construction and operational phases of Icebreaker Wind. The change analysis is included as Appendix A. This Navigational Risk Assessment includes details on many of the factors that may contribute to elevated risk, including environmental conditions, weather, current vessel traffic patterns, coordination with agencies and local first responders, and an analysis of electronic navigation and communication systems.

The analysis of the construction phase indicated that the construction plans, and vessel routes and traffic, will not adversely affect navigational safety in the Project Area. The establishment of safety zones and/or exclusion areas around the turbine sites and cable route during construction will mitigate any risks associated with construction areas and associated traffic. Vessel traffic increases as a result of construction are expected to be minor in comparison over current traffic use of the Project Area, as the Cleveland Harbor and Port of Cleveland frequently experience high traffic volumes during peak spring and summer seasons.

The change analysis and this Assessment include details on Project design and turbine layout, existing traffic routes, and electronic navigation and communication systems. While there is an elevated risk to navigational safety, especially during low visibility or inclement weather conditions, the mitigation strategies employed by the Applicant, and coordination with local USCG and other relevant authorities, will substantially reduce the risk to navigational safety. Due to the small number of turbines, their linear array, the large amount of space between each turbine, and the 20 meter (66 foot) rotor clearance above the water surface, risk of collisions with turbines due to the new structures are expected to be easily avoided. Updating navigational charts and following lighting and ATON requirements with the USCG will help to mitigate vessel collisions with the turbines. The Project will not significantly affect the USCG's missions.

Additionally, Icebreaker Windpower Inc. is committed to working with the USCG, local emergency responders, and other relevant local authorities throughout the development, construction and operation of the Project to minimize risks to navigational safety.

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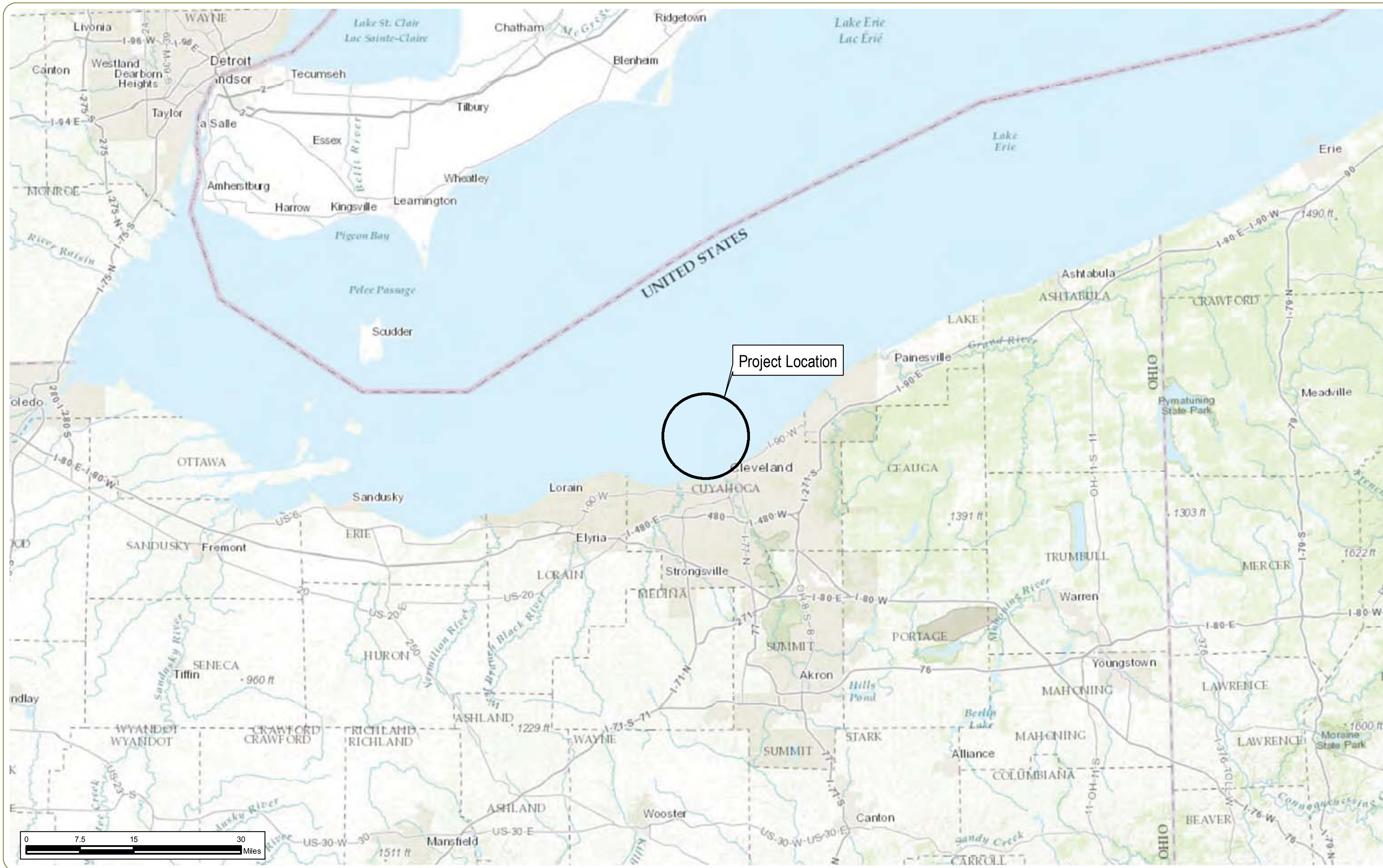
FIGURES



Icebreaker Wind

Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 1: Regional Project Location

Notes: 1. Basemap: ESRI ArcGIS Online "World Topographic Map" map service.
2. This map was generated in ArcMap on March 17, 2017.
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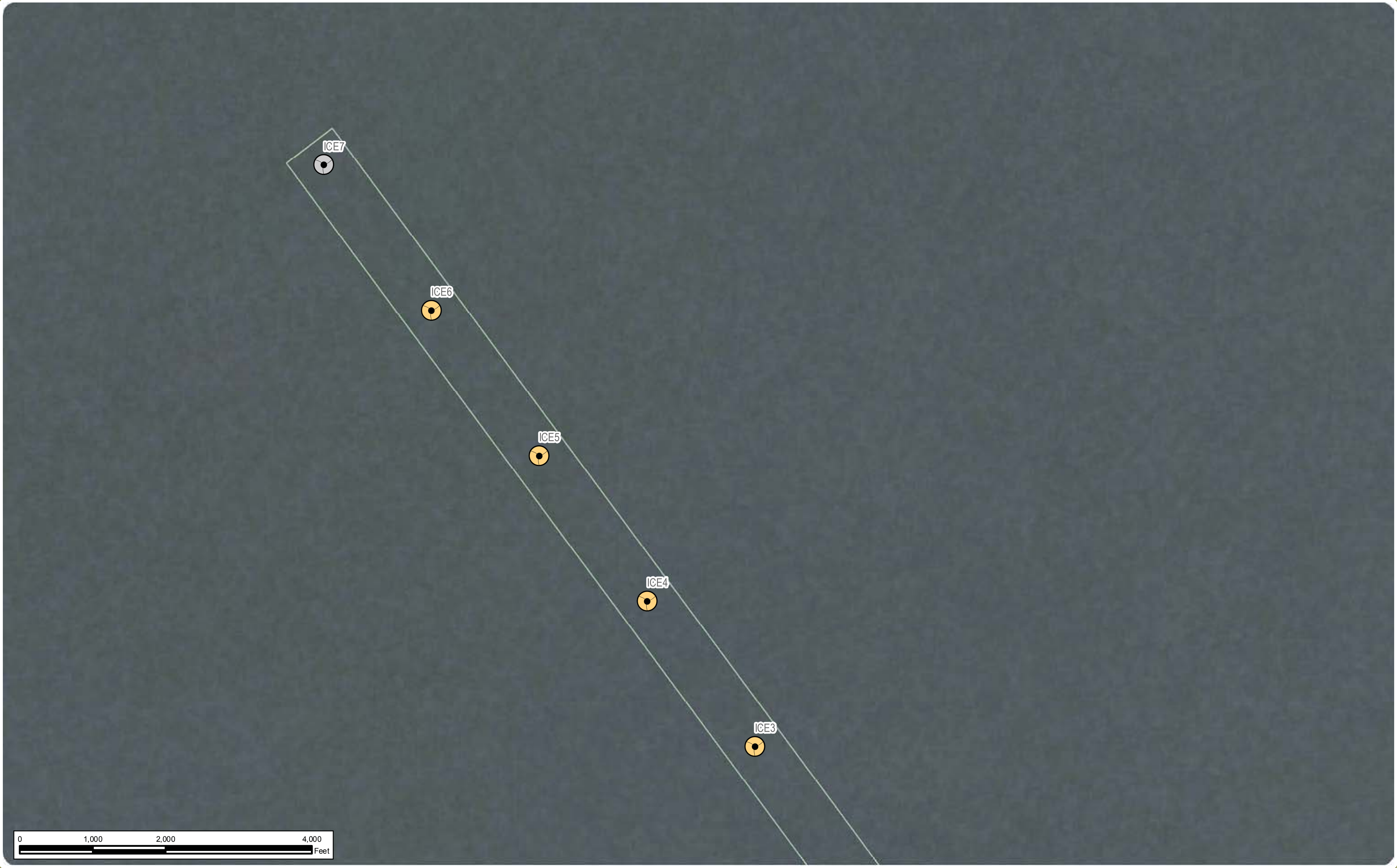

Icebreaker Wind

Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 2. Project Layout

Sheet 1 of 6

Notes: 1. Basemap: ESRI ArcGIS Online "World Imagery" map service.
2. This map was generated in ArcMap on March 17, 2017.
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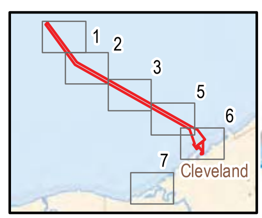
Wind Turbine

Alternate Wind Turbine

Ancillary Features

Cable Route Envelope



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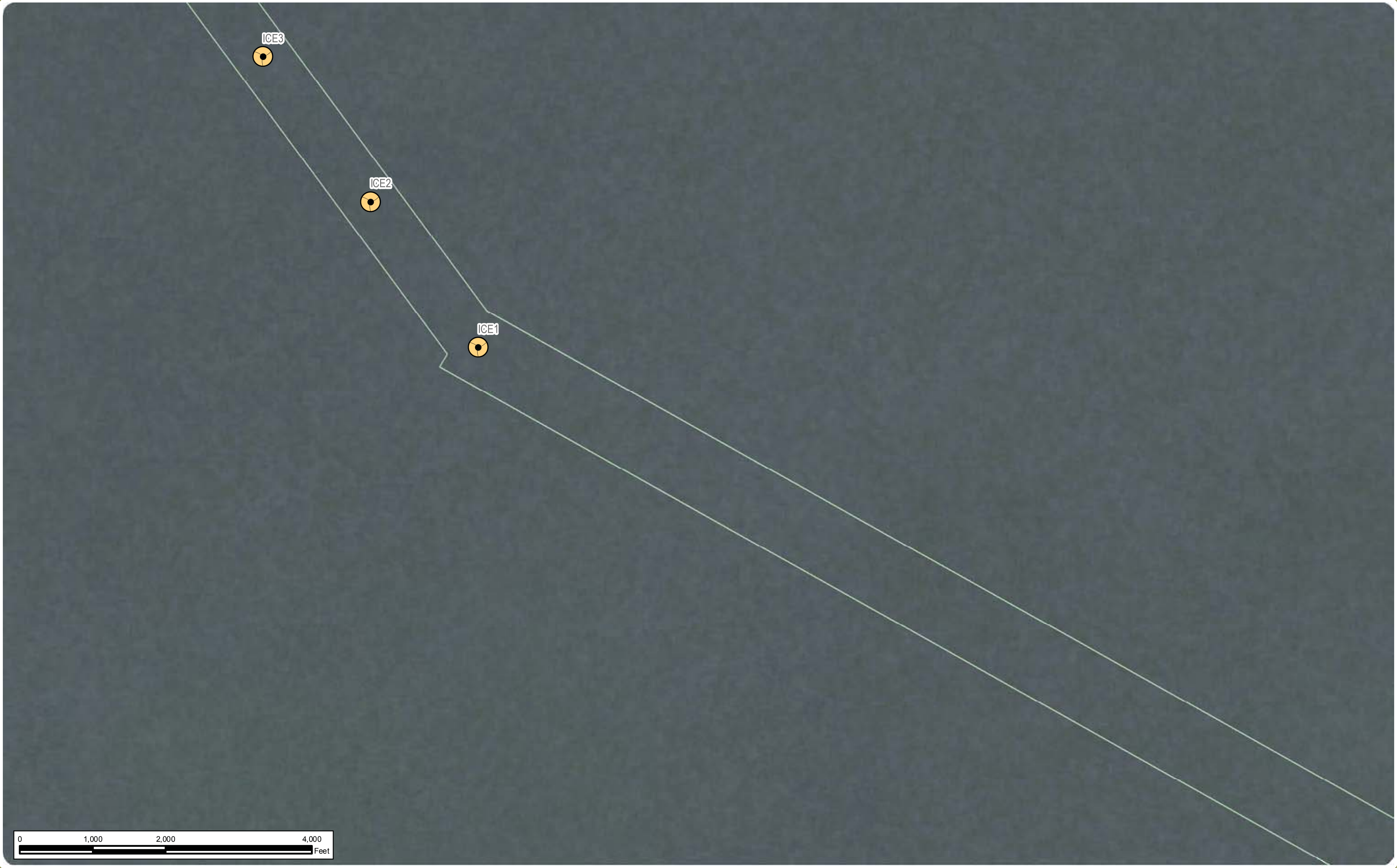

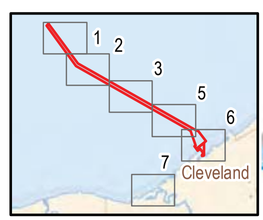

Icebreaker Wind

Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 2. Project Layout

Sheet 2 of 6

Notes: 1. Basemap: ESRI ArcGIS Online "World Imagery" map service.
2. This map was generated in ArcMap on March 17, 2017.
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- Wind Turbine
- Alternate Wind Turbine
- Ancillary Features
- Cable Route Envelope

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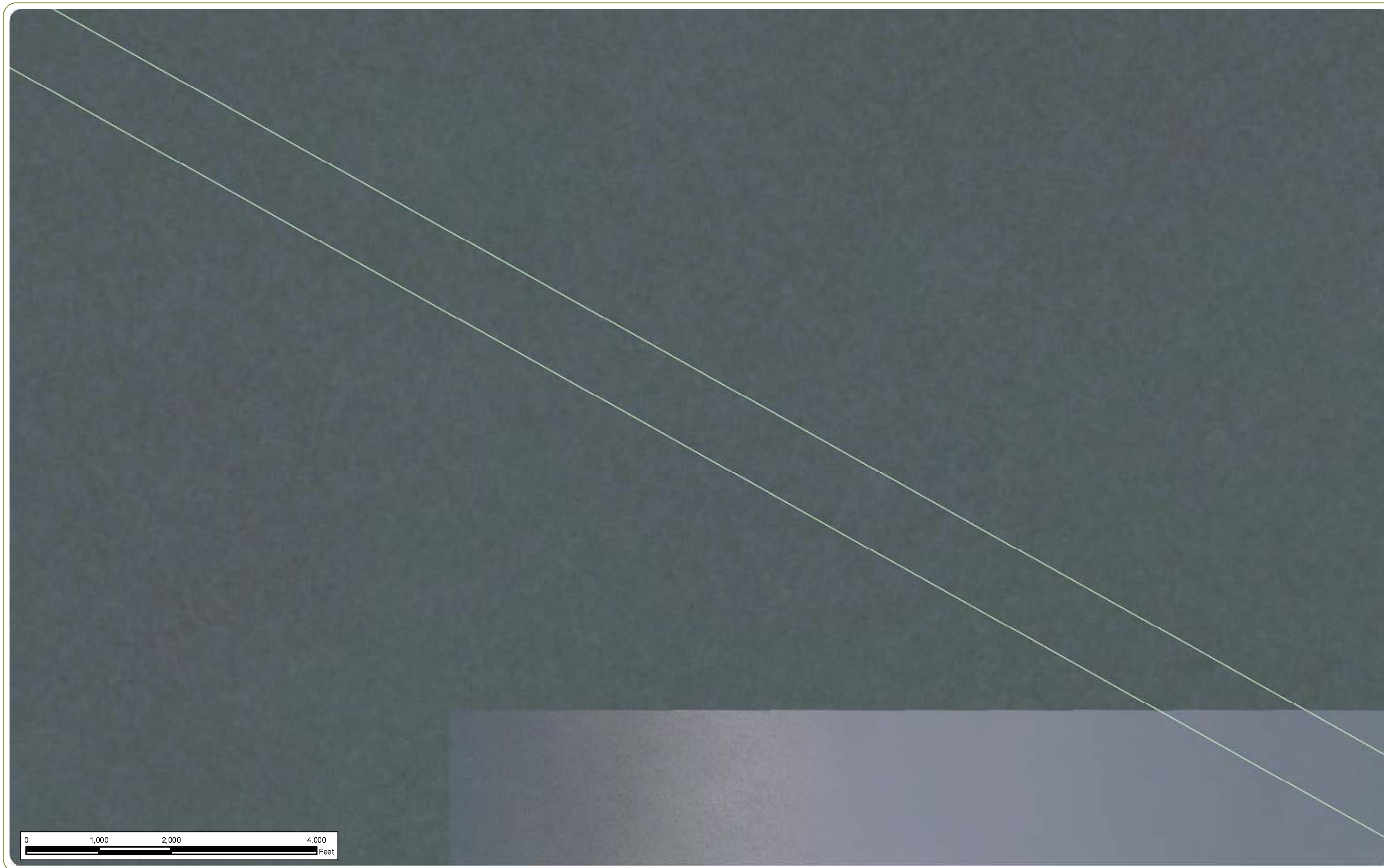

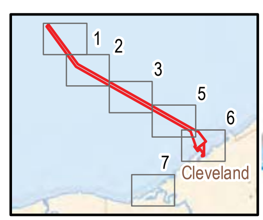

Icebreaker Wind

Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 2. Project Layout

Sheet 3 of 6

Notes: 1. Basemap: ESRI ArcGIS Online "World Imagery" map service.
2. This map was generated in ArcMap on March 17, 2017.
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

- Wind Turbine
- Alternate Wind Turbine
- Ancillary Features
- Cable Route Envelope

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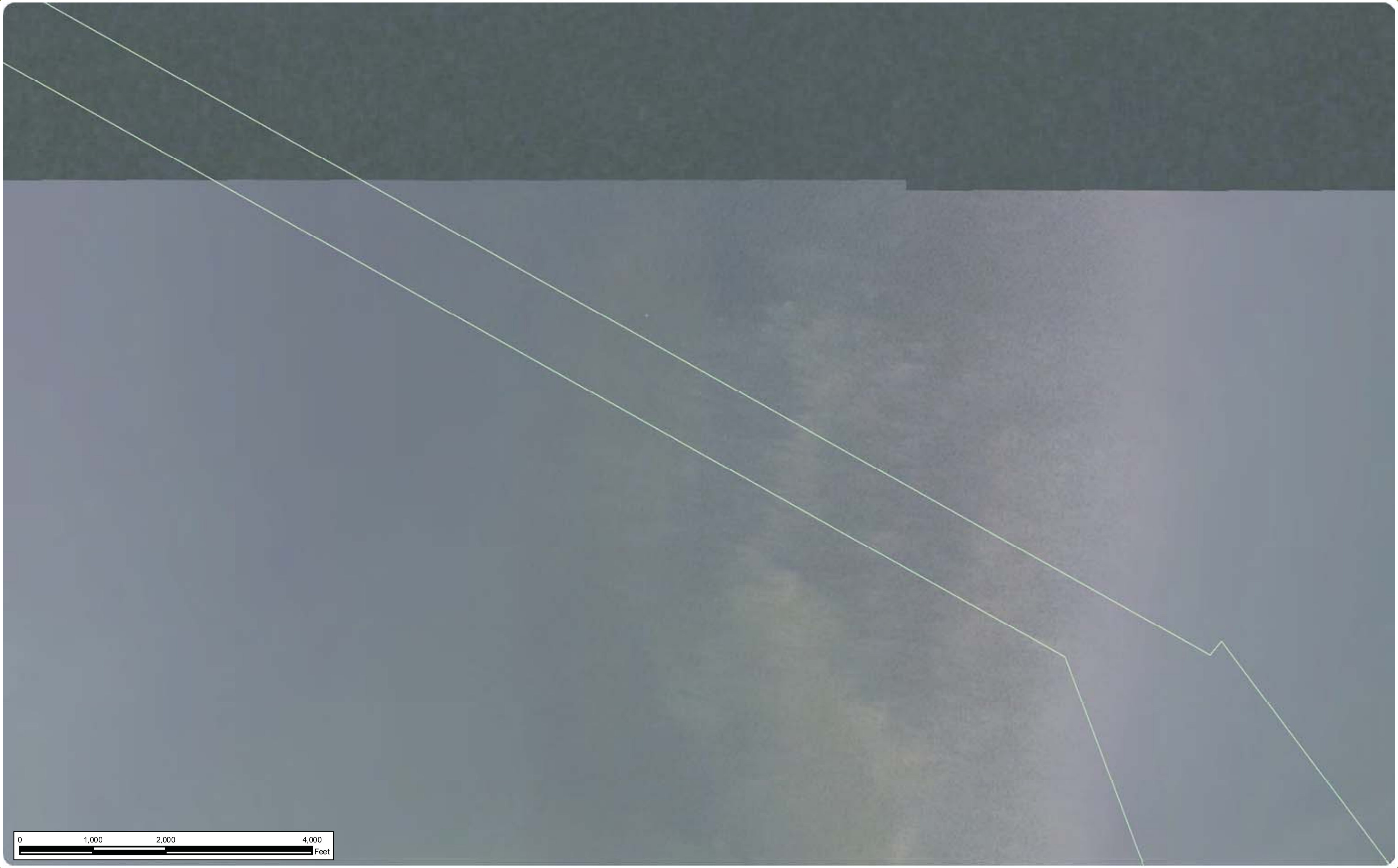

Icebreaker Wind

Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 2. Project Layout

Sheet 4 of 6

Notes: 1. Basemap: ESRI ArcGIS Online "World Imagery" map service.
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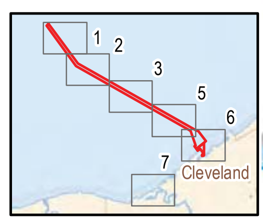
Wind Turbine
Alternate Wind Turbine
Ancillary Features
Cable Route Envelope



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Icebreaker Wind

Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 2. Project Layout

Sheet 5 of 6

Notes: 1. Basemap: ESRI ArcGIS Online "World Imagery" map service.
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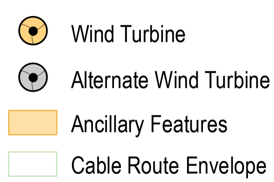
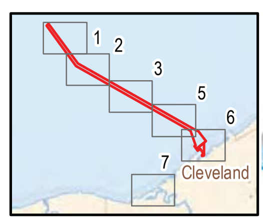




Icebreaker Wind

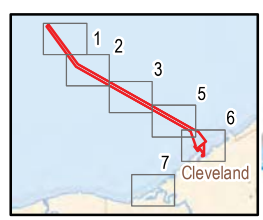
Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 2. Project Layout

Sheet 6 of 6

Notes: 1. Basemap: ESRI ArcGIS Online "World Imagery" map service.
2. This map was generated in ArcMap on March 17, 2017.
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

Wind Turbine
Alternate Wind Turbine
Ancillary Features
Cable Route Envelope



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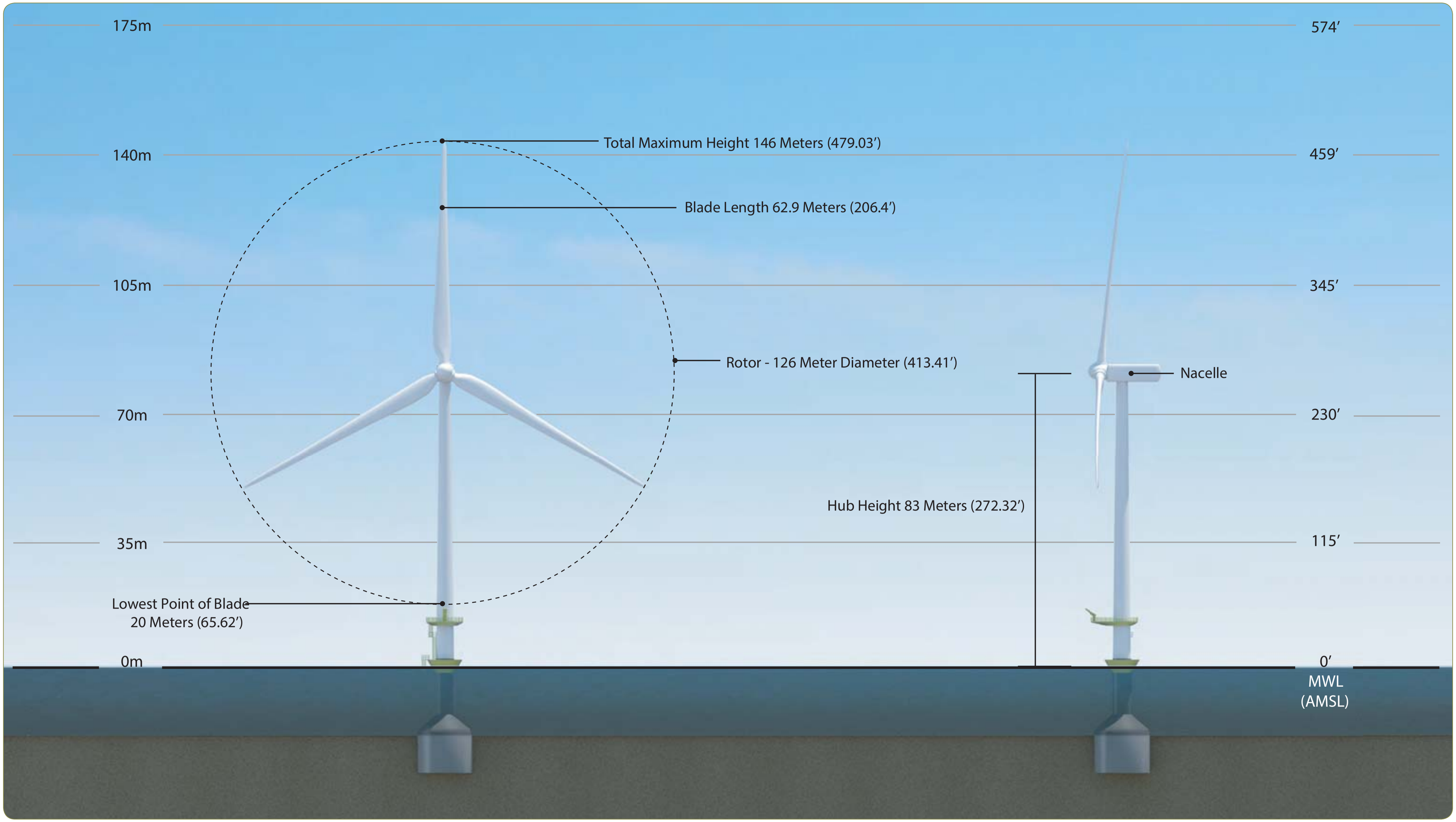

Icebreaker Wind
Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 3: Turbine Design

November 2016

Prepared for:

Prepared by:

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Icebreaker Wind

Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 4. Proposed Nearshore Cable Line

Substation Parcel

Cable Route Envelope

Notes: 1. Basemap: ESRI ArcGIS Online "World Topography" map service.
2. This map was generated in ArcMap on March 17, 2017.
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

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Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 5. Lake Erie Bathymetry

Notes: 1. Basemap: ESRI ArcGIS Online "World Imagery" map service.
2. This map was generated in ArcMap on March 17, 2017.
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

Wind Turbine
Alternate Wind Turbine
Bathymetry (ft)
Substation Parcel
Cable Route Envelope

Icebreaker Wind

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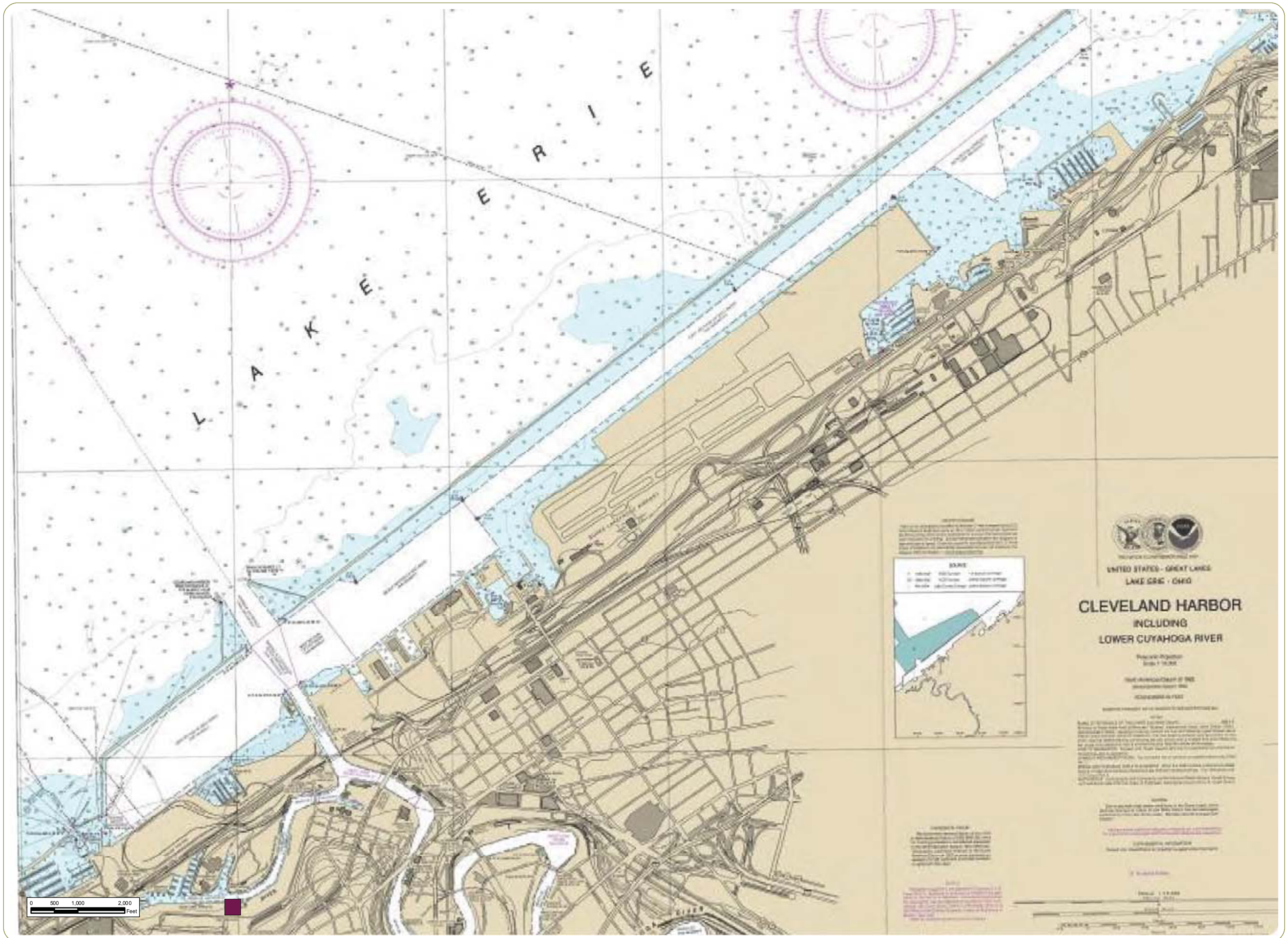

Icebreaker Wind

Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 6. Cleveland Harbor

Notes:
1. Basemap: NOAA Navigational Chart #14839.
2. This map was generated in ArcMap on March 23, 2017.
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

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Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 7. NOAA Obstructions

Notes: 1. Basemap: ESRI ArcGIS Online "World Imagery" map serivce.
2. This map was generated in ArcMap on March 23, 2017.
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

- ENC Wreck
- AWOIS Wreck
- AWOIS Obstruction
- Cleveland Public Power Substation
- Wind Turbine
- Alternate Wind Turbine
- Cable Route Envelope

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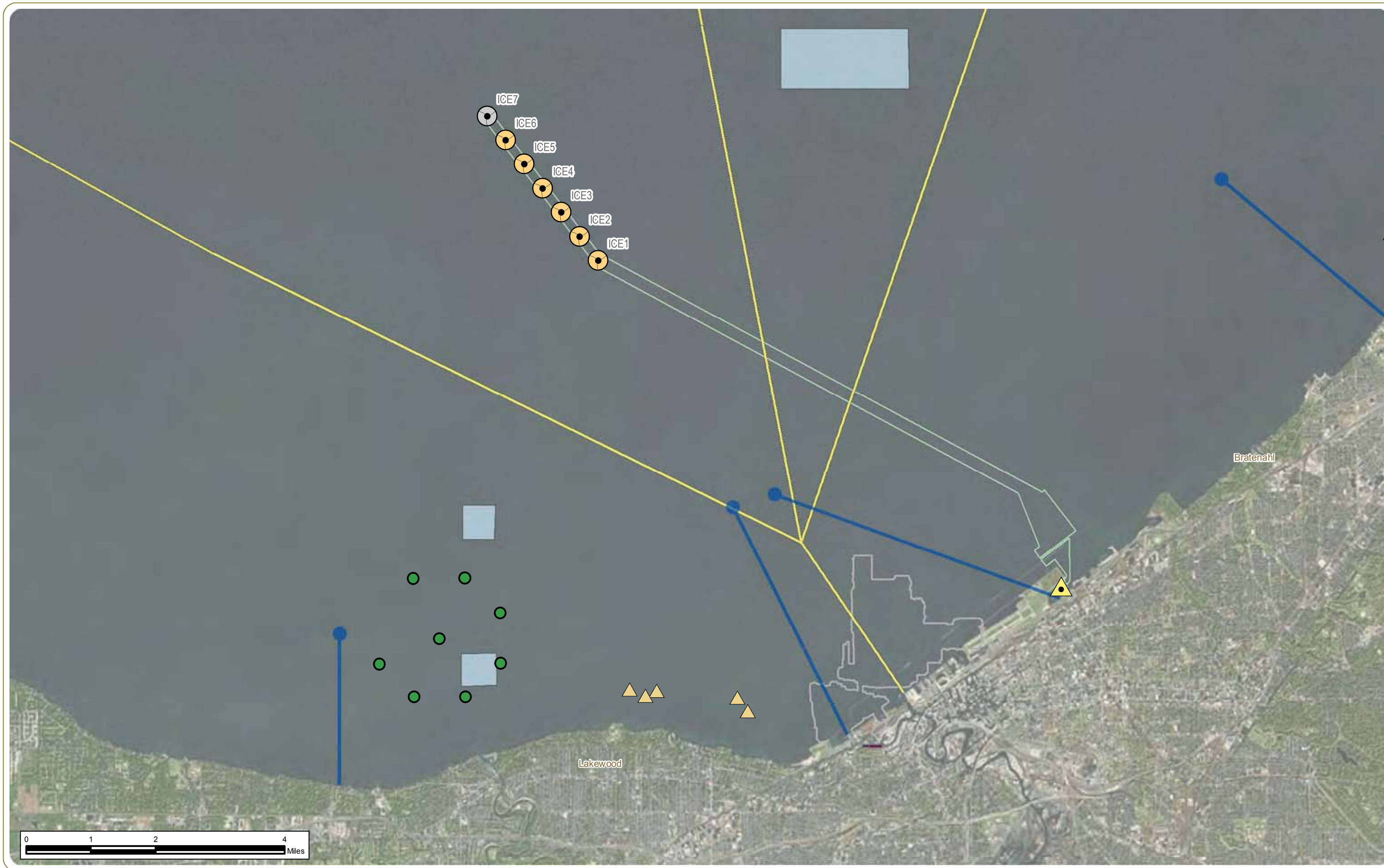

Icebreaker Wind

Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 8. Project Area Existing Uses

Notes: 1. Basemap: ESRI ArcGIS Online "World Imagery" map service.
2. This map was generated in ArcMap on March 23, 2017.
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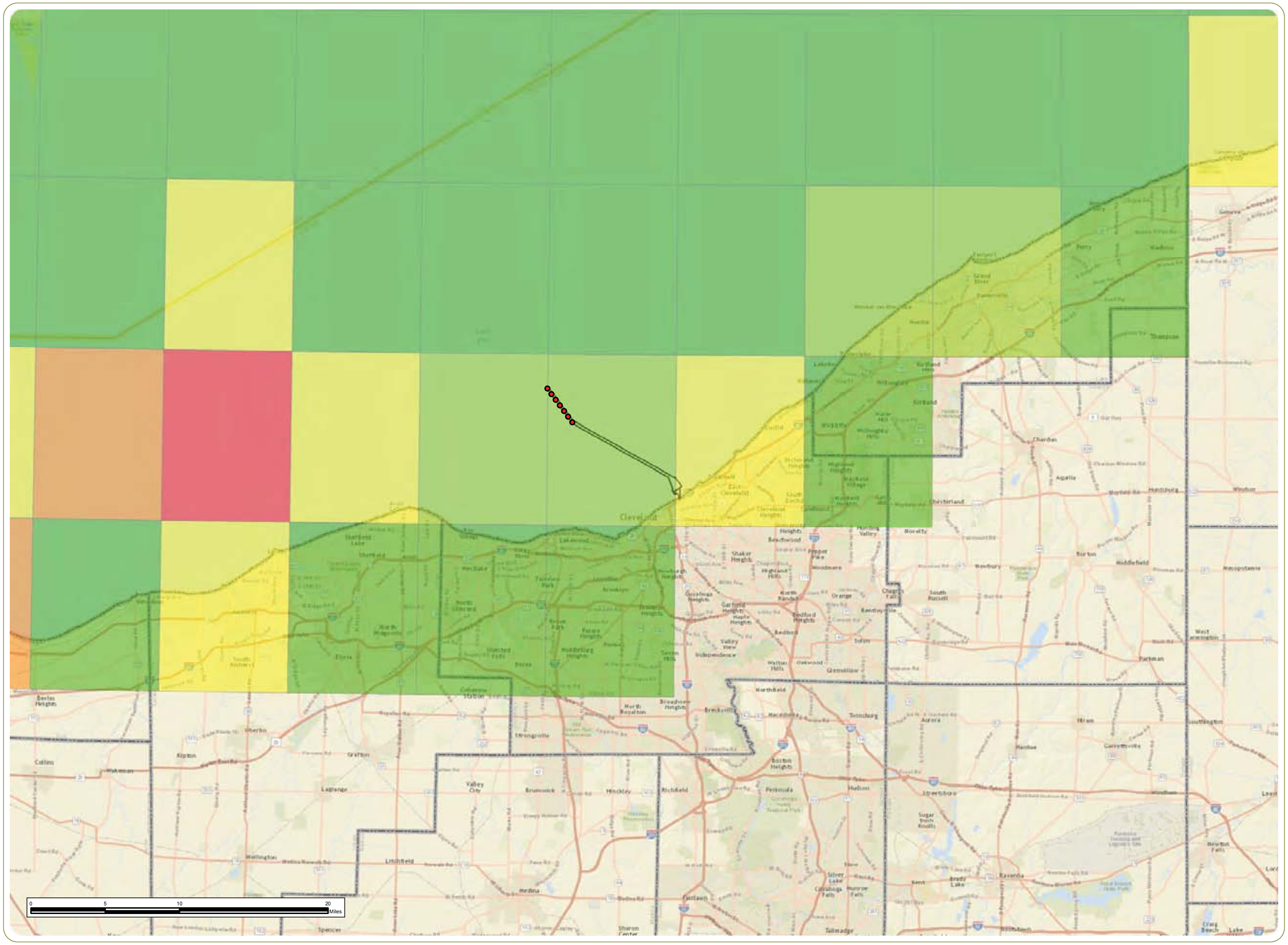

Icebreaker Wind

Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 9. Commercial Fisheries in Lake Erie

- Wind Turbine
- Electric Collection Line Envelope
- County Boundary

Commercial Fishery Density

- Less than 1%
- 1.0% to 3.0%
- 3.1% to 6.0%
- 6.1% to 14.4%
- Over 14.5%

Notes:
1. Basemap: ESRI ArcGIS Online "World Street Map" map service.
2. This map was generated in ArcMap on June 13, 2017.
3. Commercial fishery density is from ODNR, represents percentage of total fishing nets pulled from each management unit (2011-2015).
4. This is a color graphic. Reproduction in grayscale may misrepresent the data.

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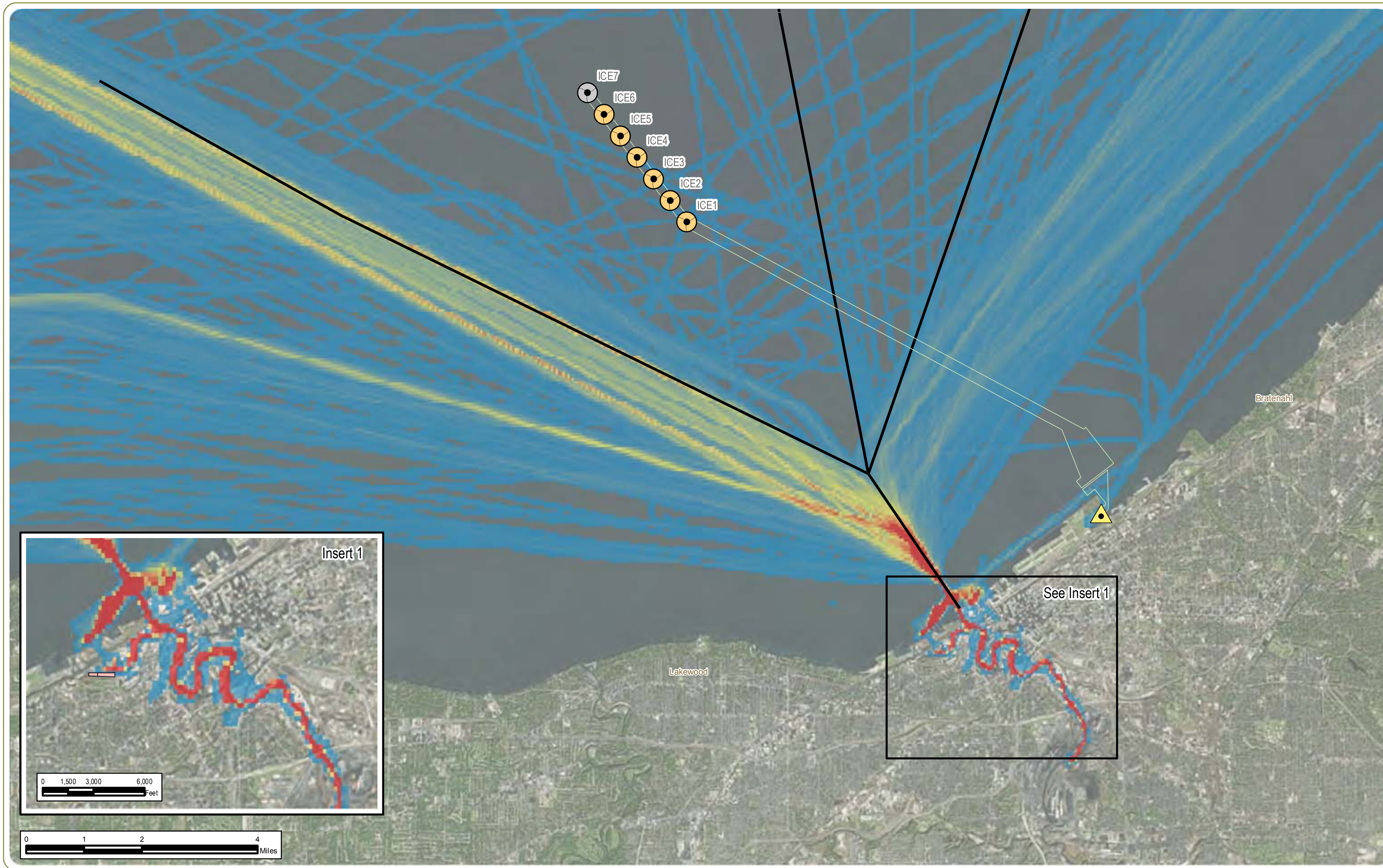

Icebreaker Wind

Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 10. Cargo Vessel Density

Notes: 1. Basemap: ESRI ArcGIS Online "World Imagery" map service.
2. This map was generated in ArcMap on June 13, 2017.
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

Wind Turbine
Alternate Wind Turbine
Cleveland Public Power Substation
Shipping Lanes
Cable Route Envelope
O&M Center Parcel
Cargo Vessel Density
High
Low

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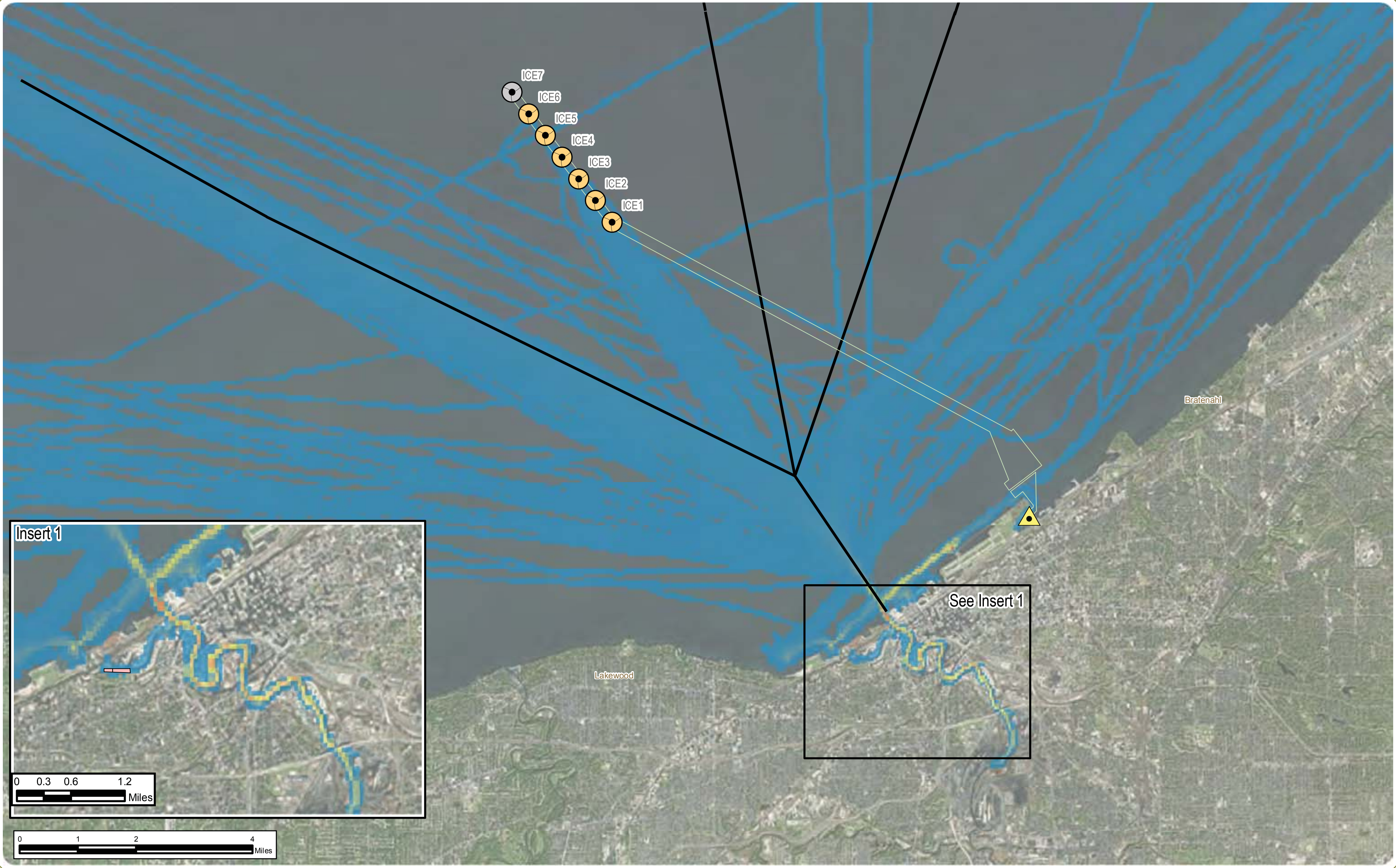

Icebreaker Wind

Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 11. Tug and Towing Vessel Density

Notes: 1. Basemap: ESRI ArcGIS Online "World Imagery" map service.
2. This map was generated in ArcMap on June 13, 2017.
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

Wind Turbine
Alternate Wind Turbine
Cleveland Public Power Substation
Shipping Lanes
Cable Route Envelope
O&M Center Parcel
2013 Tug and Towing Vessel Density
High
Low

Icebreaker Wind

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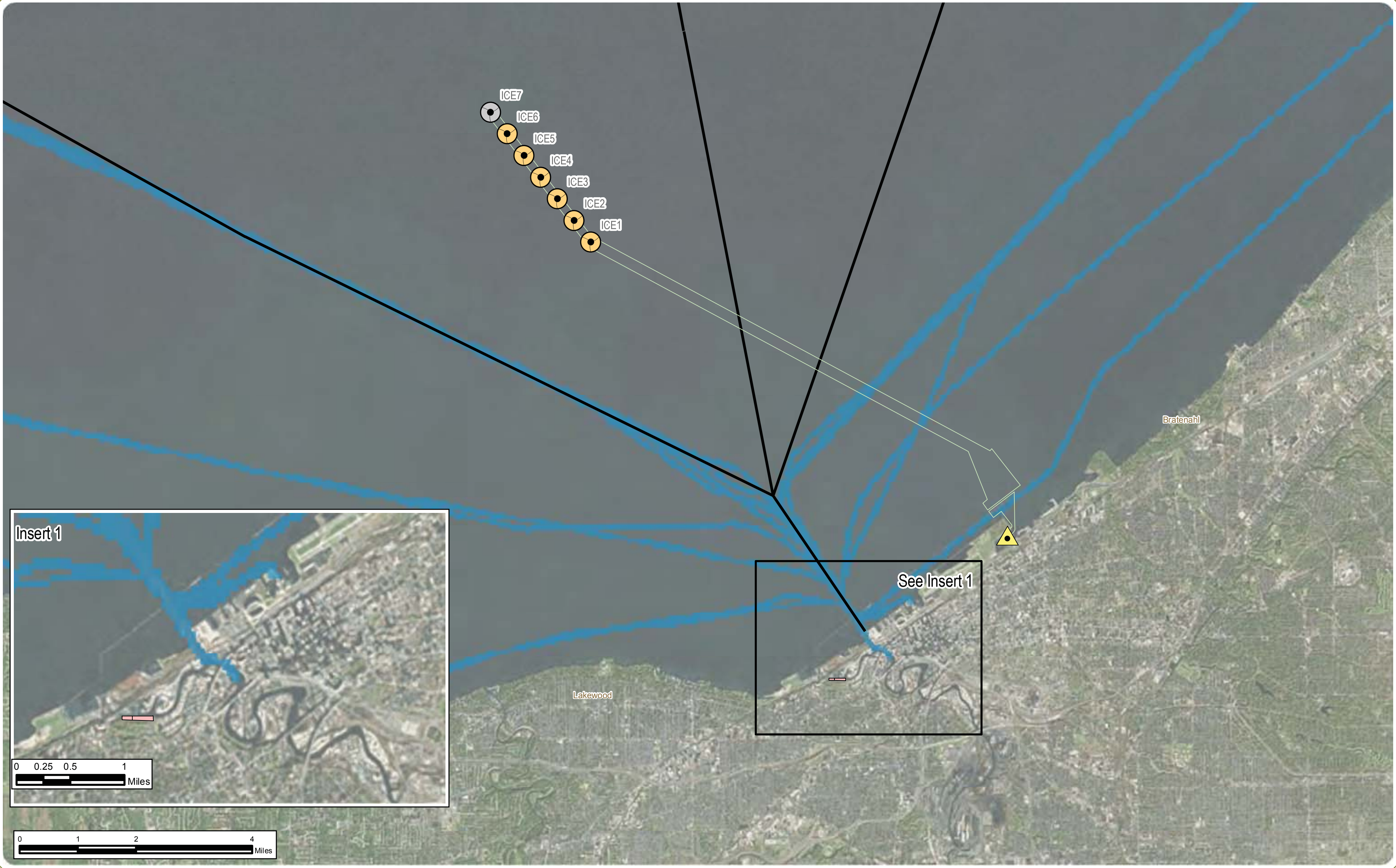

Icebreaker Wind

Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 12: Passenger Vessel Density

Notes: 1. Basemap: ESRI ArcGIS Online "World Imagery" map service.
2. This map was generated in ArcMap on June 13, 2017.
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

Wind Turbine
Alternate Wind Turbine
Cleveland Public Power Substation
Shipping Lanes
Cable Route Envelope
O&M Center Parcel
2013 Passenger Vessel Density
High
Low

Icebreaker Wind

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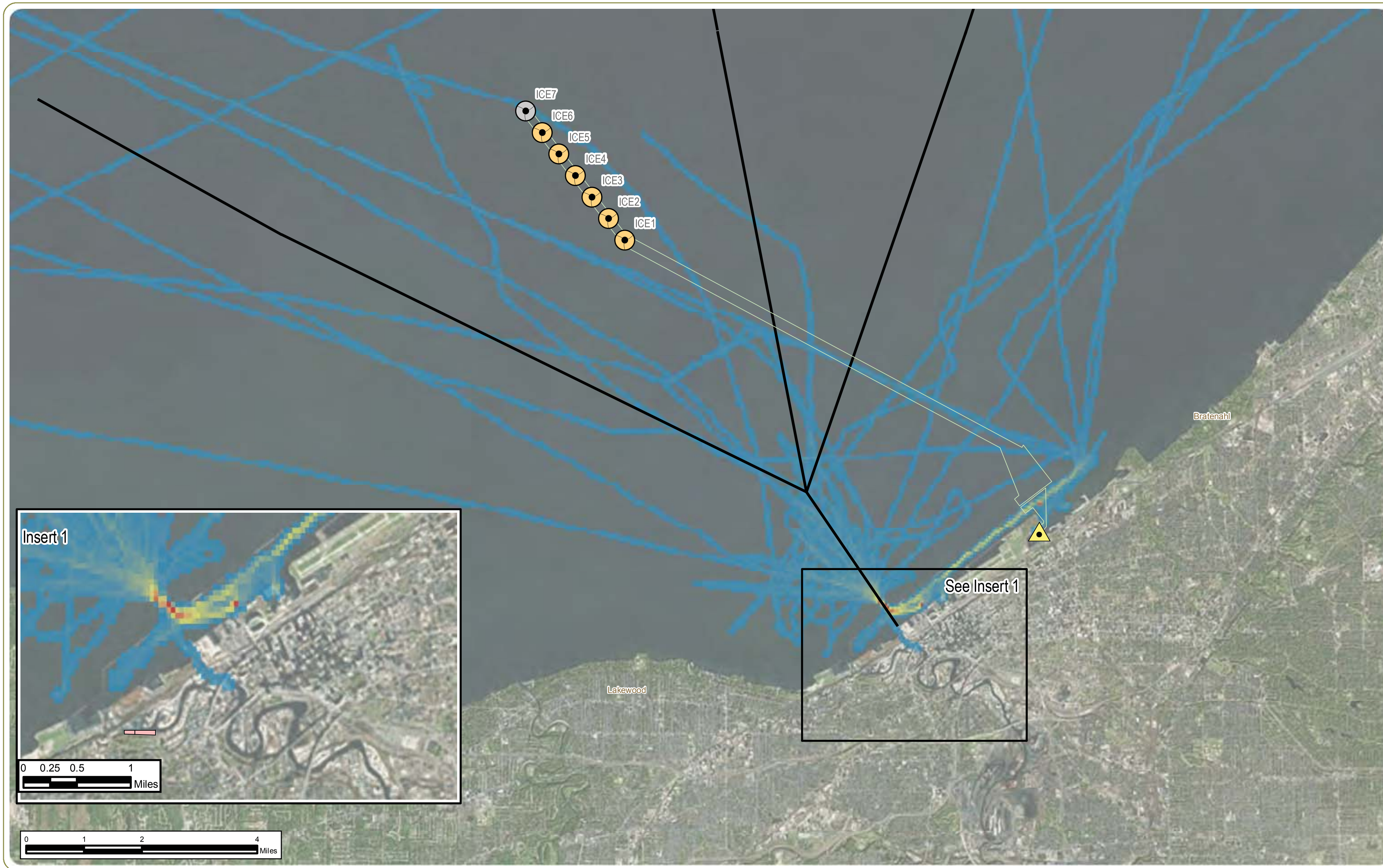
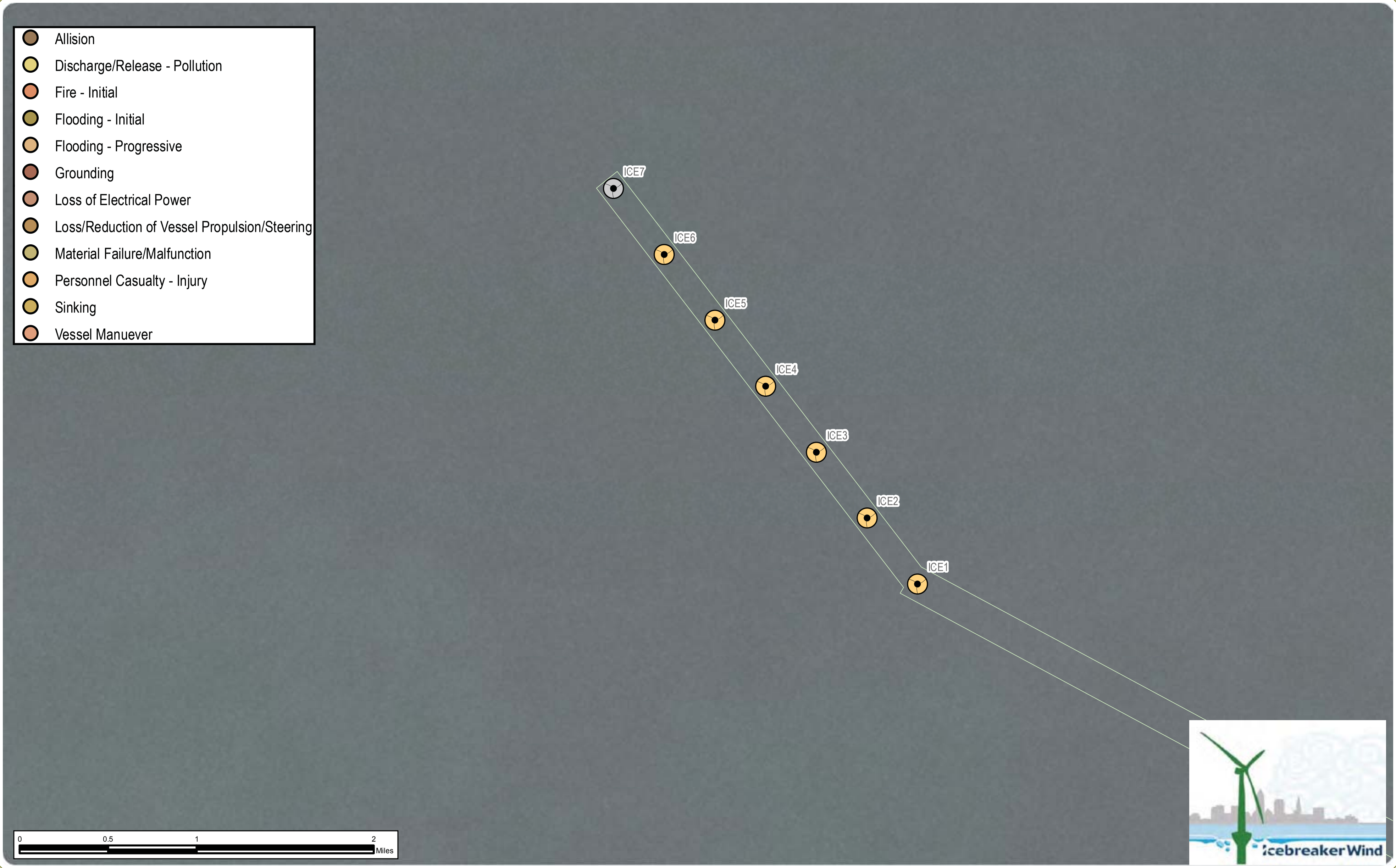


Icebreaker Wind

Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 13: Commercial Pleasure Craft and Sailing Vessel Density

Notes: 1. Basemap: ESRI ArcGIS Online "World Imagery" map service.
2. This map was generated in ArcMap on June 13, 2017.
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.



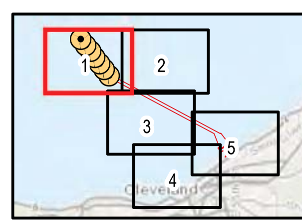
Icebreaker Wind

Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 14: U.S. Coast Guard MISLE IIA Activities

Notes: 1. Basemap: ESRI ArcGIS Online "World Imagery" map service.
2. This map was generated in ArcMap on June 13, 2017.
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

Wind Turbine
Alternate Wind Turbine
Cleveland Public Power Substation
Cable Route Envelope
O&M Center Parcel



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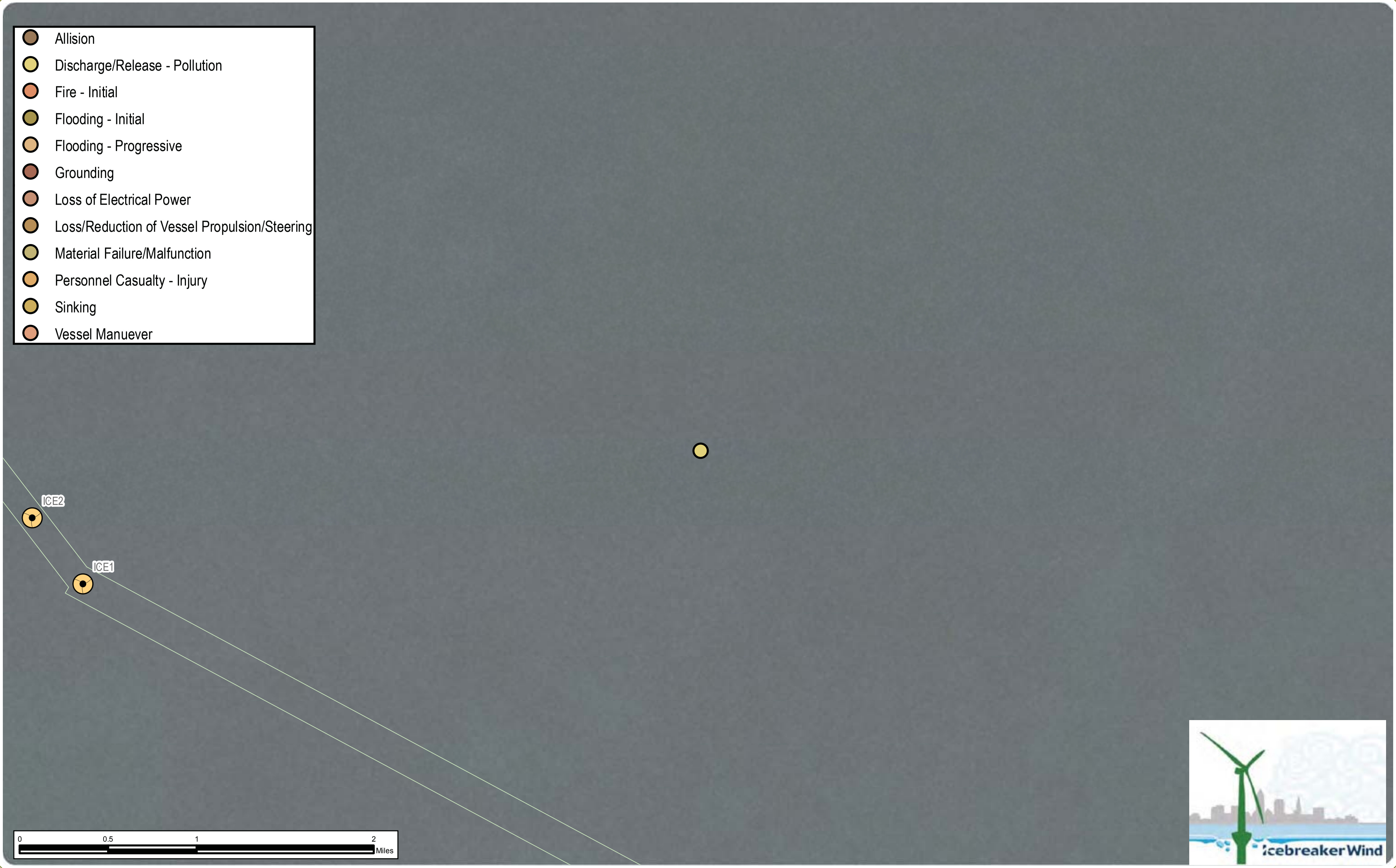

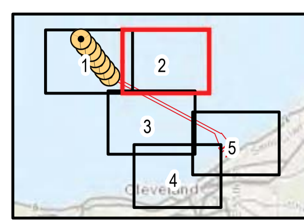

Icebreaker Wind

Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 14: U.S. Coast Guard MISLE IIA Activities

Notes: 1. Basemap: ESRI ArcGIS Online "World Imagery" map service.
2. This map was generated in ArcMap on June 13, 2017.
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

- Wind Turbine
- Alternate Wind Turbine
- Cleveland Public Power Substation
- Cable Route Envelope
- O&M Center Parcel

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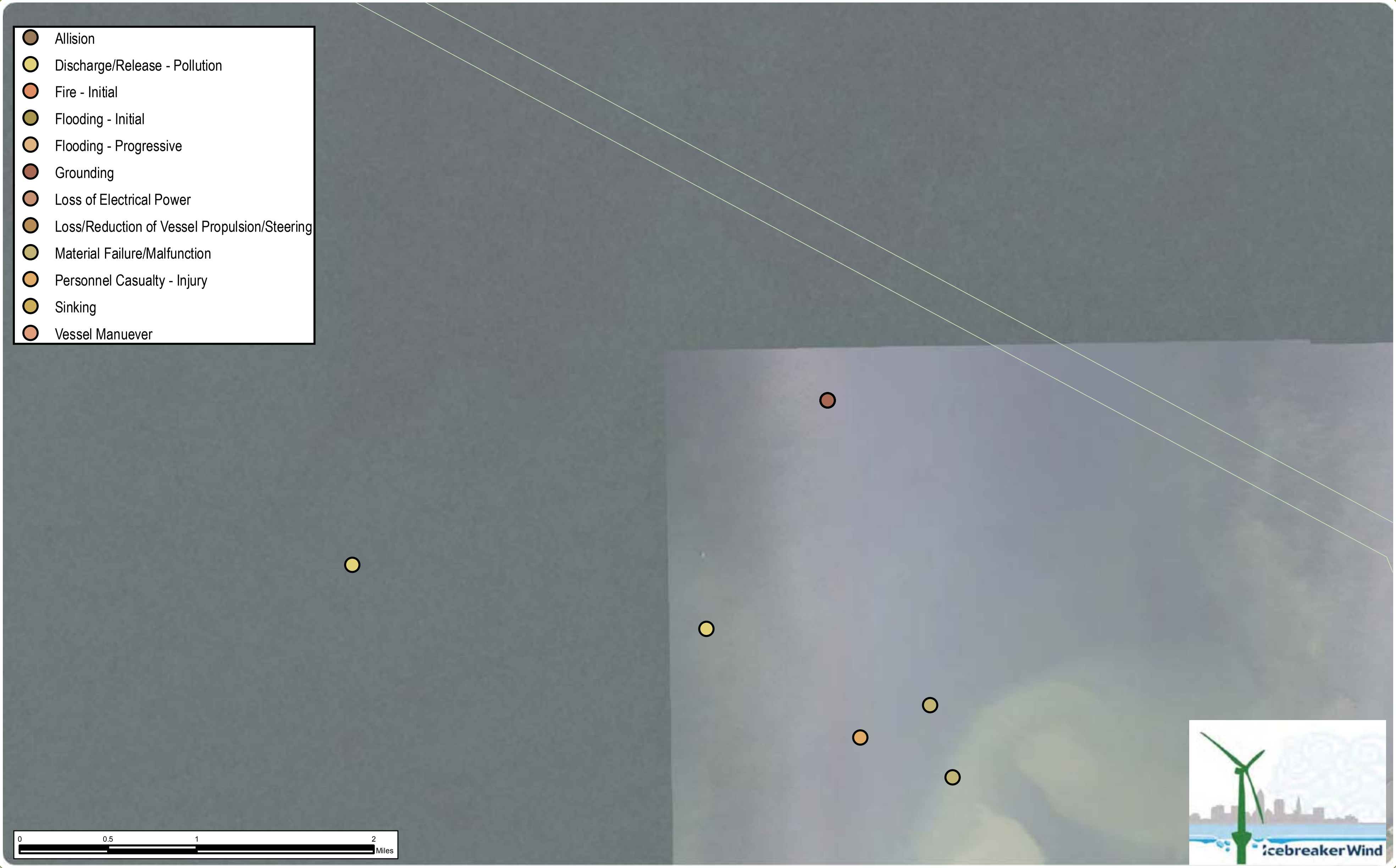

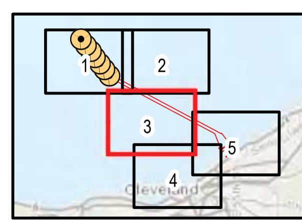

Icebreaker Wind

Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 14: U.S. Coast Guard MISLE IIA Activities

Notes: 1. Basemap: ESRI ArcGIS Online "World Imagery" map service.
2. This map was generated in ArcMap on June 13, 2017.
3. This is a color graphic. Reproduction in grayscale may misrepresent the data.

Wind Turbine
Alternate Wind Turbine
Cleveland Public Power Substation
Cable Route Envelope
O&M Center Parcel

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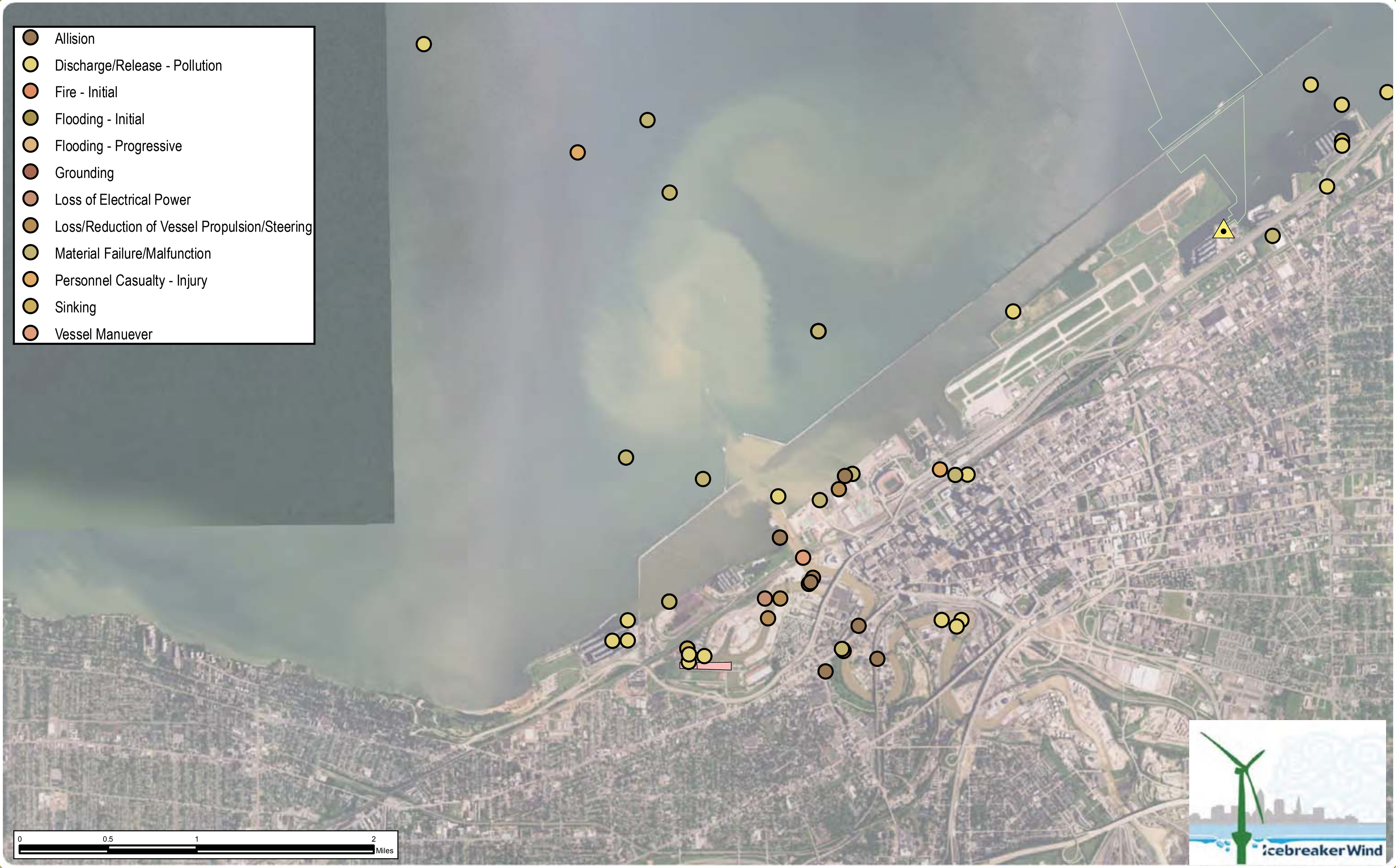
www.edrdpc.com



Icebreaker Wind

Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 14: U.S. Coast Guard MISLE IIA Activities

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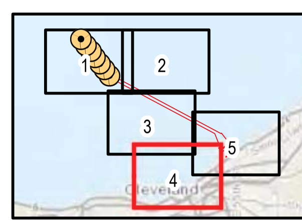
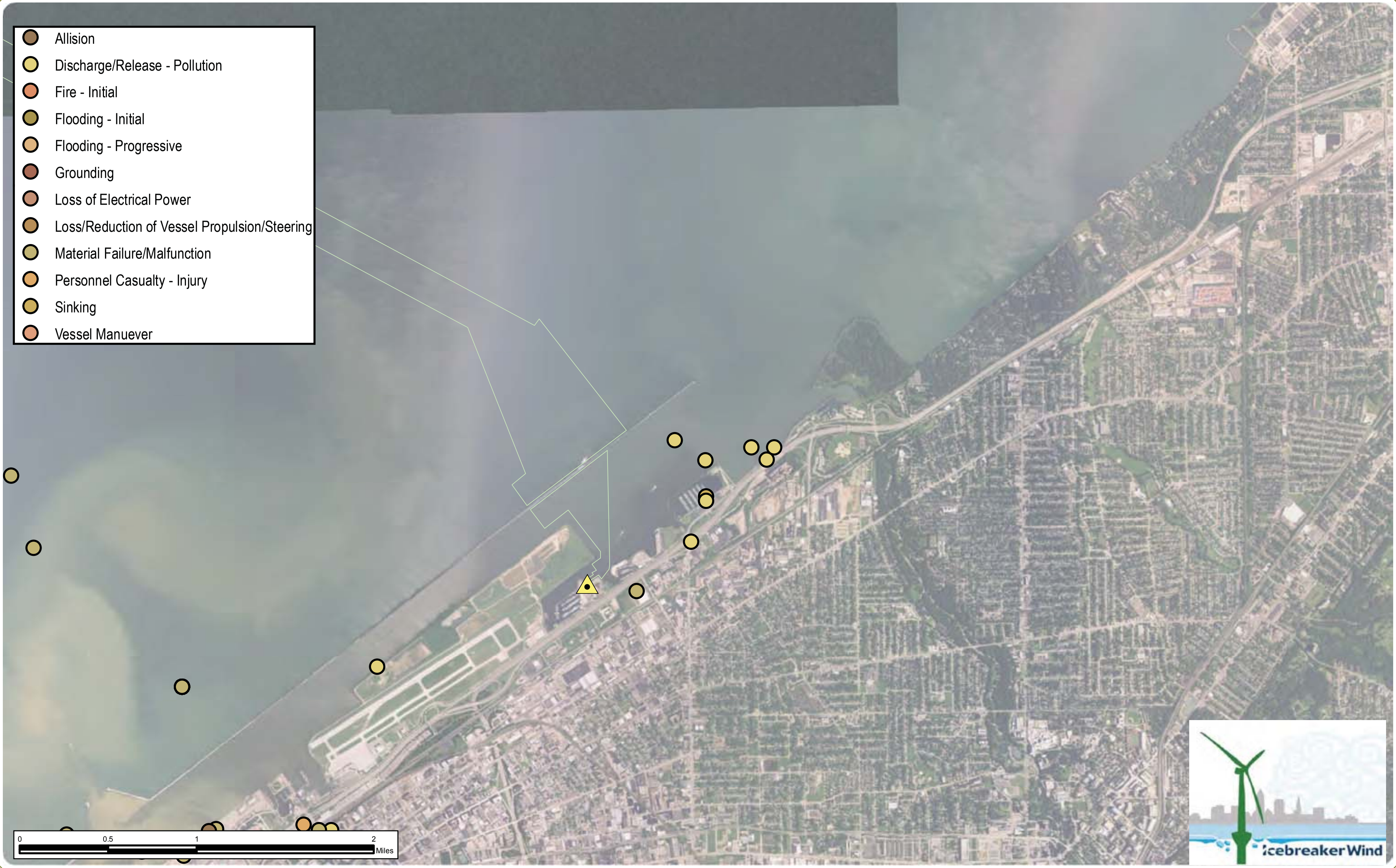


www.edrdpc.com



Icebreaker Wind

Lake Erie, City of Cleveland, Cuyahoga County, Ohio

Figure 14: U.S. Coast Guard MISLE IIA Activities

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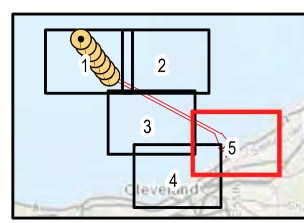

N W E S

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APPENDIX A

Change Analysis of Icebreaker Wind				
Project Phase	Differences from Normal Activities	Potential Effects	Recommended Risk Control Strategies	
			Prevention Requirements	Surveillance Actions
Construction	Increased vessel traffic at the Project Site	Increased chance of vessel collisions and allisions Environmental spill (oil release) due to a marine accident Personnel injury from a marine accident	Request a designated Safety Zone and/or exclusion area be established Publish a NTM, broadcast local NTMs, and notify local media Ensure construction vessels have access to adequate spill response assets and resources Establish and coordinate with USCG on emergency response plans Construction vessel operators to use best practices to minimize potential risks	Coordinate with USCG and State officials for assistance in monitoring any construction area interference
Construction	Increased vessel traffic between Cleveland Harbor, Port of Cleveland, and the Project Site	Transit delays that impact port operations Recreational and commercial vessels during boating season may interfere with project vessels	Publish a NTM, broadcast local NTMs, and notify local media	Maintain proper lookouts on construction vessels
Construction	Interference with commercial/recreational traffic during cable installation	Increased risk of collision occurring between project vessels and other vessels Delays that impact port operations	Request temporary exclusion area around installation vessels Publish a NTM, broadcast local NTMs, and notify local media	Enhance lookouts and communications while laying cable, especially across shipping lanes
Construction	Increased marine radio traffic	Communication delays that may affect search and rescue response, mission coordination, recreational boaters, commercial traffic, pilot operations, etc.	Develop a communications plan to include working channels and crisis communications; include USCG and relevant State authorities	Test the communications plan on a frequent basis
Construction	Impact on marine events	Potential for complaints from members of the public	Limit construction activities during major annual special events Develop complaint resolution program Conduct a public relations campaign	Monitor news media to be aware of potential issues Quickly address complaints

Change Analysis of Icebreaker Wind				
Project Phase	Differences from Normal Activities	Potential Effects	Recommended Risk Control Strategies	
			Prevention Requirements	Surveillance Actions
Operation	New obstruction could block or hinder view of vessels operating in Project Area	Increased likelihood of vessel collisions and allisions Environmental spill (oil release) due to a marine accident Personnel injury from a marine accident	Publish a NTM, broadcast local NTMs, notify local media Update NOAA navigational charts Ensure maintenance vessels have access to spill response assets and resources Establish and coordinate with USCG on emergency response plans Implement lighting and marking plan	Coordinate with USCG and State officials for assistance in monitoring Project Site interference
Operation	Impact on USCG missions	Turbines could interfere with USCG search and rescue efforts, law enforcement, or other surveillance missions	Coordinate with USCG and local and State authorities Inform USCG and other relevant authorities of shutdown methods and procedures	Implement emergency shutdown procedures when requested by USCG or other relevant authorities
Operation	Increased traffic in the Project Area due to maintenance vessels	Increased risk of collision between project vessels and commercial and/or recreational vessels Potential delays that impact port operations Environmental spill due to a marine accident Personnel injury from a marine accident	Publish a NTM, broadcast local NTMs, notify local media Ensure maintenance vessels have access to spill response assets and resources Establish and coordinate with USCG and local SAR assets on communication and evacuation plans	Coordinate with USCG and State officials for assistance in monitoring Project Site interference
Operation	Structures could interfere with light and sound signal characteristics in certain sectors	Alteration of light and/or sound signals could confuse mariners	Publish a NTM, broadcast local NTMs, broadcast port community information, and notify local media Lighting and marking provides additional aids to navigation	

APPENDIX B

Icebreaker Windpower Inc.
Icebreaker Wind
Preliminary Inadvertent Return Contingency Plan

This Preliminary Inadvertent Return Contingency Plan (Plan) describes the procedures Icebreaker Windpower Inc. and its contractor will implement to avoid, minimize and remediate potential environmental impacts that could result from an inadvertent return of drilling fluids during horizontal directional drilling (HDD) operations associated with the proposed Icebreaker Wind project.

The Plan includes the following components:

(1) Project Description;

(2) Horizontal Directional Drilling Design;

(3) Drilling Fluids;

(4) Monitoring;

(5) Notification Procedures; and

(6) Containment and Remediation.

This preliminary Plan is a template to provide minimum requirements for a site-specific plan to be developed by the HDD contractor once that contractor has been selected. Copies of the final site-specific plan will be provided to interested state and federal regulatory agencies prior to commencement of HDD operations.

Project Description

Construction of the proposed approximately 21 megawatt offshore wind facility consists of:

- Six wind turbines in Lake Erie, approximately 8-10 miles offshore of Cleveland.
- Buried and shielded submarine cables including a fiber optic communications cable interconnecting the turbines (inter-array cables), in total approximately 2.8 miles
- One approximately 9-mile-long buried and shielded submarine cable, including a fiber optic communications cable (export cable) connecting the demonstration project to the new Project Substation located at the existing Cleveland Public Power (CPP) Lake Road Substation in Cleveland, Ohio
- Installation of equipment including a Project Substation at the CPP Lake Road Substation in Cleveland, Ohio to accept power from the Proposed Project
- Approximately 150 feet of new, pole supported, overhead transmission line to transmit electricity from the new Project Substation to the existing CPP Lake Road Substation

The proposed export cable would be brought ashore entirely under the Cleveland Harbor and the breakwater through a duct installed using HDD. Entry/exit points for the HDD would be located at the CPP Lake Road Substation and approximately 3,700 feet offshore. A drawback machine or similar would be used to drill an approximately 30 cm (11.8 inch) diameter bore. The bore would be lined with High-Density Polyethylene conduit or other commonly used lining material.

Horizontal Directional Drilling Design

For a successful HDD and to minimize the potential for an inadvertent return, a site-specific investigation and detailed design of the drill bore is needed.

Subsurface Conditions

Geotechnical investigations have been completed by Icebreaker Windpower Inc. and its contractor to identify subsurface conditions along the proposed HDD path.

Drill Design and Drilling Procedures

Based on the geotechnical investigations, Icebreaker Windpower Inc.'s HDD contractor will develop detailed HDD design plans and procedures identifying the optimal location, depth and methodology for the drill. It is anticipated that these plans will be finalized by the end of 2017.

Drilling Fluids

HDD operations will use drilling fluids to stabilize the bore hole and to lubricate the drilling process. Drilling fluids would be used that are biocompatible with freshwater. The detailed HDD design plan will include the specifications for the chosen drilling fluids. During HDD operations, an inadvertent return of drilling fluids may occur when the drilling fluids follow a path of least resistance through the overburden to the surface (land or water). Some minimal losses of drilling fluids can be expected within the subsurface materials voids or sediments; typically, these losses do not reach the surface.

Additives

Drilling fluids consist of water, bentonite clay and additives. The specific design mix for the drilling fluid depends on site-specific conditions and the drill design (variables may include a water softener, viscosities, filtration control additives, or torque reduction). Since the fluids largely consist of bentonite clay-water mix, they are generally considered non-toxic. Material Safety Data Sheets for fluid additives will be provided in the final site-specific plan.

Disposal

Drilling fluids will be recycled or disposed of at an approved disposal facility according to regulatory requirements. Recovered materials may be collected in containers for temporary storage prior to removal from the site. Qualified disposal facilities will be identified in the final site-specific plan.

Monitoring

Drilling activities will be monitored throughout the HDD operation to determine if an inadvertent release is occurring. Monitoring fluid volumes (circulation), fluid pressures, penetration rates, and fluid viscosity will help minimize the potential for a release and identify releases or potential releases. Specific monitoring protocols based on the HDD design and procedures will be identified in the final site-specific plan.

Visual monitoring will occur on land and in water at set distance intervals along the drilling path. A log will be kept to include the inspector, time of monitoring event and observations. Visual monitoring frequency will be increased if a significant loss of fluids is suspected.

Notification Procedures

The intent of notification procedure is to notify the appropriate agencies when a release occurs according to regulatory requirements. Specific agency personnel, contact information and timeframes will be provided in the final site-specific plan. Agencies to be notified include but are not limited to:

- U.S. Army Corps of Engineers Buffalo District
- U.S. Department of Energy
- Ohio Power Siting Board

- Ohio Environmental Protection Agency
- Ohio Department of Natural Resources

Containment and Remediation

In the event of an inadvertent return, measures will be implemented to control, contain and clean up the release of drilling fluid and the affected area. Site-specific measures will be refined by Icebreaker Windpower Inc.'s HDD contractor as the HDD design is completed and included in the final site-specific plan.

Containment can be achieved by sealing the leak point using loss control materials (LCMs). The use of LCMs is an industry standard for HDD projects to control flow of fluids that may inadvertently escape from the drill bore. LCMs are generally environmentally benign materials that slow or stop the release of fluid from the unintended opening of the HDD bore. The HDD contractor can provide safety data sheets (SDS) for LCMs prior to the start of drilling.

In the event of an unintended compromise of the HDD bore, the contractor would install a gravity cell to contain fluids that may be released into the environment. The gravity cell is a box-like structure that is placed over the location of the release to prevent migration of drilling fluids away from the location. The gravity cell will be constructed of steel and once lowered into place provides a seal at the interface with the sea floor or lake bottom. Once the unintended return has been stabilized, the contractor will send a diver down to the gravity cell with a hose to vacuum out the contained drilling fluids. The captured fluid will be pumped to a holding tank on the work vessel for proper handling and disposal. During the HDD operation, the contractor shall have a barge with a dive team stationed offshore.

Turbidity curtains would not be proposed as they are generally ineffective for confining an inadvertent return of drilling fluids. This is because the drilling fluids are heavier than water and turbidity curtains cannot effectively seal the interface with the sea floor or lake bottom. Released fluids will tend to sink directly to the bottom. The gravity cells described in the preceding paragraph are the industry standard and far more effective at containing fluids that may be released to the environment during an inadvertent return episode.

The following measures provide a minimum guideline to be used by the HDD Contractor in preparing the final site-specific plan.

- Reduce or suspend drilling activities to determine the extent of the release and implement corrective actions;
- Attempt to seal off the release to the surface from the borehole using approved LCMs;
- Pull back the drill string allowing the fluids in the fracture to solidify;
- Determine the cause of the release and implement measures to minimize reoccurrence, such as adjusting fluid viscosity;
- Containment equipment and personnel will be on site during HDD operations;
- Depending on the amount of fluid released on land the area may be swept, shoveled, or mixed with sand and temporarily left in place to dry prior to proper disposal of the material. Appropriate erosion and sediment control measures will be used as needed to prevent drilling fluid from entering the lake or other resources; and,
- The HDD contractor will ensure that appropriate personnel will be available to assist in the containment and cleanup effort that may be necessary within the lake.

The contractor will also use environmentally responsible work practices and methods including the best management practices associated with spill prevention and containment and storm water pollution and prevention.

APPENDIX C

LimnoTech
Water | Scientists
Environment | Engineers

501 Avis Drive
Ann Arbor, MI 48108
734.332.1200
www.limno.com

Memorandum

From:	Ed Verhamme, LimnoTech	**Date:**	April 13, 2017
		Project:	LEEDCo – Project Icebreaker
To:	Lorry Wagner, LEEDCo	**CC:**	

SUBJECT: **Recreational Boat Slip Assessment for Cleveland Area Marinas**

Introduction

This memorandum was prepared at the request of LEEDCo to assess the extent of recreational boating in the Cleveland area and gather baseline data regarding area marinas and general boat characteristics. Information gathered included identifying the major marinas, counting the number of available boat slips, identifying the type of boat present in the slip, and estimating boat lengths. The study was conducted using high resolution aerial imagery in late summer of 2016. Data from this study will help to inform US Coast Guard Navigational Risk Assessments and other key permit documents.

Overview

A recreational boat study was conducted in 2016 to count and classify power and sail boats in the recreational harbors, marinas, and yacht clubs in Lorain, Cuyahoga, and Lake Counties. Aerial imagery, with an on ground pixel resolution of approximately six inches, was obtained for 16 key harbor areas in the three county area surrounding Cleveland, Ohio on the morning of Wednesday, August 3, 2016. The imagery was captured by Aerial Associates under contract to LimnoTech using a Leica DMC III and post-processed to create a tiled image mosaic. For each of the 16 distinct harbor areas, LimnoTech staff delineated every visible boat slip and marked it as either empty or containing a power or sail boat. For slips containing a boat, a polyline was drawn from its stern to bow to allow for length measurements of each boat. Figure 1 shows an example of how boats were delineated in the marina.

Results

A total of 6,057 boat slips were inventoried across the 16 marina areas. A summary of each of the 16 marina areas is shown in Table 1. A summary of boat lengths for all of marina areas is shown in Table 2. For sail boats, an estimate of the mast height above the water was generated by looking up sail boat specifications common of sailboats in each sailboat range on http://sailboatdata.com. Catalina brand sailboats were used for lengths up to 36 ft and Oceanis brand sailboats were used for sailboats longer than 36 ft. Mast height estimates are meant to be used as a rough guide of sailboat mast heights above the water. Additions to the top of the mast (from whip antennas and wind vanes) can increase the total height of the mast above the water by one or two feet.

Table 1. Summary of boat slips and type by marina area.

Cty.	Marina	Empty	Powerboat	Sailboat	Total
Cuyahoga	Bicentennial Park	46	1	0	47
	East 55th ST	42	260	60	362
	Edgewater	133	235	254	622
	Euclid Creek	46	50	5	101
	Forest City YC	18	75	36	129
	Intercity YC	61	39	0	100
	Lakeside YC	67	127	42	236
	Northeast YC	50	85	17	152
	Olde River YC	82	170	3	255
	Rocky River	84	378	96	558
	Shoreby	50	59	6	115
	Whiskey Island	76	157	27	260
	Sub-Total	**755**	**1636**	**546**	**2937**
Lake	Fairport	270	449	92	811
	Mentor	277	448	52	777
	Sub-Total	**547**	**897**	**144**	**1588**
Lorain	Beaver Park	227	399	7	633
	Lorain	464	320	115	899
	Sub-Total	**691**	**719**	**122**	**1532**
	Total	**1993**	**3252**	**812**	**6057**

Table 2. Summary of boat lengths and estimated mast heights above water.

Percentile of boats counted	Power Boat Length (ft)	Sailboats		
		Length (ft)	# of boats > or =	Mast Height (ft)
25%	23	26	586	41
50%	27	29	396	45
75%	31	33	191	48
90%	36	36	74	50
95%	39	38	47	54
97%	42	40	20	58
99%	48	45	8	65

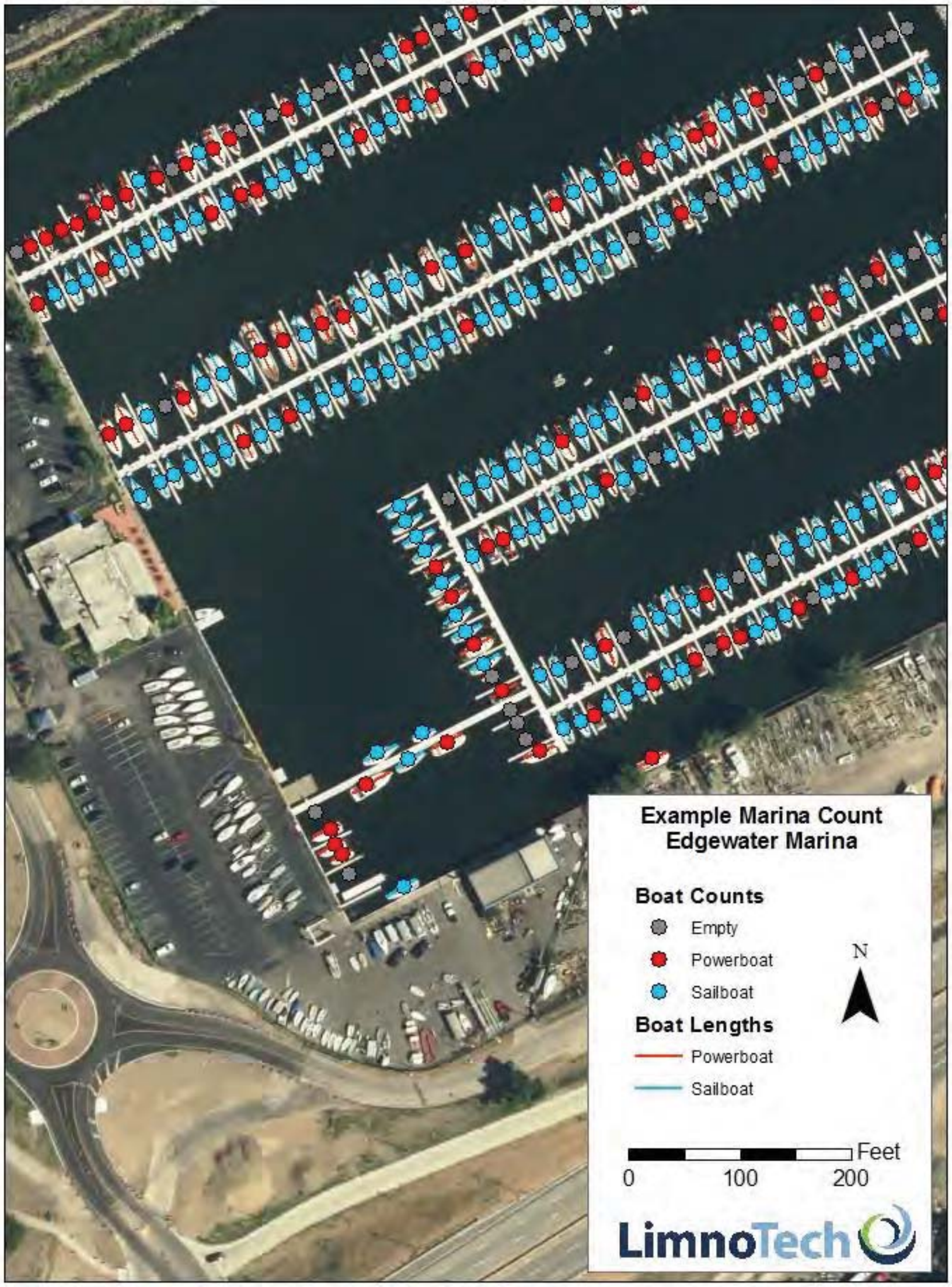

Figure 1. Example marina count from Edgewater Marina.

APPENDIX D

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2016-WTE-5048-OE
Prior Study No.
2014-WTE-684-OE

Issued Date: 02/22/2017

Lorry Wagner
LEEDCo
1938 Euclid Avenue
Ste 200
Cleveland, OH 44115

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine Turbine 1
Location:	Cleveland, OH
Latitude:	41-36-02.80N NAD 83
Longitude:	81-48-02.20W
Heights:	569 feet site elevation (SE)
	479 feet above ground level (AGL)
	1048 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure would have no substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on the operation of air navigation facilities. Therefore, pursuant to the authority delegated to me, it is hereby determined that the structure would not be a hazard to air navigation provided the following condition(s) is(are) met:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

__X__ At least 56 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 08/22/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is subject to review if an interested party files a petition that is received by the FAA on or before March 24, 2017. In the event a petition for review is filed, it must contain a full statement of the basis upon which it is made and be submitted to the Manager, Airspace Policy & Regulation, Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591.

This determination becomes final on April 03, 2017 unless a petition is timely filed. In which case, this determination will not become final pending disposition of the petition. Interested parties will be notified of the grant of any review. For any questions regarding your petition, please contact Airspace Regulations & ATC Procedures Group via telephone -- 202-267-8783 - or facsimile 202-267-9328.

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights, and frequencies or use of greater power will void this determination. Any future construction or alteration, including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

This aeronautical study considered and analyzed the impact on existing and proposed arrival, departure, and en route procedures for aircraft operating under both visual flight rules and instrument flight rules; the impact on all existing and planned public-use airports, military airports and aeronautical facilities; and the cumulative impact resulting from the studied structure when combined with the impact of other existing or proposed structures. The study disclosed that the described structure would have no substantial adverse effect on air navigation.

An account of the study findings, aeronautical objections received by the FAA during the study (if any), and the basis for the FAA's decision in this matter can be found on the following page(s).

If we can be of further assistance, please contact Paul Holmquist, at (425) 227-2625. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2016-WTE-5048-OE.

Signature Control No: 299560645-322889480 (DNH -WT)
Mike Helvey
Manager, Obstruction Evaluation Group

Attachment(s)
Additional Information
Map(s)

Narrative for ASNs
2016-WTE-5048-OE
2016-WTE-5049-OE
2016-WTE-5050-OE
2016-WTE-5051-OE
2016-WTE-5052-OE
2016-WTE-5053-OE
2016-WTE-5054-OE

Abbreviations
AGL - above ground level AMSL - above mean sea level RWY - runway
VFR - visual flight rules IFR - instrument flight rules NM - nautical mile
ASN- Aeronautical Study Number MVA - minimum vectoring altitude
Part 77 - Title 14 Code of Federal Regulations (CFR) Part 77, Safe, Efficient Use and Preservation of the Navigable Airspace

The proposed project consisting of seven, 479 AGL (1048 AMSL) wind turbines would be located between 7.3 and 9.7 NM northwest of Burke Lakefront Airport, Cleveland, OH. For the sake of efficiency this narrative contains all turbines within this project that have similar impacts. Separate determinations will be issued for each turbine which will be available on the FAA's website at htttp://oeaaa.faa.gov.

The turbine(s) exceed(s) Part 77 standards as described below.

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

The turbines studied under the ASNs listed below would increase the Sector A Minimum Vectoring Altitude (MVA) from 1800 feet AMSL to 2000 feet AMSL for the Cleveland Ohio Terminal Radar Approach Control (CLE ATCT/TRACON)

2016-WTE-5048-OE
2016-WTE-5049-OE
2016-WTE-5050-OE
2016-WTE-5051-OE
2016-WTE-5052-OE
2016-WTE-5053-OE
2016-WTE-5054-OE

There would be no impact to this standard if the turbines do not exceed 849 feet AMSL (280 AGL).

The study was not circularized for public comment as the impact to Cleveland TRACON's MVA identified above only requires FAA comment. Cleveland Air Traffic Control has responded to this study with no objection to the increase in MVA height.

Aeronautical study disclosed that the proposed structure would have no effect on any existing or proposed arrival, departure, or en route instrument flight rule (IFR) operations or procedures other than the MVA impact identified above.

Study for possible visual flight rules (VFR) effect disclosed that the proposed structure would have no effect on any existing or proposed arrival or departure VFR operations or procedures. It would not conflict with airspace required to conduct normal VFR traffic pattern operations at any known public use or military airport. At 479 feet above ground level the proposed structure would not have a substantial adverse effect on VFR en route flight operations.

The proposed structure would be appropriately obstruction marked and/or lighted to make it more conspicuous to airmen should circumnavigation be necessary.

Therefore, it is determined that the proposed construction would not have a substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on any air navigation facility and would not be a hazard to air navigation provided the conditions set forth within this determination are met.

Sectional Map for ASN 2016-WTE-5048-OE

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2016-WTE-5049-OE
Prior Study No.
2014-WTE-685-OE

Issued Date: 02/22/2017

Lorry Wagner
LEEDCo
1938 Euclid Avenue
Ste 200
Cleveland, OH 44115

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine Turbine 2
Location:	Cleveland, OH
Latitude:	41-36-22.40N NAD 83
Longitude:	81-48-21.60W
Heights:	569 feet site elevation (SE)
	479 feet above ground level (AGL)
	1048 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure would have no substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on the operation of air navigation facilities. Therefore, pursuant to the authority delegated to me, it is hereby determined that the structure would not be a hazard to air navigation provided the following condition(s) is(are) met:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

__X__ At least 56 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 08/22/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is subject to review if an interested party files a petition that is received by the FAA on or before March 24, 2017. In the event a petition for review is filed, it must contain a full statement of the basis upon which it is made and be submitted to the Manager, Airspace Policy & Regulation, Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591.

This determination becomes final on April 03, 2017 unless a petition is timely filed. In which case, this determination will not become final pending disposition of the petition. Interested parties will be notified of the grant of any review. For any questions regarding your petition, please contact Airspace Regulations & ATC Procedures Group via telephone -- 202-267-8783 - or facsimile 202-267-9328.

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights, and frequencies or use of greater power will void this determination. Any future construction or alteration, including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

This aeronautical study considered and analyzed the impact on existing and proposed arrival, departure, and en route procedures for aircraft operating under both visual flight rules and instrument flight rules; the impact on all existing and planned public-use airports, military airports and aeronautical facilities; and the cumulative impact resulting from the studied structure when combined with the impact of other existing or proposed structures. The study disclosed that the described structure would have no substantial adverse effect on air navigation.

An account of the study findings, aeronautical objections received by the FAA during the study (if any), and the basis for the FAA's decision in this matter can be found on the following page(s).

If we can be of further assistance, please contact Paul Holmquist, at (425) 227-2625. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2016-WTE-5049-OE.

Signature Control No: 299560647-322889482 (DNH -WT)

Mike Helvey
Manager, Obstruction Evaluation Group

Attachment(s)
Additional Information
Map(s)

Narrative for ASNs
2016-WTE-5048-OE
2016-WTE-5049-OE
2016-WTE-5050-OE
2016-WTE-5051-OE
2016-WTE-5052-OE
2016-WTE-5053-OE
2016-WTE-5054-OE

Abbreviations
AGL - above ground level
AMSL - above mean sea level
RWY - runway
VFR - visual flight rules
IFR - instrument flight rules
NM - nautical mile
ASN- Aeronautical Study Number
MVA - minimum vectoring altitude
Part 77 - Title 14 Code of Federal Regulations (CFR) Part 77, Safe, Efficient Use and Preservation of the Navigable Airspace

The proposed project consisting of seven, 479 AGL (1048 AMSL) wind turbines would be located between 7.3 and 9.7 NM northwest of Burke Lakefront Airport, Cleveland, OH. For the sake of efficiency this narrative contains all turbines within this project that have similar impacts. Separate determinations will be issued for each turbine which will be available on the FAA's website at htttp://oeaaa.faa.gov.

The turbine(s) exceed(s) Part 77 standards as described below.

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

The turbines studied under the ASNs listed below would increase the Sector A Minimum Vectoring Altitude (MVA) from 1800 feet AMSL to 2000 feet AMSL for the Cleveland Ohio Terminal Radar Approach Control (CLE ATCT/TRACON)

2016-WTE-5048-OE
2016-WTE-5049-OE
2016-WTE-5050-OE
2016-WTE-5051-OE
2016-WTE-5052-OE
2016-WTE-5053-OE
2016-WTE-5054-OE

There would be no impact to this standard if the turbines do not exceed 849 feet AMSL (280 AGL).

The study was not circularized for public comment as the impact to Cleveland TRACON's MVA identified above only requires FAA comment. Cleveland Air Traffic Control has responded to this study with no objection to the increase in MVA height.

Aeronautical study disclosed that the proposed structure would have no effect on any existing or proposed arrival, departure, or en route instrument flight rule (IFR) operations or procedures other than the MVA impact identified above.

Study for possible visual flight rules (VFR) effect disclosed that the proposed structure would have no effect on any existing or proposed arrival or departure VFR operations or procedures. It would not conflict with airspace required to conduct normal VFR traffic pattern operations at any known public use or military airport. At 479 feet above ground level the proposed structure would not have a substantial adverse effect on VFR en route flight operations.

The proposed structure would be appropriately obstruction marked and/or lighted to make it more conspicuous to airmen should circumnavigation be necessary.

Therefore, it is determined that the proposed construction would not have a substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on any air navigation facility and would not be a hazard to air navigation provided the conditions set forth within this determination are met.


CLEVELAND CLASS B
ERIE
80
40
80
30
572
BURKE LAKEFRONT (BKL)
CT - 124.3 ★ C
ATIS 125.25
584 *L 66 122.95
RP 24L, 24R
See NOTAMs/Su
for Class D/E (sf
243.0
122.2
122.35
255.4
122.1R
CLEVELAND RCO
CLEVELAND
V5
110
30
896
waterworks
intake
1603
(952)
bldgs
1000
(360)
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980
NO SVFR
CLEVELAND-HOPKINS INTL (CLE)
CT - 120.9 124.5
ATIS 127.85
799 L 99 122.95
1067
stack
LEBRN

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2016-WTE-5050-OE
Prior Study No.
2014-WTE-686-OE

Issued Date: 02/22/2017

Lorry Wagner
LEEDCo
1938 Euclid Avenue
Ste 200
Cleveland, OH 44115

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine Turbine 3
Location:	Cleveland, OH
Latitude:	41-36-41.50N NAD 83
Longitude:	81-48-41.10W
Heights:	569 feet site elevation (SE)
	479 feet above ground level (AGL)
	1048 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure would have no substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on the operation of air navigation facilities. Therefore, pursuant to the authority delegated to me, it is hereby determined that the structure would not be a hazard to air navigation provided the following condition(s) is(are) met:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

__X__ At least 56 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 08/22/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is subject to review if an interested party files a petition that is received by the FAA on or before March 24, 2017. In the event a petition for review is filed, it must contain a full statement of the basis upon which it is made and be submitted to the Manager, Airspace Policy & Regulation, Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591.

This determination becomes final on April 03, 2017 unless a petition is timely filed. In which case, this determination will not become final pending disposition of the petition. Interested parties will be notified of the grant of any review. For any questions regarding your petition, please contact Airspace Regulations & ATC Procedures Group via telephone -- 202-267-8783 - or facsimile 202-267-9328.

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights, and frequencies or use of greater power will void this determination. Any future construction or alteration, including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

This aeronautical study considered and analyzed the impact on existing and proposed arrival, departure, and en route procedures for aircraft operating under both visual flight rules and instrument flight rules; the impact on all existing and planned public-use airports, military airports and aeronautical facilities; and the cumulative impact resulting from the studied structure when combined with the impact of other existing or proposed structures. The study disclosed that the described structure would have no substantial adverse effect on air navigation.

An account of the study findings, aeronautical objections received by the FAA during the study (if any), and the basis for the FAA's decision in this matter can be found on the following page(s).

If we can be of further assistance, please contact Paul Holmquist, at (425) 227-2625. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2016-WTE-5050-OE.

Signature Control No: 299560648-322889486 (DNH -WT)
Mike Helvey
Manager, Obstruction Evaluation Group

Attachment(s)
Additional Information
Map(s)

Narrative for ASNs
2016-WTE-5048-OE
2016-WTE-5049-OE
2016-WTE-5050-OE
2016-WTE-5051-OE
2016-WTE-5052-OE
2016-WTE-5053-OE
2016-WTE-5054-OE

Abbreviations
AGL - above ground level
AMSL - above mean sea level
RWY - runway
VFR - visual flight rules
IFR - instrument flight rules
NM - nautical mile
ASN- Aeronautical Study Number
MVA - minimum vectoring altitude
Part 77 - Title 14 Code of Federal Regulations (CFR) Part 77, Safe, Efficient Use and Preservation of the Navigable Airspace

The proposed project consisting of seven, 479 AGL (1048 AMSL) wind turbines would be located between 7.3 and 9.7 NM northwest of Burke Lakefront Airport, Cleveland, OH. For the sake of efficiency this narrative contains all turbines within this project that have similar impacts. Separate determinations will be issued for each turbine which will be available on the FAA's website at htttp://oeaaa.faa.gov.

The turbine(s) exceed(s) Part 77 standards as described below.

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

The turbines studied under the ASNs listed below would increase the Sector A Minimum Vectoring Altitude (MVA) from 1800 feet AMSL to 2000 feet AMSL for the Cleveland Ohio Terminal Radar Approach Control (CLE ATCT/TRACON)

2016-WTE-5048-OE
2016-WTE-5049-OE
2016-WTE-5050-OE
2016-WTE-5051-OE
2016-WTE-5052-OE
2016-WTE-5053-OE
2016-WTE-5054-OE

There would be no impact to this standard if the turbines do not exceed 849 feet AMSL (280 AGL).

The study was not circularized for public comment as the impact to Cleveland TRACON's MVA identified above only requires FAA comment. Cleveland Air Traffic Control has responded to this study with no objection to the increase in MVA height.

Aeronautical study disclosed that the proposed structure would have no effect on any existing or proposed arrival, departure, or en route instrument flight rule (IFR) operations or procedures other than the MVA impact identified above.

Study for possible visual flight rules (VFR) effect disclosed that the proposed structure would have no effect on any existing or proposed arrival or departure VFR operations or procedures. It would not conflict with airspace required to conduct normal VFR traffic pattern operations at any known public use or military airport. At 479 feet above ground level the proposed structure would not have a substantial adverse effect on VFR en route flight operations.

The proposed structure would be appropriately obstruction marked and/or lighted to make it more conspicuous to airmen should circumnavigation be necessary.

Therefore, it is determined that the proposed construction would not have a substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on any air navigation facility and would not be a hazard to air navigation provided the conditions set forth within this determination are met.

Sectional Map for ASN 2016-WTE-5050-OE

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2016-WTE-5051-OE
Prior Study No.
2014-WTE-687-OE

Issued Date: 02/22/2017

Lorry Wagner
LEEDCo
1938 Euclid Avenue
Ste 200
Cleveland, OH 44115

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine Turbine 4
Location:	Cleveland, OH
Latitude:	41-37-01.00N NAD 83
Longitude:	81-49-01.10W
Heights:	569 feet site elevation (SE)
	479 feet above ground level (AGL)
	1048 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure would have no substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on the operation of air navigation facilities. Therefore, pursuant to the authority delegated to me, it is hereby determined that the structure would not be a hazard to air navigation provided the following condition(s) is(are) met:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

__X__ At least 56 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 08/22/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

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An account of the study findings, aeronautical objections received by the FAA during the study (if any), and the basis for the FAA's decision in this matter can be found on the following page(s).

If we can be of further assistance, please contact Paul Holmquist, at (425) 227-2625. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2016-WTE-5051-OE.

Signature Control No: 299560650-322889484 (DNH -WT)
Mike Helvey
Manager, Obstruction Evaluation Group

Attachment(s)
Additional Information
Map(s)

Narrative for ASNs
2016-WTE-5048-OE
2016-WTE-5049-OE
2016-WTE-5050-OE
2016-WTE-5051-OE
2016-WTE-5052-OE
2016-WTE-5053-OE
2016-WTE-5054-OE

Abbreviations
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Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

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2016-WTE-5048-OE
2016-WTE-5049-OE
2016-WTE-5050-OE
2016-WTE-5051-OE
2016-WTE-5052-OE
2016-WTE-5053-OE
2016-WTE-5054-OE

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Therefore, it is determined that the proposed construction would not have a substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on any air navigation facility and would not be a hazard to air navigation provided the conditions set forth within this determination are met.

Sectional Map for ASN 2016-WTE-5051-OE

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2016-WTE-5052-OE
Prior Study No.
2014-WTE-688-OE

Issued Date: 02/22/2017

Lorry Wagner
LEEDCo
1938 Euclid Avenue
Ste 200
Cleveland, OH 44115

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine Turbine 5
Location:	Cleveland, OH
Latitude:	41-37-21.00N NAD 83
Longitude:	81-49-21.00W
Heights:	569 feet site elevation (SE)
	479 feet above ground level (AGL)
	1048 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure would have no substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on the operation of air navigation facilities. Therefore, pursuant to the authority delegated to me, it is hereby determined that the structure would not be a hazard to air navigation provided the following condition(s) is(are) met:

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See attachment for additional condition(s) or information.

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(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
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In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

This aeronautical study considered and analyzed the impact on existing and proposed arrival, departure, and en route procedures for aircraft operating under both visual flight rules and instrument flight rules; the impact on all existing and planned public-use airports, military airports and aeronautical facilities; and the cumulative impact resulting from the studied structure when combined with the impact of other existing or proposed structures. The study disclosed that the described structure would have no substantial adverse effect on air navigation.

An account of the study findings, aeronautical objections received by the FAA during the study (if any), and the basis for the FAA's decision in this matter can be found on the following page(s).

If we can be of further assistance, please contact Paul Holmquist, at (425) 227-2625. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2016-WTE-5052-OE.

Signature Control No: 299560651-322889485 (DNH -WT)

Mike Helvey
Manager, Obstruction Evaluation Group

Attachment(s)
Additional Information
Map(s)

Narrative for ASNs
2016-WTE-5048-OE
2016-WTE-5049-OE
2016-WTE-5050-OE
2016-WTE-5051-OE
2016-WTE-5052-OE
2016-WTE-5053-OE
2016-WTE-5054-OE

Abbreviations

AGL - above ground level
AMSL - above mean sea level
RWY - runway
VFR - visual flight rules
IFR - instrument flight rules
NM - nautical mile
ASN- Aeronautical Study Number
MVA - minimum vectoring altitude
Part 77 - Title 14 Code of Federal Regulations (CFR) Part 77, Safe, Efficient Use and Preservation of the Navigable Airspace

The proposed project consisting of seven, 479 AGL (1048 AMSL) wind turbines would be located between 7.3 and 9.7 NM northwest of Burke Lakefront Airport, Cleveland, OH. For the sake of efficiency this narrative contains all turbines within this project that have similar impacts. Separate determinations will be issued for each turbine which will be available on the FAA's website at htttp://oeaaa.faa.gov.

The turbine(s) exceed(s) Part 77 standards as described below.

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

The turbines studied under the ASNs listed below would increase the Sector A Minimum Vectoring Altitude (MVA) from 1800 feet AMSL to 2000 feet AMSL for the Cleveland Ohio Terminal Radar Approach Control (CLE ATCT/TRACON)

2016-WTE-5048-OE
2016-WTE-5049-OE
2016-WTE-5050-OE
2016-WTE-5051-OE
2016-WTE-5052-OE
2016-WTE-5053-OE
2016-WTE-5054-OE

There would be no impact to this standard if the turbines do not exceed 849 feet AMSL (280 AGL).

The study was not circularized for public comment as the impact to Cleveland TRACON's MVA identified above only requires FAA comment. Cleveland Air Traffic Control has responded to this study with no objection to the increase in MVA height.

Aeronautical study disclosed that the proposed structure would have no effect on any existing or proposed arrival, departure, or en route instrument flight rule (IFR) operations or procedures other than the MVA impact identified above.

Study for possible visual flight rules (VFR) effect disclosed that the proposed structure would have no effect on any existing or proposed arrival or departure VFR operations or procedures. It would not conflict with airspace required to conduct normal VFR traffic pattern operations at any known public use or military airport. At 479 feet above ground level the proposed structure would not have a substantial adverse effect on VFR en route flight operations.

The proposed structure would be appropriately obstruction marked and/or lighted to make it more conspicuous to airmen should circumnavigation be necessary.

Therefore, it is determined that the proposed construction would not have a substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on any air navigation facility and would not be a hazard to air navigation provided the conditions set forth within this determination are met.


Terminal Area Chart for flights at and bel
CLEVELAND CLASS B
ERIE
V5
110
80
40
See NOTAMs/
for Class D/E
80
30
572
BURKE LAKEFRONT (BKL)
CT - 124.3 ★ C
ATIS 125.25
584 *L 66 122.95
RP 24L, 24R
30
243.0
122.2
122.35
255.4
122.1R
CLEVELAND RCO
CLEVELAND
waterworks
intake
1603
(952)
bldgs
1000
(360)
054°
NO SVFR
980
CLEVELAND-HOPKINS INTL (CLE)
CT-120.9 124.5
ATIS 127.85
LEBRN

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2016-WTE-5053-OE
Prior Study No.
2014-WTE-689-OE

Issued Date: 02/22/2017

Lorry Wagner
LEEDCo
1938 Euclid Avenue
Ste 200
Cleveland, OH 44115

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine Turbine 6
Location:	Cleveland, OH
Latitude:	41-37-40.60N NAD 83
Longitude:	81-49-40.40W
Heights:	569 feet site elevation (SE)
	479 feet above ground level (AGL)
	1048 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure would have no substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on the operation of air navigation facilities. Therefore, pursuant to the authority delegated to me, it is hereby determined that the structure would not be a hazard to air navigation provided the following condition(s) is(are) met:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

__X__ At least 56 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 08/22/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is subject to review if an interested party files a petition that is received by the FAA on or before March 24, 2017. In the event a petition for review is filed, it must contain a full statement of the basis upon which it is made and be submitted to the Manager, Airspace Policy & Regulation, Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591.

This determination becomes final on April 03, 2017 unless a petition is timely filed. In which case, this determination will not become final pending disposition of the petition. Interested parties will be notified of the grant of any review. For any questions regarding your petition, please contact Airspace Regulations & ATC Procedures Group via telephone -- 202-267-8783 - or facsimile 202-267-9328.

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights, and frequencies or use of greater power will void this determination. Any future construction or alteration, including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

This aeronautical study considered and analyzed the impact on existing and proposed arrival, departure, and en route procedures for aircraft operating under both visual flight rules and instrument flight rules; the impact on all existing and planned public-use airports, military airports and aeronautical facilities; and the cumulative impact resulting from the studied structure when combined with the impact of other existing or proposed structures. The study disclosed that the described structure would have no substantial adverse effect on air navigation.

An account of the study findings, aeronautical objections received by the FAA during the study (if any), and the basis for the FAA's decision in this matter can be found on the following page(s).

If we can be of further assistance, please contact Paul Holmquist, at (425) 227-2625. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2016-WTE-5053-OE.

Signature Control No: 299560652-322889483 (DNH -WT)
Mike Helvey
Manager, Obstruction Evaluation Group

Attachment(s)
Additional Information
Map(s)

Narrative for ASNs
2016-WTE-5048-OE
2016-WTE-5049-OE
2016-WTE-5050-OE
2016-WTE-5051-OE
2016-WTE-5052-OE
2016-WTE-5053-OE
2016-WTE-5054-OE

Abbreviations

AGL - above ground level	AMSL - above mean sea level	RWY - runway
VFR - visual flight rules	IFR - instrument flight rules	NM - nautical mile
ASN- Aeronautical Study Number	MVA - minimum vectoring altitude	

Part 77 - Title 14 Code of Federal Regulations (CFR) Part 77, Safe, Efficient Use and Preservation of the Navigable Airspace

The proposed project consisting of seven, 479 AGL (1048 AMSL) wind turbines would be located between 7.3 and 9.7 NM northwest of Burke Lakefront Airport, Cleveland, OH. For the sake of efficiency this narrative contains all turbines within this project that have similar impacts. Separate determinations will be issued for each turbine which will be available on the FAA's website at htttp://oeaaa.faa.gov.

The turbine(s) exceed(s) Part 77 standards as described below.

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

The turbines studied under the ASNs listed below would increase the Sector A Minimum Vectoring Altitude (MVA) from 1800 feet AMSL to 2000 feet AMSL for the Cleveland Ohio Terminal Radar Approach Control (CLE ATCT/TRACON)

2016-WTE-5048-OE
2016-WTE-5049-OE
2016-WTE-5050-OE
2016-WTE-5051-OE
2016-WTE-5052-OE
2016-WTE-5053-OE
2016-WTE-5054-OE

There would be no impact to this standard if the turbines do not exceed 849 feet AMSL (280 AGL).

The study was not circularized for public comment as the impact to Cleveland TRACON's MVA identified above only requires FAA comment. Cleveland Air Traffic Control has responded to this study with no objection to the increase in MVA height.

Aeronautical study disclosed that the proposed structure would have no effect on any existing or proposed arrival, departure, or en route instrument flight rule (IFR) operations or procedures other than the MVA impact identified above.

Study for possible visual flight rules (VFR) effect disclosed that the proposed structure would have no effect on any existing or proposed arrival or departure VFR operations or procedures. It would not conflict with airspace required to conduct normal VFR traffic pattern operations at any known public use or military airport. At 479 feet above ground level the proposed structure would not have a substantial adverse effect on VFR en route flight operations.

The proposed structure would be appropriately obstruction marked and/or lighted to make it more conspicuous to airmen should circumnavigation be necessary.

Therefore, it is determined that the proposed construction would not have a substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on any air navigation facility and would not be a hazard to air navigation provided the conditions set forth within this determination are met.

Terminal Area Chart for flights at and be
CLEVELAND CLASS B
82°
E R I E
V5
110
80
40
80
30
See NOTAMs/
for Class D/E
572
243.0
122.2
122.35
255.4
122.1R
CLEVELAND RCO
CLEVELAND
BURKE LAKEFRONT (BKL)
CT - 124.3 ★ C
ATIS 125.25
584 *L 66 122.95
RP 24L, 24R
30
waterworks
intake
1603
(952)
bldgs
1000
(360)
054°
NO SVFR
CLEVELAND-HOPKINS INTL (CLE)
CT- 120.9 124.5
ATIS 127.85
LEBRN

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2016-WTE-5054-OE

Issued Date: 02/22/2017

Lorry Wagner
LEEDCo
1938 Euclid Avenue
Ste 200
Cleveland, OH 44115

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine Turbine 7
Location:	Cleveland, OH
Latitude:	41-37-59.70N NAD 83
Longitude:	81-50-00.00W
Heights:	569 feet site elevation (SE)
	479 feet above ground level (AGL)
	1048 feet above mean sea level (AMSL)

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It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

__X__ At least 56 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 08/22/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

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Signature Control No: 299560653-322889481 (DNH -WT)
Mike Helvey
Manager, Obstruction Evaluation Group

Attachment(s)
Additional Information
Map(s)

Narrative for ASNs
2016-WTE-5048-OE
2016-WTE-5049-OE
2016-WTE-5050-OE
2016-WTE-5051-OE
2016-WTE-5052-OE
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Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

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2016-WTE-5048-OE
2016-WTE-5049-OE
2016-WTE-5050-OE
2016-WTE-5051-OE
2016-WTE-5052-OE
2016-WTE-5053-OE
2016-WTE-5054-OE

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Aeronautical study disclosed that the proposed structure would have no effect on any existing or proposed arrival, departure, or en route instrument flight rule (IFR) operations or procedures other than the MVA impact identified above.

Study for possible visual flight rules (VFR) effect disclosed that the proposed structure would have no effect on any existing or proposed arrival or departure VFR operations or procedures. It would not conflict with airspace required to conduct normal VFR traffic pattern operations at any known public use or military airport. At 479 feet above ground level the proposed structure would not have a substantial adverse effect on VFR en route flight operations.

The proposed structure would be appropriately obstruction marked and/or lighted to make it more conspicuous to airmen should circumnavigation be necessary.

Therefore, it is determined that the proposed construction would not have a substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on any air navigation facility and would not be a hazard to air navigation provided the conditions set forth within this determination are met.

Sectional Map for ASN 2016-WTE-5054-OE

APPENDIX E

Case Id	Year	Month	Day	Unit Name	Title	Latitude	Longitude	Event Type
284959	2006	4	19	Marine Safety Unit Cleveland	E.55th St. Sinker	41.51852	-81.70728	Discharge/Release - Pollution
300866	2006	6	22	Marine Safety Unit Cleveland	CANADIAN TRANSFER ALLISION	41.491667	-81.701167	Allision
297392	2006	6	29	Marine Safety Unit Cleveland	M/V CALUMET ELECTROCUTION	41.51852	-81.70728	Personnel Casualty - Injury
368679	2006	9	12	Sector Detroit	ADAM E. CORNELIUS_crew injury	41.496497	-81.723795	Personnel Casualty - Injury
315289	2006	9	13	Marine Safety Unit Cleveland	WOLVERINE ALLISION	41.51852	-81.70728	Allision
329826	2006	12	4	Marine Safety Unit Cleveland	M/V CANADIAN OLYMPIC GROUNDING	41.56096	-81.73659	Grounding
343943	2007	4	4	Marine Safety Unit Cleveland	M/V CUYAHOGA ALLISION	41.51852	-81.70728	Allision
352154	2007	5	26	Marine Safety Unit Cleveland	Channel Park Marina Discharge	41.51852	-81.70728	Discharge/Release - Pollution
352182	2007	5	30	Marine Safety Unit Cleveland	Boat Fire	41.56096	-81.73659	Discharge/Release - Pollution
353485	2007	6	7	Marine Safety Unit Cleveland	CPN 07116 Solvent Release Outfall CSO #080	41.51852	-81.70728	Discharge/Release - Pollution
353872	2007	6	9	Marine Safety Unit Cleveland	M Pollution - Oil (06/09/2007 3:00:00 AM)	41.51852	-81.70728	Allision
360257	2007	7	5	Marine Safety Unit Cleveland	M/V MAUMEE ALLISION	41.51852	-81.70728	Allision
372999	2007	8	28	Marine Safety Unit Cleveland	M/V AMERICAN REPUBLIC: Crew Member INJURY	41.51852	-81.70728	Personnel Casualty - Injury
382708	2007	11	15	Marine Safety Unit Cleveland	M/V CALUMET ALLISION	41.490667	-81.706833	Allision
383927	2007	11	26	Marine Safety Unit Cleveland	M/V MANISTEE ALLISION	41.51852	-81.70728	Allision
392192	2008	1	10	Marine Safety Unit Cleveland	AMERICAN COURAGE EQUIPMENT FAILURE	41.51852	-81.70728	Loss/Reduction of Vessel Propulsion/Steering
399805	2008	4	18	Marine Safety Unit Cleveland	M/V ALGORAIL Allision w/Flats Industrial RR Bridge	41.51852	-81.70728	Allision
400091	2008	4	21	Marine Safety Unit Cleveland	Blue Mystery Drum	41.49245	-81.70495	Discharge/Release - Pollution
400112	2008	4	21	Marine Safety Unit Cleveland	MITAL STEEL discharge	41.51852	-81.70728	Discharge/Release - Pollution

Case Id	Year	Month	Day	Unit Name	Title	Latitude	Longitude	Event Type
401974	2008	5	6	Marine Safety Unit Cleveland	AMERICAN REPUBLIC EQUIPMENT FAILURE	41.501667	-81.711667	Loss of Electrical Power
405832	2008	6	1	Marine Safety Unit Cleveland	M/V CUYAHOGA allision with P/C BEVERLY II	41.51852	-81.70728	Allision
414009	2008	7	12	Marine Safety Unit Cleveland	Transformer Vandalism at Scranton Ave.	41.51852	-81.70728	Discharge/Release - Pollution
414545	2008	7	16	Marine Safety Unit Cleveland	Cuyahoga River Mystery Drum C08112	41.51852	-81.70728	Discharge/Release - Pollution
424371	2008	9	7	Marine Safety Unit Cleveland	Sunken boat at Olde River Yacht Club (08-056)	41.49264	-81.72185	Sinking
428569	2008	9	27	Marine Safety Unit Cleveland	MS Equipment Failure (09/27/2008 8:00:00 PM)	41.506667	-81.6925	Material Failure/Malfunction
431305	2008	10	29	Marine Safety Unit Cleveland	MS Allision (10/29/2008 11:26:00 PM)	41.51852	-81.70728	Allision
439712	2009	1	24	Marine Safety Unit Cleveland	Mercedes crashes on I-90/Oil spill	41.51852	-81.70728	Discharge/Release - Pollution
445971	2009	3	26	Marine Safety Unit Cleveland	MEP Pollution - Hazardous Material	41.51852	-81.70728	Discharge/Release - Pollution
454094	2009	5	25	Marine Safety Unit Cleveland	Maumee / Allision	41.51852	-81.70728	Allision
455369	2009	6	4	Marine Safety Unit Cleveland	Sinking at Old River Yacht Club	41.49264	-81.72185	Sinking
459556	2009	6	20	Marine Safety Unit Cleveland	M/V Holiday / Injury	41.51852	-81.70728	Personnel Casualty - Injury
458538	2009	6	23	Marine Safety Unit Cleveland	DAMAGED GOODS Potential Gasoline Discharge	41.56096	-81.73659	Sinking
462963	2009	7	6	Marine Safety Unit Cleveland	MEP Pollution - Oil (07/06/2009 3:30:00 PM)	41.506667	-81.691167	Discharge/Release - Pollution
461975	2009	7	10	Marine Safety Unit Cleveland	MEP Special Operation (07/11/2009 12:18:00 AM)	41.56096	-81.73659	Personnel Casualty - Injury
463374	2009	7	17	Marine Safety Unit Cleveland	Truck in water; sheen at Wildwood Marina	41.56096	-81.73659	Discharge/Release - Pollution
464157	2009	7	20	Marine Safety Unit Cleveland	Nautica Queen/Mechanical Failure/Allision/Injury	41.501667	-81.711667	Personnel Casualty - Injury
478919	2009	9	13	Marine Safety Unit Cleveland	Express / Flooding	41.56096	-81.73659	Flooding - Initial
480627	2009	11	2	Marine Safety Unit Cleveland	MEP Pollution- Burke Airport 02Nov09	41.51852	-81.70728	Discharge/Release - Pollution

Case Id	Year	Month	Day	Unit Name	Title	Latitude	Longitude	Event Type
484026	2009	12	7	Marine Safety Unit Cleveland	CALUMET / Loss of Propulsion	41.4925	-81.705	Material Failure/Malfunction
486622	2010	1	5	Marine Safety Unit Cleveland	Crank Case Explosion	41.51852	-81.70728	Loss/Reduction of Vessel Propulsion/Steering
487273	2010	1	11	Marine Safety Unit Cleveland	DISCHARGE OF SEWAGE M/V MAUMEE	41.51852	-81.70728	Discharge/Release - Pollution
490904	2010	2	18	Marine Safety Unit Cleveland	MAUMEE OIL DISCHARGE	41.51852	-81.70728	Discharge/Release - Pollution
498274	2010	3	3	Marine Safety Unit Cleveland	SHOOTERS ALLISION	41.51852	-81.70728	Allision
497868	2010	4	9	Marine Safety Unit Cleveland	Oil Discharge from the M/V Maumee	41.51852	-81.70728	Discharge/Release - Pollution
498370	2010	4	23	Marine Safety Unit Cleveland	Nautica Queen/Allision/Machinery Failure	41.51852	-81.70728	Material Failure/Malfunction
499189	2010	5	4	Marine Safety Unit Cleveland	ALGORAIL / Allision & Pollution	41.51852	-81.70728	Allision
499862	2010	5	5	Marine Safety Unit Cleveland	Sam Laud / machinery failure	41.51852	-81.70728	Loss/Reduction of Vessel Propulsion/Steering
501333	2010	5	21	Marine Safety Unit Cleveland	R/V Scooter/Gasoline Discharge/21MAY10	41.51852	-81.70728	Discharge/Release - Pollution
503468	2010	6	3	Marine Safety Unit Cleveland	EQUIPMENT FAILURE/ M/V ST CLAIR	41.535935	-81.725702	Material Failure/Malfunction
505534	2010	6	12	Marine Safety Unit Cleveland	Holiday / Machinery Failure	41.51852	-81.70728	Loss/Reduction of Vessel Propulsion/Steering
505517	2010	6	14	Marine Safety Unit Cleveland	Mentor on the Lake sheen	41.56096	-81.73659	Discharge/Release - Pollution
510448	2010	7	12	Marine Safety Unit Cleveland	Discharge of Oil Whiskey Island Marina/OH5439DZ	41.51852	-81.70728	Discharge/Release - Pollution
512026	2010	7	21	Marine Safety Unit Cleveland	M/V Maumee slop tank oil discharge	41.51852	-81.70728	Discharge/Release - Pollution
515942	2010	8	9	Marine Safety Unit Cleveland	M/V MAUMEE V. TUG IOWA ALLISION/09AUG10	41.51852	-81.70728	Allision
517106	2010	8	12	Marine Safety Unit Cleveland	McKee Sons / Machinery Failure	41.508333	-81.728333	Material Failure/Malfunction
517674	2010	8	18	Marine Safety Unit Cleveland	Nautica Queen / electrical fire	41.51852	-81.70728	Fire - Initial
521157	2010	9	1	Marine Safety Unit Cleveland	MEP Pollution - Oil (09/01/2010 11:41:00 PM)	41.611167	-81.733	Discharge/Release - Pollution

Case Id	Year	Month	Day	Unit Name	Title	Latitude	Longitude	Event Type
524640	2010	9	29	Marine Safety Unit Cleveland	Cleveland Crib/Biodiesel/29SEP10	41.542333	-81.75	Discharge/Release - Pollution
526608	2010	10	8	Marine Safety Unit Cleveland	LINDA MAE / Steering Failure	41.56096	-81.73659	Loss/Reduction of Vessel Propulsion/Steering
525521	2010	10	11	Marine Safety Unit Cleveland	OH9084YK/Gasoline/11OCT2010	41.533333	-81.65	Discharge/Release - Pollution
529613	2010	10	21	Marine Safety Unit Cleveland	MS Loss of Life/Injury (10/21/2010 7:30:00 AM)	41.51852	-81.70728	Personnel Casualty - Injury
529970	2010	11	18	Marine Safety Unit Cleveland	Nautica Queen / Starboard Generator Failure	41.526	-81.657667	Material Failure/Malfunction
532394	2010	12	14	Marine Safety Unit Cleveland	MAUMEE ELECTRICAL FIRE/14DEC10	41.51852	-81.70728	Material Failure/Malfunction
542697	2011	4	4	Marine Safety Unit Cleveland	Personnel Injury on American Integrity	41.533333	-81.733333	Personnel Casualty - Injury
542782	2011	4	4	Marine Safety Unit Cleveland	River Gate Club Gasoline Discharge	41.51852	-81.70728	Discharge/Release - Pollution
544734	2011	4	18	Marine Safety Unit Cleveland	Intercity Yacht Club/ OH 5277 BV/ 02 GAL GAS	41.51852	-81.70728	Discharge/Release - Pollution
551235	2011	4	19	Marine Safety Unit Cleveland	SHEFFIELD LAKE/REPUBLIC SERVICES/DIESEL/19APR11	41.51852	-81.70728	Discharge/Release - Pollution
550718	2011	6	4	Marine Safety Unit Cleveland	EdgeWater Marina R/V SUTTLE SEAS	41.51852	-81.70728	Sinking
552691	2011	6	16	Marine Safety Unit Cleveland	MEP Pollution - Oil (06/16/2011 4:00:00 PM)	41.51852	-81.70728	Discharge/Release - Pollution
553993	2011	6	24	Marine Safety Unit Cleveland	MS/ Loss of Propulsion Goodtime 3	41.496497	-81.723795	Material Failure/Malfunction
556085	2011	7	4	Marine Safety Unit Cleveland	MEP Pollution/Oil/E. 55th Marina	41.5337	-81.64998	Sinking
558302	2011	7	16	Marine Safety Unit Cleveland	Allision / Barge St Mary's Cement	41.51852	-81.70728	Loss/Reduction of Vessel Propulsion/Steering
558869	2011	7	18	Marine Safety Unit Cleveland	MS Allision M/V Calumet vs Shooters Dock	41.492333	-81.704833	Allision
559939	2011	7	23	Marine Safety Unit Cleveland	Discharge of Oil/ OH4572DZ/East 55th Street Marina	41.53	-81.651667	Discharge/Release - Pollution
560152	2011	7	25	Marine Safety Unit Cleveland	M/V H. LEE WHITE/Discharge	41.51852	-81.70728	Discharge/Release - Pollution
560098	2011	7	25	Marine Safety Unit Cleveland	Discharge of Oil/OH4117YT	41.537667	-81.645	Discharge/Release - Pollution

Case Id	Year	Month	Day	Unit Name	Title	Latitude	Longitude	Event Type
560642	2011	7	27	Marine Safety Unit Cleveland	Calumet Allision (07/27/2011 6:00:00 PM)	41.501667	-81.711667	Allision
565787	2011	8	20	Marine Safety Unit Cleveland	Nautica Queen Injury	41.51852	-81.70728	Personnel Casualty - Injury
566490	2011	8	26	Marine Safety Unit Cleveland	CALUMET Equipment Failure	41.56096	-81.73659	Loss/Reduction of Vessel Propulsion/Steering
566717	2011	8	29	Marine Safety Unit Cleveland	MS Allision (08/29/2011 1:30:00 PM)	41.51852	-81.70728	Allision
567300	2011	9	3	Marine Safety Unit Cleveland	036-11 M/V MAUMEE OWS Failure	41.51852	-81.70728	Discharge/Release - Pollution
568337	2011	9	9	Marine Safety Unit Cleveland	037-11 Cuyahoga Valley Scenic Railyard Discharge	41.51852	-81.70728	Discharge/Release - Pollution
571712	2011	9	30	Marine Safety Unit Cleveland	MS Loss of Life/Injury	41.507122	-81.694167	Personnel Casualty - Injury
572833	2011	9	30	Marine Safety Unit Cleveland	OH 2283SB / Discharge of oil / Edgewater Marina	41.493333	-81.728333	Discharge/Release - Pollution
572574	2011	10	7	Marine Safety Unit Cleveland	EXPRESS Engine Overheat	41.56096	-81.73659	Loss/Reduction of Vessel Propulsion/Steering
574130	2011	10	25	Marine Safety Unit Cleveland	054-11 CGC NEAHBAY Oil Discharge	41.51852	-81.70728	Discharge/Release - Pollution
575983	2011	11	11	Marine Safety Unit Cleveland	064-11 Tug OHIO Discharge of Lube Oil	41.51852	-81.70728	Discharge/Release - Pollution
579194	2011	12	14	Marine Safety Unit Cleveland	UCN 076 - 11 Discharge of Oil - M/V ST CLAIR	41.51852	-81.70728	Discharge/Release - Pollution
582500	2011	12	18	Marine Safety Unit Cleveland	Life/Injury	41.51852	-81.70728	Personnel Casualty - Injury
587599	2012	3	21	Marine Safety Unit Cleveland	UCN 029-12 DRUM LAKE ERIE	41.547833	-81.788567	Discharge/Release - Pollution
608647	2012	4	11	Marine Safety Unit Cleveland	Mooring Damage	41.51852	-81.70728	Allision
593293	2012	5	12	Marine Safety Unit Cleveland	051-12 S/V TOCABRE/5 GAL DIESEL DISCHARGE	41.51852	-81.70728	Discharge/Release - Pollution
595248	2012	5	27	Marine Safety Unit Cleveland	UCN 055-12 SUBMERGED VEHICLE/DISCHARGE OF OIL	41.51852	-81.70728	Discharge/Release - Pollution
595904	2012	5	27	Marine Safety Unit Cleveland	UCN 056-12 CAPSIZED VESSEL/DISCHARGE OF GASOLINE	41.51852	-81.70728	Discharge/Release - Pollution

Case Id	Year	Month	Day	Unit Name	Title	Latitude	Longitude	Event Type
596025	2012	5	31	Marine Safety Unit Cleveland	UCN-58-12 SUNKEN VESSEL/POTENTIAL DISCHARGE	41.51852	-81.70728	Discharge/Release - Pollution
596771	2012	6	2	Marine Safety Unit Cleveland	UCN-59-12 GROUNDED VESSEL/POTENTIAL DISCHARGE	41.51852	-81.70728	Discharge/Release - Pollution
597301	2012	6	8	Marine Safety Unit Cleveland	UCN-062 SOUL MATE grounding/ potential discharge	41.52	-81.686	Discharge/Release - Pollution
605687	2012	7	27	Marine Safety Unit Cleveland	Bradshaw McKee Flooding Rec Vessel	41.51852	-81.70728	Flooding - Initial
610298	2012	8	24	Marine Safety Unit Cleveland	M/V BUFFALO Equipment Failure/Loss of Propulsion	41.51852	-81.70728	Loss/Reduction of Vessel Propulsion/Steering
612486	2012	9	8	Marine Safety Unit Cleveland	UCN 090-12 Tractor Trailer Crash Discharge	41.51852	-81.70728	Discharge/Release - Pollution
613473	2012	9	15	Marine Safety Unit Cleveland	UCN 093-12 MV KNOT YET	41.51852	-81.70728	Discharge/Release - Pollution
613622	2012	9	16	Marine Safety Unit Cleveland	UCN 094-12 Discharge of Gasoline/Ivancic Marine	41.51852	-81.70728	Discharge/Release - Pollution
618586	2012	10	26	Marine Safety Unit Cleveland	UCN-105-12/Sunken Vessel/Potential Discharge Oil	41.56096	-81.73659	Discharge/Release - Pollution
619008	2012	10	26	Marine Safety Unit Cleveland	UCN106-12/Sunken Vessel/Lakefront Park/Potential	41.56096	-81.73659	Discharge/Release - Pollution
618954	2012	10	28	Marine Safety Unit Cleveland	UCN108-12/Submerged Dodge/Rocky River/Potential	41.51852	-81.70728	Discharge/Release - Pollution
618909	2012	10	30	Marine Safety Unit Cleveland	UCN119-12/OH1870AV/Sunken/Potential	41.51852	-81.70728	Discharge/Release - Pollution
618914	2012	10	30	Marine Safety Unit Cleveland	UCN115-12/OH1442YT/Potential Discharge	41.51852	-81.70728	Discharge/Release - Pollution
618916	2012	10	30	Marine Safety Unit Cleveland	UCN120-12/OH8317YN/Sunken/Potential	41.51852	-81.70728	Discharge/Release - Pollution
618920	2012	10	30	Marine Safety Unit Cleveland	UCN114-12/OH1229ZB/Sunken/Potential	41.51852	-81.70728	Discharge/Release - Pollution
618942	2012	10	30	Marine Safety Unit Cleveland	UCN117-12/Plum Crazy/Sunken/Potential	41.51852	-81.70728	Discharge/Release - Pollution
619018	2012	10	30	Marine Safety Unit Cleveland	Storm Sandy: UCN112-12/Sunken Vessel/OH9640YF	41.51852	-81.70728	Discharge/Release - Pollution
619045	2012	10	30	Marine Safety Unit Cleveland	UCN 129-12 OH4102WB Sunken Sailboat Whiskey Island	41.492167	-81.721667	Discharge/Release - Pollution

Case Id	Year	Month	Day	Unit Name	Title	Latitude	Longitude	Event Type
619046	2012	10	30	Marine Safety Unit Cleveland	UCN 128-12/S/V DRAGON/WHISKY ISLAND MARINA	41.51852	-81.70728	Discharge/Release - Pollution
619054	2012	10	30	Marine Safety Unit Cleveland	Storm Sandy: UCN 125-12 Sunken s/v Whiskey Island	41.492	-81.72	Discharge/Release - Pollution
619057	2012	10	30	Marine Safety Unit Cleveland	UCN 130-12/OH 4300 UC/EAST 55TH ST MARINA	41.536667	-81.643333	Discharge/Release - Pollution
619171	2012	10	30	Marine Safety Unit Cleveland	Hurricane Sandy Capsized vessel	41.51852	-81.70728	Discharge/Release - Pollution
619172	2012	10	30	Marine Safety Unit Cleveland	Storm Sandy: UCN135-12/OH1659YF/Sunken/Potential	41.51852	-81.70728	Discharge/Release - Pollution
619175	2012	10	30	Marine Safety Unit Cleveland	UCN136-12 22ft Sunken Searay Mouth of Rocky River	41.51852	-81.70728	Discharge/Release - Pollution
619192	2012	10	30	Marine Safety Unit Cleveland	Sandy: UCN140-12/OH9652YU/Potential/Sunk	41.51852	-81.70728	Discharge/Release - Pollution
619193	2012	10	30	Marine Safety Unit Cleveland	SANDY: UCN141-12/OH6366ZB/Sunken/Potential	41.51852	-81.70728	Discharge/Release - Pollution
619274	2012	10	30	Marine Safety Unit Cleveland	UCN 137-12 OH5833ZE Sunken VSL Whiskey Island	41.51852	-81.70728	Discharge/Release - Pollution
619996	2012	10	30	Marine Safety Unit Cleveland	UCN132-12/OH3271BG/Sunken/Potential	41.51852	-81.70728	Discharge/Release - Pollution
620212	2012	10	30	Marine Safety Unit Cleveland	UCN149-12/OH4987DM/Sunken/Potential	41.51852	-81.70728	Discharge/Release - Pollution
620298	2012	10	30	Marine Safety Unit Cleveland	UCN111-12/OH4805DW/Potential	41.51852	-81.70728	Discharge/Release - Pollution
620215	2012	10	30	Marine Safety Unit Cleveland	UCN154-12/Potential/27' Catalina/Sunken	41.51852	-81.70728	Discharge/Release - Pollution
620217	2012	10	30	Marine Safety Unit Cleveland	SANDY: UCN155-12/27' Catalina/Sunken	41.51852	-81.70728	Discharge/Release - Pollution
620344	2012	11	16	Marine Safety Unit Cleveland	M/V MANISTEE loss of propulsion	41.51852	-81.70728	Material Failure/Malfunction
624484	2013	1	9	Marine Safety Unit Cleveland	UCN001-13/Discharge of Oil/UTV California	41.491536	-81.721727	Discharge/Release - Pollution
630808	2013	3	25	Marine Safety Unit Cleveland	UCN-018-13 Discharge of Oil/Universal Oil Inc.	41.51852	-81.70728	Discharge/Release - Pollution
636071	2013	5	14	Marine Safety Unit Cleveland	UCN 030-13 / Great Lakes Towing Company Discharge	41.51852	-81.70728	Discharge/Release - Pollution

Case Id	Year	Month	Day	Unit Name	Title	Latitude	Longitude	Event Type
639501	2013	6	7	Marine Safety Unit Cleveland	UCN039-13 Potential/Tug ATLAS	41.51852	-81.70728	Discharge/Release - Pollution
649090	2013	6	11	Marine Safety Unit Cleveland	UTV ATLAS Loss of Propulsion/Injured Crewmember	41.504683	-81.707267	Material Failure/Malfunction
644476	2013	7	9	Marine Safety Unit Cleveland	M/V MANISTEE Loss of Propulsion	41.496667	-81.711667	Loss/Reduction of Vessel Propulsion/Steering
645642	2013	7	12	Marine Safety Unit Cleveland	UCN 047-13 Lakewood Park Boat Sinking	41.51852	-81.70728	Discharge/Release - Pollution
645973	2013	7	14	Marine Safety Unit Cleveland	UCN 050-13 Arcelor Mittal Outfall Sheen	41.51852	-81.70728	Discharge/Release - Pollution
646215	2013	7	16	Marine Safety Unit Cleveland	M/V AMERICAN COURAGE Bridge Allision	41.51852	-81.70728	Loss of Electrical Power
647047	2013	7	20	Marine Safety Unit Cleveland	UCN 056-13 Potential Discharge	41.56096	-81.73659	Discharge/Release - Pollution
647053	2013	7	20	Marine Safety Unit Cleveland	UCN 057-13 Potential discharge capsized vessel	41.56096	-81.73659	Discharge/Release - Pollution
650182	2013	8	7	Marine Safety Unit Cleveland	UCN063-13 Car Crash Edgewater Yacht Club	41.493333	-81.73	Discharge/Release - Pollution
651223	2013	8	8	Marine Safety Unit Cleveland	T/V ILLINOIS Loss of Steering	41.505576	-81.705204	Loss/Reduction of Vessel Propulsion/Steering
651716	2013	8	12	Marine Safety Unit Cleveland	M/V Holiday Collision with N&S#1	41.5	-81.709167	Vessel Maneuver
654845	2013	8	26	Marine Safety Unit Cleveland	M/V HOOK FOR REEL Loss of Rudder	41.51852	-81.70728	Material Failure/Malfunction
658251	2013	9	23	Marine Safety Unit Cleveland	UTV ILLINOIS Loss of Power	41.496497	-81.723795	Material Failure/Malfunction
658048	2013	9	28	Marine Safety Unit Cleveland	UCN-079-13 East 55th Marina Potential	41.536667	-81.65	Discharge/Release - Pollution
659968	2013	10	10	Marine Safety Unit Cleveland	UCN081-13 Submerged Cadillac/Edgewater Marina	41.495	-81.728333	Discharge/Release - Pollution
661251	2013	10	26	Marine Safety Unit Cleveland	UTV ILLINOIS - Loss of electrical power	41.51852	-81.70728	Loss of Electrical Power
662817	2013	11	9	Marine Safety Unit Cleveland	UCN 090-13 Partially Sunken Rec Vsl E.55th	41.537667	-81.6425	Discharge/Release - Pollution
664400	2013	11	24	Marine Safety Unit Cleveland	M/V MANISTEE Property Damage-Cargo Conveyor Motor	41.51852	-81.70728	Material Failure/Malfunction
669166	2014	1	20	Marine Safety Unit Cleveland	UTV PENNSYLVANIA Flooding	41.51852	-81.70728	Material Failure/Malfunction

Case Id	Year	Month	Day	Unit Name	Title	Latitude	Longitude	Event Type
669165	2014	1	20	Marine Safety Unit Cleveland	UTV DELAWARE Flooding	41.51852	-81.70728	Flooding - Initial
673151	2014	3	3	Marine Safety Unit Cleveland	UTV IOWA Loss of Maneuverability	41.51852	-81.70728	Material Failure/Malfunction
676967	2014	4	9	Marine Safety Unit Cleveland	M/V MANITOWAC Allision with Osborne Stone Dock	41.51852	-81.70728	Loss/Reduction of Vessel Propulsion/Steering
683145	2014	5	29	Marine Safety Unit Cleveland	M/V MANISTEE Loss of Electrical Power	41.496667	-81.713333	Loss of Electrical Power
685523	2014	6	13	Marine Safety Unit Cleveland	Barge GL 170 Flooding	41.496497	-81.723793	Material Failure/Malfunction
687017	2014	6	22	Marine Safety Unit Cleveland	AMERICAN COURAGE - Loss of Bow Thruster	41.51852	-81.70728	Loss of Electrical Power
692471	2014	7	22	Marine Safety Unit Cleveland	UCN 045-14 Conneaut Break Wall Boat Sinking	41.51852	-81.70728	Discharge/Release - Pollution
694578	2014	8	3	Marine Safety Unit Cleveland	P/C CRUZAN Flooding/Sinking	41.5065	-81.72	Material Failure/Malfunction
695610	2014	8	9	Marine Safety Unit Cleveland	M/V GOODTIME III - Allision/Crew Injury	41.506667	-81.7045	Allision
700763	2014	8	29	Marine Safety Unit Cleveland	Fuel Pump; <5 gal gas; E 55th Street Marina	41.56096	-81.73659	Discharge/Release - Pollution
702575	2014	9	23	Marine Safety Unit Cleveland	M/V CALUMET Loss of Bow Thruster in Nav Channel	41.51852	-81.70728	Loss/Reduction of Vessel Propulsion/Steering
703051	2014	9	27	Marine Safety Unit Cleveland	American Bridge Sunken Barge	41.51852	-81.70728	Flooding - Progressive
706820	2014	10	28	Marine Safety Unit Cleveland	Barge LAKES CONTENDER; <1gal hydraulic oil	41.51852	-81.70728	Discharge/Release - Pollution
710148	2014	12	1	Marine Safety Unit Cleveland	M/V BUFFALO Loss of Stern Thruster	41.51852	-81.70728	Material Failure/Malfunction
718879	2015	3	6	Marine Safety Unit Cleveland	Columbus Road Bridge Allision	41.51852	-81.70728	Allision
719630	2015	3	18	Marine Safety Unit Cleveland	UTV DOROTHY ANN Flooding	41.506828	-81.703705	Material Failure/Malfunction
720687	2015	3	28	Marine Safety Unit Cleveland	ARCELOR MITTAL Oil Discharge Cuyahoga River	41.51852	-81.70728	Discharge/Release - Pollution
721345	2015	4	3	Marine Safety Unit Cleveland	Oil Spill at Forest City Yacht Club	41.56096	-81.73659	Discharge/Release - Pollution
722703	2015	4	16	Marine Safety Unit Cleveland	ArcelorMittal 5 Gal Oily Water Into Cuyahoga River	41.51852	-81.70728	Discharge/Release - Pollution

Case Id	Year	Month	Day	Unit Name	Title	Latitude	Longitude	Event Type
723126	2015	4	19	Marine Safety Unit Cleveland	M/V AMERICAN COURAGE Loss of Steering	41.51852	-81.70728	Loss/Reduction of Vessel Propulsion/Steering
724486	2015	5	1	Marine Safety Unit Cleveland	M/V GADWALL Loss of Propulsion	41.51852	-81.70728	Material Failure/Malfunction
726548	2015	5	17	Marine Safety Unit Cleveland	M/V AMERICAN COURAGE Loss of Bow Thruster	41.51852	-81.70728	Loss/Reduction of Vessel Propulsion/Steering
727525	2015	5	25	Marine Safety Unit Cleveland	M/V SAM LAUD Loss of Propulsion	41.51852	-81.70728	Material Failure/Malfunction
727513	2015	5	25	Marine Safety Unit Cleveland	M/V AMERICAN MARINER Loss of Prop Pitch Control	41.53	-81.723333	Material Failure/Malfunction
730767	2015	5	28	Marine Safety Unit Cleveland	RHODE ISLAND; discharge of oil; Lake Erie	41.505033	-81.711817	Discharge/Release - Pollution
730124	2015	6	12	Marine Safety Unit Cleveland	Cleveland Metroparks /Discharge of Diesel / Euclid	41.51852	-81.70728	Discharge/Release - Pollution
732546	2015	6	27	Marine Safety Unit Cleveland	; 15 gal of gasoline; Lake Erie	41.51852	-81.70728	Discharge/Release - Pollution
735149	2015	7	12	Marine Safety Unit Cleveland	/Gasoline Discharge / E. 55th St. Marina	41.538333	-81.653333	Discharge/Release - Pollution
735413	2015	7	13	Marine Safety Unit Cleveland	XYGasoline Discharge/E.55th St. Marina	41.51852	-81.70728	Discharge/Release - Pollution
736621	2015	7	20	Marine Safety Unit Cleveland	19' Sea Ray gasoline discharge; Chagrin River	41.56096	-81.73659	Discharge/Release - Pollution
993491	2015	9	11	Marine Safety Unit Cleveland	M/V HERBERT C JACKSON allision with a bridge	41.49437	-81.703171	Allision
995509	2015	9	26	Marine Safety Unit Cleveland	M/V GREAT REPUBLIC allision with a pier	41.497841	-81.708557	Allision
996156	2015	9	30	Marine Safety Unit Cleveland	M/V MANISTEE allision/loss of maneuverability	41.497977	-81.708355	Allision
1006543	2016	1	3	Marine Safety Unit Cleveland	IMD;Mystery Sheen; Cuyahoga River; UCN 001-16	41.494764	-81.691971	Discharge/Release - Pollution
1018103	2016	3	22	Marine Safety Unit Cleveland	IMD; Gasoline; P/C Live Wire; Cleveland; 018-16	41.494784	-81.694111	Discharge/Release - Pollution
1023638	2016	5	9	Marine Safety Unit Cleveland	Tug ILLINOIS loss of maneuverability	41.495061	-81.713053	Loss/Reduction of Vessel Propulsion/Steering
1027385	2016	6	3	Marine Safety Unit Cleveland	M/V CALUMET allison with pier	41.498333	-81.708086	Allision
1035203	2016	7	18	Marine Safety Unit Cleveland	MSU CLE; Oil; CFD FB Celebrezze; Cleveland; OH	41.494242	-81.692506	Discharge/Release - Pollution

Attachment E
National Oceanic and Atmospheric Administration Low Impact to KCLE Weather Radar dated September 11, 2017

Christine M.T. Pirik (0029759)
(Counsel of Record)
Terrence O'Donnell (0074213)
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Attorneys for Icebreaker Windpower, Inc.

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Project Icebreaker

Low Impact to KCLE Weather Radar

<u>Cleveland, OH WSR-88D Impacts Overview</u>

There are seven (7) turbines as part of Project Icebreaker, which is located approximately 22 km northeast of the Cleveland, OH KCLE WSR-88D. The project is within the radar's Consultation Zone. However, since there are a small number of turbines located offshore and they will only contaminate the lowest elevation angle, the impacts to the KCLE radar will be low.

All WSR-88Ds in the United States serve the missions of the National Weather Service, Department of Defense, and the Federal Aviation Administration in the protection of life, property, and government resources.

If the project changes (number of turbines, location/height of turbines), please contact The Radar Operations Center via email (wind.energy.matters@noaa.gov) for further discussion on KCLE impacts.

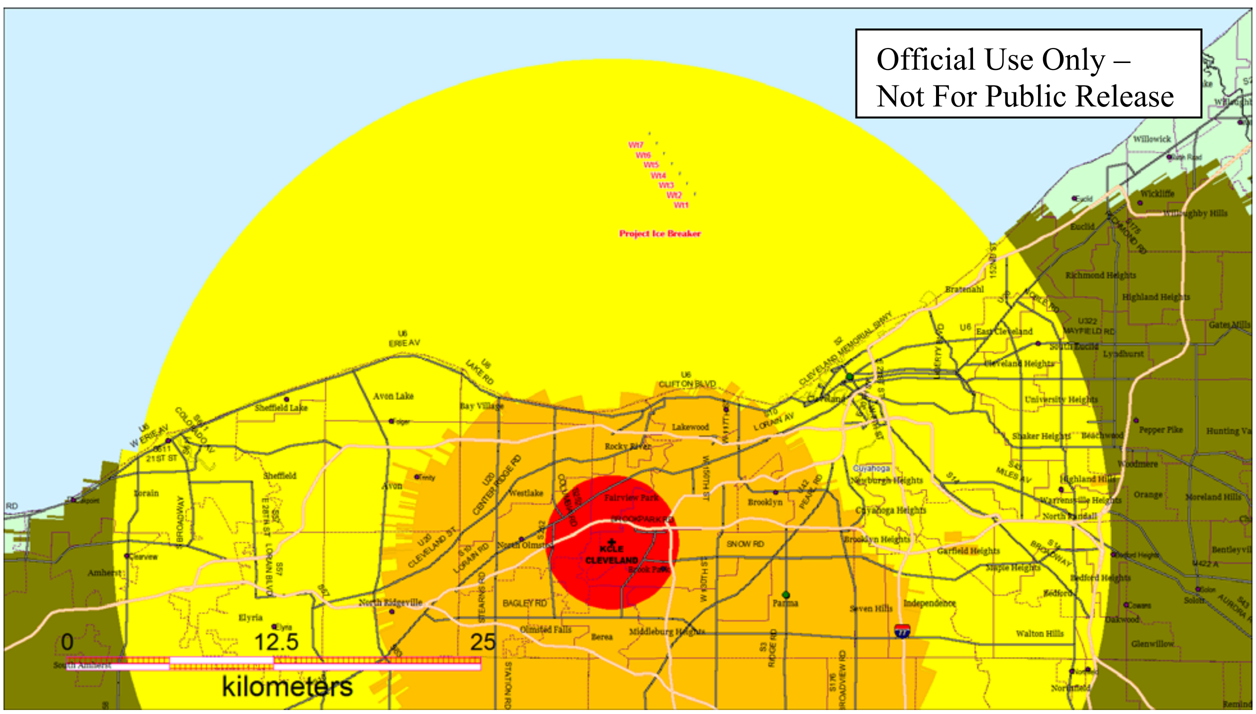

Figure 1: Turbine locations of Project Icebreaker to the northeast of the Cleveland, OH (KCLE) WSR-88D. The No Build Zone (red), Mitigation Zone (orange), Consultation Zone (yellow), and Notification Zone (dark green) are depicted.

Report date: 11 September 2017

Attachment F
International Joint Commission
Boundary Water Treaty Approval
dated June 30, 2017

Christine M.T. Pirik (0029759)
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Attorneys for Icebreaker Windpower, Inc.

From: Sandrolini, Christopher J [mailto:SandroliniCJ@state.gov]
Sent: Friday, June 30, 2017 3:22 PM
To: Lindsay Dressel <ldressel@edrdpc.com>
Cc: Selinger, Kirsten B <SelingerKB@state.gov>; Hemsch, Peter G <HemschPG@state.gov>; Kierscht, Cynthia A <KierschtCA2@state.gov>; Lobel, Hannah J <LobelHJ@state.gov>; So, Rachel <SoR@state.gov>
Subject: RE: Icebreaker Wind Farm

Dear Ms. Dressel,
I have heard from Global Affairs Canada, and we agree that the project does not appear to require approval under the Treaty. Thank you for your patience.
Regards,
Chris

Christopher Sandrolini
Director
Office of Canadian Affairs (WHA/CAN)
U.S. Department of State
Tel: 202 647 2273
Email: sandrolinicj@state.gov

Official
UNCLASSIFIED

From: Lindsay Dressel [mailto:ldressel@edrdpc.com]
Sent: Friday, June 30, 2017 3:04 PM
To: Sandrolini, Christopher J
Cc: Selinger, Kirsten B; Hemsch, Peter G; Kierscht, Cynthia A
Subject: RE: Icebreaker Wind Farm

Mr. Sandrolini,

I am reaching out to inquire into the status of the Icebreaker IJC Boundary Waters Treaty approval. Please let me know where you and your Canadian counterparts stand in regards to this approval.

Best,

Lindsay Dressel
Environmental Analyst

Environmental Design & Research,
Landscape Architecture, Engineering & Environmental Services, D.P.C.
274 North Goodman Street, Rochester, New York 14607
P. 585.271.0040 :: F. 585.271.0042
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Check out what we're up to on Facebook and LinkedIn.

From: Sandrolini, Christopher J [mailto:SandroliniCJ@state.gov]
Sent: Friday, April 21, 2017 5:07 PM
To: Lindsay Dressel <ldressel@edrdpc.com>
Cc: Selinger, Kirsten B <SelingerKB@state.gov>; Hemsch, Peter G <HemschPG@state.gov>; Kierscht, Cynthia A <KierschtCA2@state.gov>
Subject: RE: Icebreaker Wind Farm

Dear Ms. Dressel,
Thank you for the reminder. I have asked my Canadian counterpart to confirm their views on whether this matter falls under the treaty or not, and should receive an answer shortly. I hope to respond to you next week.
Regards,
Chris

This email is UNCLASSIFIED.

From: Lindsay Dressel [mailto:ldressel@edrdpc.com]
Sent: Wednesday, April 19, 2017 8:47 AM
To: Sandrolini, Christopher J
Subject: Icebreaker Wind Farm

Mr. Sandrolini,

Could you provide us a status update on the Icebreaker Wind Project's request for approval under the Boundary Waters Treaty? In your previous email you stated that you are awaiting comment from U.S. government and Canadian agencies. Have you received any comments from those agencies? Do you know the approximate timeframe until we receive a response to the request?

Thank you.

Lindsay Dressel
Environmental Analyst

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Check out what we're up to on Facebook and LinkedIn.

The information contained in this e-mail, including any attachments, is confidential, intended only for the named recipient(s), and may be legally privileged. If you are not the intended recipient, please delete the e-mail and any attachments, destroy any printouts that you may have made and notify us immediately by return e-mail.

Neither this transmission nor any attachment shall be deemed for any purpose to be a "signature" or "signed" under any electronic transmission acts, unless otherwise specifically stated herein. Thank you.

Icebreaker Windpower, Inc.
Case No. 16-1871-EL-BGN
Data Responses to Staff's 2nd Set of Interrogatories
October 2, 2017

Attachment G
Section 408 Approval
September 13, 2017

Christine M.T. Pirik (0029759)
(Counsel of Record)
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Attorneys for Icebreaker Windpower, Inc.

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207-3199

REPLY TO
ATTENTION OF

September 8, 2017

Executive Office

Mr. Lorry Wagner
President
Icebreaker Windpower Inc.
1938 Euclid Avenue, Suite 200
Cleveland, OH 44115

Dear Mr. Wagner:

The Buffalo District of the U.S. Army Corps of Engineers (USACE) has performed an evaluation of Icebreaker Windpower, Inc's request to construct a submarine power cable under the Cleveland East Breakwater and outer harbor federal navigation channel, operated and maintained by U.S. Army Corps of Engineers. This evaluation was done pursuant to Section 14 of the Rivers and Harbors Act of 1899, 33 USC 408 (Section 408), and was performed in accordance with Engineer Circular (EC) 1165-2-216. Buffalo District's focus of this evaluation is to ensure that features and functionality of the federal project will not be adversely impacted by the proposed alteration.

Icebreaker Windpower Inc. will construct the submarine cable to connect six offshore 3.45 MW wind turbine generators located in Lake Erie to a new on-shore substation, located at the Cleveland Public Power Lake Road Substation in Cleveland, Ohio. The proposed export cable will be brought ashore entirely under the outer harbor and the breakwater through a duct installed using horizontal directional drilling (HDD). The HDD conduit will be constructed to a depth at least 12 feet below the authorized channel depth and at least 12 feet below the bottom of the breakwater, in order to prevent the cable from interfering with over-dredging, dropping of anchors, and spuds. The export cable will exit at a point approximately 490' lakeward of the East Breakwater and then be installed in a trench approximately 5 feet below the lake bottom.

Based on this evaluation, the Buffalo District grants Icebreaker Windpower Inc. permission to construct the submarine cable, as described herein, under the Cleveland East Breakwater and outer harbor federal navigation channel, contingent upon Icebreaker Windpower, Inc. (Requestor) signing and returning both copies of the enclosed Alteration Conditions Form. Upon receipt, Buffalo District will also sign both Alteration Conditions Forms and return one copy to you.

For any questions regarding this evaluation, please contact Mr. Robert Remmers, P.E., Chief of Operations and Technical Support Section, in writing at the above address, by telephone at 716-879-4277 or by e-mail at robert.w.remmers@usace.army.mil.

Sincerely,

Adam J. Czekanski
Lieutenant Colonel, Corps of Engineers
District Commander

Enclosures

Attachment H
United State Fish and Wildlife Service
Endangered Species Act Section 7 Consultation
September 7, 2017

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Attorneys for Icebreaker Windpower, Inc.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
4625 Morse Road, Suite 104
Columbus, Ohio 43230
(614) 416-8993 / FAX (614) 416-8994

September 14, 2017

U.S. Department of Energy
Golden Field Office
Attn: Kristin Kerwin
15013 Denver West Parkway
Golden, CO 80401

TAILS# 03E15000-2017-I-1867

Re: Section 7 Informal Consultation for DOE's Proposed Funding of Project Icebreaker

Dear Ms. Kerwin:

This is in response to your July 24, 2017 Biological Assessment for the Lake Erie Energy Development Corporation's (LEEDCo's) proposed Project Icebreaker, which involves the construction and operation of six 3.5 MW wind turbines, 12 miles (mi) (19.3 kilometers (km)) of transmission cable, and a substation. The turbines would be installed in Lake Erie, 8-10 mi (12.9-16.1 km) offshore of Cleveland, Cuyahoga County, Ohio. The transmission cable would run from the turbines, across the lake bottom, to the shore, where they would connect to a new substation to be located at the Cleveland Public Power substation. Additionally, 150 feet (ft) (45.7 m) of overhead transmission lines would be constructed to link the new and existing substations. The turbines are expected to operate for 25 years. Each turbine has a rotor diameter of 413 ft (126 m), yielding a rotor-swept area of 3.08 acres (0.012 km^2) per turbine, and 18.48 acres (0.075 km^2) for the total project. At its closest point, each blade will be approximately 65 ft (20 m) above water level. LEEDCo plans to conduct post-construction monitoring to assess all-bird and all-bat mortality and to monitor avoidance/attraction/displacement that may occur. The methods for post-construction mortality monitoring have yet to be determined. LEEDCo also plans to develop a Bird and Bat Conservation Strategy that would outline conditions for adaptive management implementation based on the results of post-construction monitoring.

Funding for the project may be provided by the U.S. Department of Energy (DOE). Additionally, the U.S. Army Corps of Engineers may permit the project under sections 404 and 408 of the Clean Water Act and section 10 of the Rivers and Harbors Act, while the U.S. Coast Guard will assess the impact of the project on navigation. Thus a federal nexus exists for the project, and on behalf of the Federal agencies involved, DOE prepared and submitted a Biological Assessment (BA) to assess the potential for the project to take federally-listed endangered and threatened species. The BA was prepared in accordance with section 7 of the Endangered Species Act of 1973, as amended (ESA).

The BA indicates that five federally listed species may be affected by the proposed project. These include:

- Indiana bat (*Myotis sodalis*) – Endangered
- Northern long-eared bat (*Myotis septentrionalis*) – Threatened
- Kirtland's warbler (*Setophaga kirtlandii*) – Endangered
- Piping plover (*Charadrius melodus*) – Endangered
- Rufa red knot (*Calidris canatus rufa*) – Threatened

DOE has determined that the proposed project may affect, but is not likely to adversely affect these species, and has requested U.S. Fish and Wildlife Service (Service) concurrence with this determination. Because no designated or proposed critical habitat occurs within the vicinity of the project area, there would be no effect on critical habitat. This letter constitutes the Service's review of the BA, and fulfills the requirement to consult under section 7 of the ESA.

ENDANGERED SPECIES COMMENTS:

Section 9(a)(1)(B) of the ESA, 16 U.S.C.§ 1538 (a)(1)(B), makes it unlawful for any person to "take" an endangered species. Take of threatened species is prohibited pursuant to 50 C.F.R. § 17.31, which was issued by the Service under the authority of sections 4(d) and 9(a)(1)(G) of the ESA, 16 U.S.C. §§ 1533(d) and 1538(a)(1)(G), respectively. "Take" is defined by the ESA as to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct" 16 U.S.C. § 1532(19). Harm and harass are further defined by regulation. Harm includes habitat modification or degradation that results in death or injury. Harass means to cause injury by disrupting normal behavior patterns such as breeding, feeding, or sheltering. Take that is incidental to an otherwise lawful activity can be authorized through one of several mechanisms, for example an incidental take statement via an ESA section 7 consultation process. When all potential effects to listed species are expected to be insignificant (unlikely to be meaningfully measured, detected or evaluated), discountable (extremely unlikely to occur), or entirely beneficial, a project is not likely to adversely affect listed species (Service 1998). Projects that are not likely to adversely affect listed species require concurrence from the Service during section 7 consultation.

Indiana bat

All projects in the State of Ohio lie within the range of the federally endangered Indiana bat. In Ohio, presence of the Indiana bat is assumed wherever suitable habitat occurs unless a presence/absence survey has been performed to document absence. Suitable summer habitat for Indiana bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥5 inches diameter at breast height (dbh) that have any exfoliating bark, cracks, crevices, hollows and/or cavities), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit the characteristics of a potential roost tree and are located within 1,000 ft (305 m) of other forested/wooded habitat. In the winter, Indiana bats hibernate in caves and abandoned mines.

Indiana bats show strong site fidelity to both summer habitat and hibernation sites, returning to the same locations every year.

In the spring and fall, Indiana bats migrate between their summer and winter habitats. Migration may include regional movements ranging from 50-357 mi (80.5-574.5 km) (Sanders *et al.* 2001; Hicks 2004, Gardner and Cook 2002; Butchkoski and Turner 2006; Winhold and Kurta 2006; USFWS 2007; Butchkoski *et al.* 2008). Knowledge of the migratory behavior of Indiana bats is limited.

Take of a total of 10 Indiana bats has been documented during spring and fall migration at operating wind projects in Ohio, Indiana, Illinois, Iowa, Pennsylvania, and West Virginia (Service unpublished database). This amounts to much less than 1% of detected all-bat mortalities at wind power projects in the range of the species.

Male and female Indiana bats have been documented during the summer in Cuyahoga County, and in neighboring Summit and Medina Counties, indicating that Indiana bats likely occur in this portion of Ohio in spring, summer, and fall. While the Indiana bat range includes all of Ohio as well as neighboring states (e.g., IN, WV, KY, and portions of PA, MI), the species' range does not include Ontario, Canada (Arroyo-Cabrales and Ospina-Garces 2016, Patterson *et al.* 2003) (Figure 1).

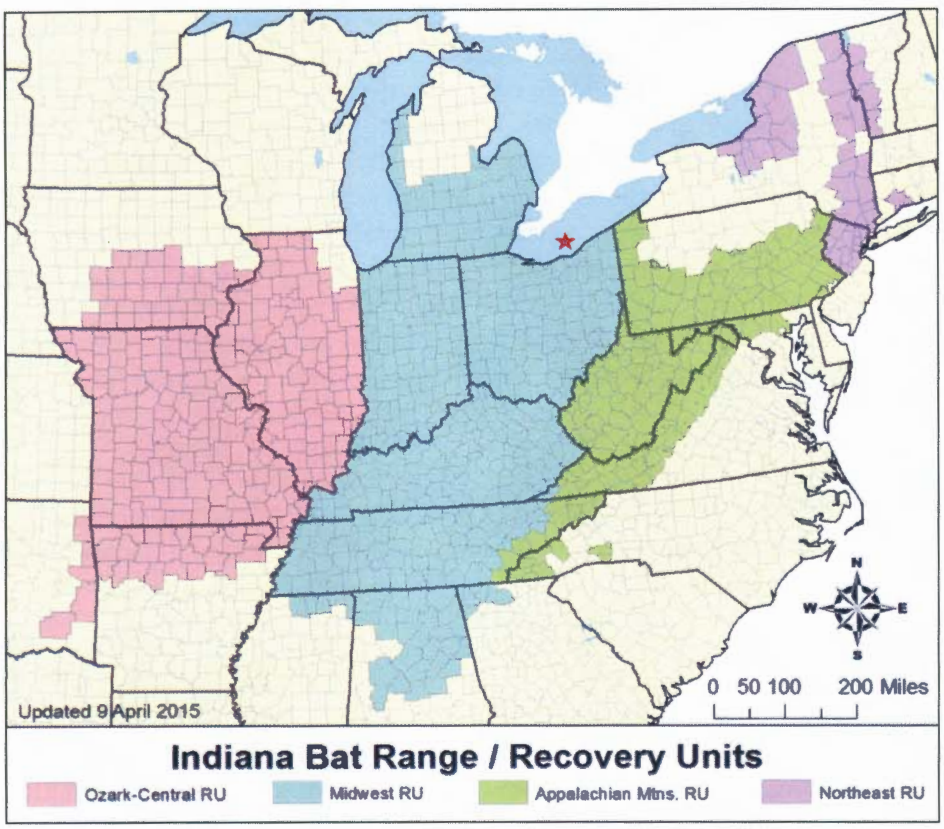

Figure 1. Indiana bat range map. LEEDCo Project Icebreaker is indicated by a red star.

None of the project area provides forest suitable for Indiana bat summer habitat, nor does it provide caves or mines suitable for winter habitat. Thus, Indiana bats would not likely occur in the project area during summer or winter. Indiana bats may migrate through the portion of the project area on land during spring and/or fall, however they are unlikely to be affected by construction or operation of a substation or transmission lines in unsuitable habitat. Though Indiana bats have been killed by operating wind turbines during spring and fall migration at some locations, they are unlikely to migrate 8-10 mi (12.9-16.1 km) offshore of Cleveland over the open water of Lake Erie because their range does not include Ontario (nearest land north of Cleveland and Lake Erie). Rather, Indiana bats that occur in and around Cuyahoga County, Ohio are likely to migrate south, southeast or southwest.

Thus, as the proposed project does not provide suitable summer or winter habitat and Indiana bats are unlikely to migrate over Lake Erie and encounter wind turbines because their range does not include land areas north of Cuyahoga County, Ohio, DOE has determined that the proposed project is not likely to adversely affect Indiana bats. The Service concurs with this determination.

Northern long-eared bat

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

In the spring and fall, northern long-eared bats migrate between their summer and winter habitats. Little is known about migration for northern long-eared bats. Some studies have reported movements ranging between approximately 30 and 60 mi (approximately 50 to 100 km) from hibernacula to summer habitat (Caire *et al.* 1979; Griffin 1945), suggesting they are regional migrants.

Mortality of northern long-eared bats has been detected at a number of wind facilities throughout the range of this species in the United States and Canada. However, the number of northern long-eared bat fatalities reported has been low relative to other bat species. Overall, 43 northern long-eared bat fatalities have been documented during post-construction monitoring studies at 86 different wind projects, amounting to less than one percent of all known bat fatalities (Service unpublished database). Compared to other parts of their range, the eastern portion of North America has had the highest number of northern long-eared bat fatalities; only eight of the 43 northern long-eared bat fatalities were found in the Midwest. Northern long-eared bat fatalities have been documented in the late spring, summer, and fall.

Male and female northern long-eared bats have been documented during the summer in Cuyahoga County, and in all neighboring counties, indicating that northern long-eared bats likely occur in this portion of Ohio in spring, summer, and fall. A northern long-eared bat hibernaculum is located in Summit County, roughly 19 mi (30.6 km) from the proposed substation, and 27-29 mi (43.5-46.7 km) from the proposed turbines.

The range of the northern long-eared bat includes much of the eastern and Midwestern U.S., extending north into Canada. Prior to the eruption of the disease white-nose syndrome (WNS) in Ohio, northern long-eared bats were among the most commonly captured bats in Ohio in summer. Since WNS reached Ohio in 2011, northern long-eared bat captures have declined significantly, and they are rarely detected during surveys now. Prior to WNS the Summit County hibernaculum northern long-eared bat population probably numbered in the thousands, but cursory observations post-WNS indicate a possible absence of this species as of 2014 (M. Johnson, Summit Metroparks, personal communication).

Acoustic bat surveys were conducted for the proposed project during spring-fall 2010 along the Cleveland shoreline and on the City of Cleveland Water Intake Crib (crib), located approximately 3.3 mi (5.3 km) offshore of downtown Cleveland in Lake Erie. A standardized index of bat activity documented substantially higher rates of bat calls on the shore compared to the crib (14 times higher in the spring and about 7 times higher in the summer/fall) (Svedlow *et al.* 2012). Additionally, much higher call rates were detected during summer/fall than spring at both the onshore and crib detectors (Svedlow *et al.* 2012). In general, bat fatality rates tend to be much higher during fall migration than spring or summer (Arnett *et al.* 2008), though researchers are uncertain why this occurs. All bat acoustic calls that were detected were visually vetted to determine if any were from northern long-eared bat. No northern long-eared bat calls were detected in spring or summer/fall, on the shoreline or on the crib. Northern long-eared bats belong to the genus *Myotis*, and some *Myotis* calls that could not be distinguished to species were detected on both the shoreline and the crib in spring and in summer/fall. While it is possible that these could be northern long-eared bat calls, they could also be from other *Myotis* species such as the little brown bat (*Myotis lucifugus*). Little brown bat calls were detected in spring on the shoreline and in summer/fall on both the shoreline and the crib. Additional bat acoustic surveys are currently ongoing at the crib and on buoys located within and near the project area. Results of these surveys may help to inform our understanding of northern long-eared bat distribution relative to the offshore environment. If northern long-eared bat acoustic calls are detected at any of the offshore detectors during the ongoing surveys, further coordination with this office will be necessary.

None of the project area provides forested habitat suitable for northern long-eared bat summer habitat, nor does it provide caves or mines suitable for winter habitat. Thus, northern long-eared bats would not likely occur in the project area during summer or winter. Northern long-eared bats may migrate through the portion of the project area on land during spring and/or fall, however they are unlikely to be affected by construction or operation of a substation or transmission lines in unsuitable habitat. Though northern long-eared bats have been killed by operating wind turbines during spring and fall migration at some locations, they are unlikely to migrate 8-10 mi (12.9-16.1 km) offshore of Cleveland over open water of Lake Erie because they tend to be regional migrants, with a maximum recorded migration distance of 60 mi (97 km). At the project location, Lake Erie is approximately 53 mi (85.3 km) wide, so it is unlikely that northern long-eared bats would migrate their maximum distance over open water. Rather, it is more likely that the northern long-eared bats that occur in and around Cuyahoga County, Ohio are likely to migrate to the documented hibernacula in Summit County, Ohio or to other hibernacula over land south, southeast or southwest of the project area.

Wind energy facilities in various habitats across the U.S. and Canada have been documented to cause "widespread and often extensive fatalities of bats" (Arnett *et al.* 2008). At this time, research into the mechanisms that cause mortality of bats at wind power sites is ongoing but collision associated with moving turbine blades are clear proximate causes of death. Also, research on how to avoid fatalities is continuing. Currently, only a few operational tools have shown success at avoiding or minimizing take. Feathering of turbines (changing the orientation of the blades out of the direction of the wind in order to stop the blades from turning during low wind speeds) during times when bats are most at risk has been shown to reduce mortality in some situations.

To further minimize the risk of mortality for all bats, including the northern long-eared bat, LEEDCo has proposed to feather turbine blades until the manufacturer's cut-in speed of 3.0 m/s has been reached at night during fall migration. At a study at Fowler Ridge, IN, feathering below the manufacturer's cut-in speed (3.5 m/s) reduced all-bat mortality by 36% (Good *et al.* 2012). The Service's recommended dates for fall migration are August 1-October 31.

Thus, as the proposed project does not provide suitable summer habitat, no acoustic calls of northern long-eared bats were detected during the survey in 2010, northern long-eared bats are unlikely to migrate over Lake Erie and encounter wind turbines, northern long-eared bats generally comprise less than 1% of all bat fatalities found at wind power projects, and a 3.0 m/s cut-in speed and feathering will be implemented at night during fall migration, DOE has determined that the proposed project is not likely to adversely affect northern long-eared bats. The Service concurs with this determination. Should new information from the 2017 bat acoustic study reveal effects of the action that have not been considered, DOE should contact the Service to ensure this determination is still appropriate.

Piping plover

The proposed project lies within the range of the federally listed endangered piping plover. Piping plover habitat includes sand or pebble beaches with sparse vegetation along the shore of Lake Erie. While piping plovers have not nested in Ohio in the recent past, migrating plovers can be expected to stop over along the shore of Lake Erie and other inland sand beaches during the period of time between April 1-May 31 and July 15-October 31 each year, which incorporates spring and fall migration periods. The vast majority of Great Lakes piping plovers nest in Michigan, and a few pairs occur in Wisconsin and Ontario. Piping plovers from the Great Lakes overwinter on the Atlantic and Gulf coasts.

Little is known about the migration behavior of Great Lakes piping plovers. While band return data shows some stopover locations, there is no information regarding the altitude at which plovers migrate and whether they migrate over open water, close to the shore, over land or a combination of shore, water and land. Piping plovers migrate both during day and night (O'Brien *et al.* 2006). They migrate as individuals (not in flocks) and they tend to stay at most stopover locations during migration for only one day (Pompei and Cuthbert 2006). They appear to "opportunistically visit stopover sites" with no clear migration pathways or consistent use of specific stopover locations (Pompei and Cuthbert 2006).

In 2016 there were 68 nesting pairs of piping plover in the Great Lakes population (Service 2016). This number of pairs has been fairly consistent over the past 4 years (Service 2015a, 2016). During the period of 2003-2008 the average fledging rate for Great Lakes piping plovers was 1.76 (Service 2009). Piping plover individuals have been documented along the shoreline of Lake Erie in Cuyahoga County during migration in 1971, 1984, 1986, 1987, and 2017 (Service unpublished database). They have also been documented along the shore of Lake Erie in neighboring Lorain County in 1997, and in neighboring Lake County at a large beach and nature preserve in 1994, 2007, 2010, 2012, 2013, and 2014 (Service unpublished database). Thus, we know that individual piping plovers occasionally occur near the land-based portion of the project area, though no suitable nesting or stopover habitat will be impacted by the project. Pre-construction bird studies for the project are unlikely to detect this species even if it is present because it would be migrating at night, offshore, and would not linger in the project area. It is plausible that migrating piping plovers may cross Lake Erie, including the proposed project area during their spring or fall migration.

Birds are known to collide with tall stationary structures such as buildings, power lines, and communication towers. It is estimated that between 100 million and 1 billion birds are killed annually in the U.S. from striking man-made structures (Klem 1990; Manville 2000). Wind turbines pose an added threat to birds which may collide with the stationary base, or may be struck by the spinning blades. Erickson *et al.* (2014) evaluated 116 post-construction mortality studies from wind power projects and based on these estimated that 368,000 birds are struck by turbines each year. Of the observed bird mortality, shorebirds (which would include piping plover) comprised 1% and waterbirds comprise 0.2% (Erickson *et al.* 2014). Rates of avian collision mortality at existing wind facilities in the east and upper Midwest of the United States have been documented to range from zero to approximately 10 bird fatalities per turbine per year (Erickson *et al.* 2001), and post-construction studies at land-based wind projects in Ohio from April-November fall within this range (USFWS unpublished data).

Canada recently analyzed post-construction collision data for 37 wind power projects in Ontario over multiple years ranging from 2006-2014. Data collection was standardized to occur within 50 m of the turbine from April 1-October 31. Based on this data, the estimated mortality for non-raptors was 6.14 +/- 0.31 birds/turbine, with a range of 0-44.31 birds/turbine (Bird Studies Canada *et al.* 2016). Passerines accounted for the most mortality (69%) across wind projects in all of Canada, while waterbirds (which would include shorebirds such as piping plover) accounted for 3.2% of mortality (Bird Studies Canada *et al.* 2016).

Although avian collision mortality can occur at any time of year, patterns in avian collision mortality at tall towers, buildings, wind turbines, and other structures suggest that the majority of fatalities occur during the spring and fall migration period (NRC 2007). Data from Ontario indicated slightly higher bird mortality during fall (mid-July-Oct. 31) (Bird Studies Canada *et al.* 2016). Erickson *et al.* (2014) also found a peak in mortality in fall, and a smaller peak in spring but cautioned that peaks may be influenced by species-specific behaviors (e.g., horned larks are often found as mortalities in spring, when aerial mating displays may result in more flights into the rotor-swept zone of the turbine). Limited data from existing wind facilities suggest that migrant species represent roughly half the fatalities, while resident species represent the other half (NRC 2007). There are no records of piping plover collisions with wind turbines.

None of the project area provides suitable nesting or migration stopover habitat for piping plover. Thus, piping plovers would not likely occur in the project area during summer nor would they be likely to stop over at or near the turbines. Piping plovers may migrate through the portion of the project area on land during spring and/or fall, however they are unlikely to be affected by construction or operation of a substation or transmission lines in unsuitable habitat. It is possible that piping plovers could migrate through the offshore portion of the project area where the wind turbines occur during spring or fall migration. However, there are very few piping plovers in the Great Lakes population—68 nesting pairs (136 individuals) that would migrate in the spring, plus an estimated 120 offspring that would also migrate each fall (68 pair x 1.76 fledglings/pair). Thus, the likelihood that one of these 256 birds would encounter the 18.48 acres (0.075 km^2) of airspace occupied by turbines during the two times per year that the individuals are migrating through this region is very small.

To further minimize the risk of mortality for all birds, including the piping plover, LEEDCo has proposed to utilize only flashing red and yellow lights on the turbines and work platforms, respectively. Gehring *et al.* (2009) found that communication towers lit at night with only flashing lights, as opposed to steady-burning lights resulted in 50–71% fewer avian fatalities.

Thus, as the proposed project does not provide suitable habitat for piping plover, shorebirds are rarely documented as mortalities at wind power projects, flashing lights will be used to minimize risk to migrating birds, and the small number of piping plovers that may cross Lake Erie during migration are unlikely to encounter the 18.48 acres (0.075 km^2) occupied by spinning turbine blades, DOE has determined that the proposed project is not likely to adversely affect piping plover. The Service concurs with this determination.

Rufa Red Knot

The proposed project lies within the range of the rufa red knot, a federally listed threatened species. The red knot is a shorebird that migrates annually between its breeding grounds in the Canadian Arctic and several wintering regions, including the Southeast United States (Southeast), the Northeast Gulf of Mexico, northern Brazil, and Tierra del Fuego at the southern tip of South America (79 FR 73706). Shorebird migration typically occurs at night. During the day the birds stop over to rest, though they will make short distance flights during the day, from one patch of habitat to another. The red knot is known to migrate through Ohio during the spring and fall. Red knot migratory stopover habitat in Ohio includes sand, gravel, or cobble beaches, and mudflats along the shore of Lake Erie. A small number of transient red knots can be expected to stop over along the shore of Lake Erie in Ohio between April 1 and October 31 each year, which incorporates spring and fall migration.

Small numbers (1-3) of red knot have been documented near the shore of Lake Erie in Cuyahoga County in 1944, 1945, 1972-73, 1983-87, 2011-12, 2015, and 2017 (ebird.org, accessed 9/8/2017). Thus, we know that individual red knots occasionally occur near the land-based portion of the project area, though no suitable nesting or stopover habitat will be impacted by the project. Pre-construction bird studies for the project are unlikely to detect this species even if it is present because it would be migrating at night, offshore, and would not linger in the project area. It is plausible that some migrating red knots may cross Lake Erie, including the proposed project area, during their spring or fall migration.

As described above for piping plover, shorebird and waterbird mortality at wind projects is rarely documented; species in these groups comprise 1.2-3.2 % of all bird mortality (Bird Studies Canada *et al.* 2016, Erickson *et al.* 2014). There are no records of red knot collisions with wind turbines.

None of the project area provides suitable nesting or migration stopover habitat for red knot. Thus, red knots would not likely occur in the project area during summer nor would they be likely to stop over at or near the turbines. Red knots may migrate through the portion of the project area on land during spring and/or fall, however they are unlikely to be affected by construction or operation of a substation or transmission lines in unsuitable habitat. It is possible that red knots could migrate through the offshore portion of the project area where the wind turbines occur during spring or fall migration. However, there are very few red knots that occur in and around Cuyahoga County each year (1-3, only in some years). Thus, the likelihood that one of these few birds would encounter the 18.48 acres (0.075 km^2) of airspace occupied by turbines during the two times per year that the individuals are migrating through this region is very small.

To further minimize the risk of mortality for all birds, including the red knot, LEEDCo has proposed to utilize only flashing red and yellow lights on the turbines and work platforms, respectively. Gehring *et al.* (2009) found that communication towers lit at night with only flashing lights, as opposed to steady-burning lights resulted in 50–71% fewer avian fatalities.

Thus, as the proposed project does not provide suitable habitat for red knot, shorebirds are rarely documented as mortalities at wind power projects, flashing lights will be used to minimize risk to migrating birds, and the small number of red knots that may cross the project area during migration are unlikely to encounter the 18.48 acres (0.075 km^2) occupied by spinning turbine blades, DOE has determined that the proposed project is not likely to adversely affect red knot. The Service concurs with this determination.

Kirtland's warbler

The proposed project lies within the range of the Kirtland's warbler, a federally listed endangered species. The Kirtland's warbler is a small blue-gray songbird with a bright yellow breast. This species migrates through Ohio in the spring and fall, traveling between its breeding grounds in Michigan, Wisconsin, and Ontario and its wintering grounds in the Bahamas. While migration occurs in a broad front across the entire state, approximately half of all Kirtland's warbler observations in Ohio have occurred within 3 mi (4.8 km) of the shoreline of Lake Erie (Service, unpublished database). During migration, individual birds usually forage in shrub/scrub or forested habitat and may stay in one area for a few days. Kirtland's warblers are most likely to occur in Ohio during spring migration April 22nd – June 1st, or fall migration August 15th – October 15th.

The Kirtland's warbler population was at its lowest in the 1970's and 1980, but has steadily increased in recent decades. Surveys on the breeding grounds resulted in a record high of 2,365 singing males in 2015 (Service 2015b). Occasionally individual Kirtland's warblers are observed in Cuyahoga County during spring or fall migration. Records exist for the late 1800's, 1930's, 1940's, 1969 and 1970 (Service unpublished database). In the last few decades, Kirtland's warblers have only been observed in Cuyahoga County in 2002, 2004, 2009 and 2011 (Service unpublished database, ebird.org accessed 9/8/2017). Similar spotty records of individuals exist in neighboring Lorain and Lake Counties. Thus, we know that individual Kirtland's warblers occasionally occur near the land-based portion of the project area, though no suitable nesting or stopover habitat will be impacted by the project. Pre-construction bird studies for the project are unlikely to detect this species even if it is present because it would be migrating at night, offshore, and would not linger in the project area.

A recent migration study by Cooper *et al.* (2017) used light-level geolocators attached to 27 male Kirtland's warblers to estimate their spring and fall migration pathways. They found that most Kirtland's warblers exhibited a loop migration pattern, following a more eastern pathway through the western portions of mid-Atlantic states on prevailing winds in the fall, and using a more western pathway that included Ohio during the spring (Cooper *et al.* 2017). While the geolocators do not provide exact locations, the figures and videos accompanying the Cooper *et al.* (2017) paper indicate that it is likely that some Kirtland's warblers crossed Lake Erie during migration. Videos show most passes of central and western Lake Erie occurring during the spring, and most passes of eastern Lake Erie/western Lake Ontario occurring during the fall. Thus, it is plausible that migrating Kirtland's warblers may cross the proposed project area during their spring and/or fall migration. No information on flight height during migration is available.

Warblers as a group are particularly susceptible to collision mortality. Erickson *et al.* (2014) indicate that wood warblers (which includes Kirtland's warbler) comprise 10.8% of all bird mortalities, second only to larks which comprise 13.7% and are dominated by horned lark mortalities. Horned larks have aerial breeding displays which may make them particularly susceptible to wind turbine collisions (Erickson *et al.* 2014). No Kirtland's warbler mortalities have been documented at wind turbines.

None of the project area provides suitable nesting or migration stopover habitat for Kirtland's warbler. Thus, Kirtland's warbler would not likely occur in the project area during summer nor would they be likely to stop over at or near the turbines. Kirtland's warblers may migrate through the portion of the project area on land during spring and/or fall, however they are unlikely to be affected by construction or operation of a substation or transmission lines in unsuitable habitat. It is possible that Kirtland's warblers could migrate through the offshore portion of the project area where the wind turbines occur during spring or fall migration. The population of Kirtland's warbler is 2,365 pairs, or 4,730 individual adults, plus additional offspring each year, and the population has been on a long-term increasing trajectory. Thus, there is some likelihood that one or more of these birds would encounter the 18.48 acres (0.075 km^2) of airspace occupied by turbines during the two times per year that the individuals are migrating through this region, over the 25 years of project operation.

To evaluate collision risk of Kirtland's warbler at the proposed project, Kerlinger and Guarnaccia (2013) used a communication tower strike estimation method with blackpoll warblers as a surrogate. They found that a 6-turbine project operating for 30 years was likely to result in take of 0.06 Kirtland's warblers, indicating that take was extremely unlikely to occur.

To further minimize the risk of mortality for all birds, including the Kirtland's warbler, LEEDCo has proposed to utilize only flashing red and yellow lights on the turbines and work platforms, respectively. Gehring *et al.* (2009) found that communication towers lit at night with only flashing lights, as opposed to steady-burning lights, resulted in 50–71% fewer avian fatalities.

Thus, as the proposed project does not provide suitable habitat for Kirtland's warbler, a collision risk model indicated that collisions were extremely unlikely to occur, and flashing lights will be used to minimize risk to migrating birds, DOE has determined that the proposed project is not likely to adversely affect Kirtland's warbler. The Service concurs with this determination.

POST CONSTRUCTION MONITORING

Because of the potential risk of all-bird and all-bat mortality, and because this project is designed to be a demonstration project to evaluate offshore wind installation in the Great Lakes, post-construction mortality monitoring is a necessary component of the project that LEEDCo proposes to implement. Because birds and bats are most likely to be at risk at night over the open water environment during short periods of time in spring and fall migration, it will likely be difficult to detect carcasses struck by turbines. Nevertheless, developing methods for generating robust mortality estimates for bats and birds, and testing methods to collect and identify carcasses at offshore wind projects is critically important if this demonstration project is to inform future offshore wind development in the Great Lakes and elsewhere and evaluate take of listed species at future projects. We strongly recommend that DOE condition the funding of the project on inclusion of a robust post-construction fatality monitoring protocol approved by the Service, and that specific funding be targeted for this project component

SUMMARY

As detailed above, DOE has determined that LEEDCo's Project Icebreaker is not likely to adversely affect Indiana bat, northern long-eared bat, piping plover, rufa red knot, and Kirtland's warbler. The Service concurs with these determinations. This concludes consultation on this action as required by section 7(a)(2) of the Endangered Species Act. Should, during the term of this action, additional information on listed or proposed species or their critical habitat become available, or if new information reveals effects of the action that were not previously considered, consultation with the Service should be reinitiated to assess whether the determinations are still valid.

Thank you for the opportunity to provide comments on this proposed project. Please contact Megan Seymour at extension 16 in this office for further information.

Sincerely,

Dan Everson

Dan Everson
Field Supervisor

Cc: Erin Hazelton, ODNR Division of Wildlife, Columbus, Ohio via e-mail

Citations:

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Attachment I
U.S. Army Corp of Engineers
Permit Application
August 2017

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U.S. Army Corps of Engineers Permit Application

Submitted to the Buffalo District Office of the U.S. Army Corps of Engineers

For the

Icebreaker Wind Project

Lake Erie, City of Cleveland
Cuyahoga County, Ohio

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1.0 OVERVIEW AND PROJECT PURPOSE

Icebreaker Windpower Incorporated ("Icebreaker Windpower" or the "Applicant") is proposing to construct the Icebreaker Wind Project (the "Project"), a demonstration-scale offshore wind farm located in Lake Erie, 8 to 10 miles from the shoreline in the City of Cleveland, Cuyahoga County, Ohio.

The Project would be an approximately 21 megawatt ("MW") offshore wind facility, consisting of the following:

- Six wind turbines,
- Five buried electric collection cables interconnecting the turbines ("inter-array cables"),
- One buried electric collection cable ("export cable") connecting the turbines to the Project substation, and
- A new Project substation located at the Cleveland Public Power ("CPP") Lake Road Substation in Cleveland, Ohio.

The general purpose of the Project is to produce wind-powered electricity that would maximize energy production from local wind resources to deliver clean, renewable electricity to the Ohio bulk power transmission system to serve the needs of electric utilities and their customers. The Project would add fuel diversity and reliability to the state's and region's electric supply mix; help reduce air pollution in an area that historically has been in non-attainment for 2.5-micron particulate matter, lead, and ozone; reduce greenhouse gas emissions; and create local jobs and spur economic development. The electricity generated by the Facility would be transferred to the transmission grid owned by CPP. Two-thirds of the Facility's output has been sold to CPP under a long-term power purchase agreement. The balance of the power could be delivered to the grid operated by PJM Interconnection, LLC and sold in the wholesale market or under bi-lateral power purchase agreement(s).

The U.S. Department of Energy ("DOE") is proposing to authorize the expenditure of federal funding to design, permit, construct, and decommission the Project. The DOE seeks to provide support for regionally-diverse Advanced Technology Demonstration Projects through collaborative partnerships. By providing funding, technical assistance, and government coordination to accelerate deployment of these demonstration projects, DOE can help eliminate uncertainties, mitigate risks, and help create a robust U.S. offshore wind energy industry. The Advanced Technology Demonstrations Program for Offshore Wind began in 2012 with the selection of seven projects, including Icebreaker Wind (referred to at the time as Project Icebreaker). In December 2016, DOE determined that two of these projects (including the Project) had demonstrated significant progress toward being successfully completed and producing power. If all appropriate criteria are completed and milestones are met, Icebreaker Windpower would be eligible to receive additional federal funding.

The U.S. Army Corps of Engineers ("USACE") is the agency responsible for reviewing and issuing permits pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. Through a permit review process, Section 404 of the Clean Water Act regulates the discharge of dredged or fill material into waters of the United States. While efforts were made during the siting, planning, and design processes to avoid and/or minimize potential impacts to jurisdictional water resources, the Project would result in minor unavoidable impacts to Lake Erie. These impacts are described in this Application and in additional detail in the Draft Environmental Assessment ("Draft EA")[1], prepared by DOE. While the Project is referred to in this Application as "Icebreaker Wind," the DOE uses the original Project name, "Project Icebreaker" in the Draft EA. "Project Icebreaker" and "Icebreaker Wind" are synonomous, and refer to the same Project. The Applicant is submitting this Application for a Section 404 Permit for any aspect of the project the USACE determines it has jurisdiction over pursuant to Section 404.

By way of example, over the past 10 years, several submerged cables have been installed and/or permitted to be installed in Lake Erie including:

- Kerite Cable to South Bass Island (2007)
- Kerite Cable to Middle Bass Island (2009)
- ITC Lake Erie Connector (anticipated construction - 2020).

The Applicant is aware that at least two of these projects, Kerite Cable to South Bass Island and ITC Lake Erie Connector, have sought and received Section 404 permits from the U.S. Army Corps of Engineers prior to construction.

Section 10 Permits are required for the construction of any structure in or over any navigable water of the United States. The Applicant is also submitting this Application for an Individual Section 10 Permit for the installation of the MB foundations, turbines, and electrical collection cable

In addition to the Section 10 and 404 regulatory and permitting authority, Section 114 of the Rivers and Harbors Act of 1899, as amended, and codified in 33 USC 408 ("Section 408") requires permission for any alterations to, or temporary or permanent occupation or use of, USACE federally authorized civil works

[1] The Draft EA is available at: https://energy.gov/nepa/downloads/ea-2045-draft-environmental-assessment

projects. Icebreaker Windpower submitted its Section 408 Request on February 3, 2017, and is awaiting a decision from the USACE by August 31, 2017.

The DOE is responsible for providing federal funding and is serving as the lead agency for the Project's review under the National Environmental Policy Act ("NEPA"). The U.S. Coast Guard ("USCG") and USACE are cooperating agencies for the NEPA review. As a part of the NEPA process, the DOE along with the USCG and USACE, prepared a Draft EA to evaluate the potential impacts of the Project (available at: https://energy.gov/nepa/downloads/ea-2045-draft-environmental-assessment). The following application describes the proposed Project, its potential impact on Waters of the United States, and actions taken to avoid and minimize these impacts.

2.0 PROJECT LOCATION & SITE DESCRIPTION

2.1 Project Location

The Project turbines would be sited in Lake Erie, 8 to 10 miles off the coast of the City of Cleveland, Ohio (see Figures 1 and 2). The turbines would be arranged in a southeast to northwest linear alignment with 750 meters (2,480 feet) between each turbine. An electric collection system, approximately 12 miles in length, would be buried in the lakebed and connect the turbines to the Project substation, located along the lakefront in the City of Cleveland (Figure 2). Construction activities would be supported by a construction staging area on the lakeshore within the Port of Cleveland. An existing building at the Great Lakes Towing ("GLT") facility on the Cuyahoga River in Cleveland, would serve as the Operations and Maintenance ("O&M") center (Figure 2). The only Project components impacting Waters of the United States would be the turbines and the electric collection system.

The Applicant has entered into a 50-year submerged lands lease ("SLL") with the State of Ohio. The SLL covers the turbine sites, cable right-of-way, and the Project substation. As per the SLL, the acreage to be used in the construction/operation of the Project consists of 0.4 acre for the substation, 4.2 acres for the six wind turbine sites, and a 100-foot wide strip along the approximately 12-mile-long cable route.

2.2 Water Resources

Lake Erie is the shallowest and warmest of the Great Lakes and also has the highest primary production, biological diversity and fish production of all the Great Lakes (Allinger & Reavie, 2013). It is the fourth largest of the Great Lakes in surface area (9,910 square miles) and the smallest by volume (116 cubic miles). The average depth of the lake is 19 meters (62 feet) and the maximum depth is 64 meters (210 feet). The lake is divided into the Western, Central, and Eastern Basins with average depths of 7.4 meters (24.1 feet), 18.5

meters (60.1 feet), and 24.4 meters (79.3 feet), respectively (Great Lakes Fishery Commission, 2003). The Central Basin, where the Project is located, is the intermediate of the three basins in terms of temperature, productivity, and depth (Ludsin & Hook, 2013). Lake Erie is used for recreation, commerce, navigation, manufacturing, and power production, and has led to intensive industrial development along its shore in places such as Cleveland, Ohio.

The geophysical characteristics, biological communities, and anthropogenic uses of Lake Erie are summarized below.

2.2.1 Geophysical

Within the Central Basin of Lake Erie, the Project is located in an area of relatively uniform lakebed topography that slopes downward from southeast to northwest, with water depth increasing linearly with increasing distance from shore. Water depth in Lake Erie in the Project Area ranges from 0 feet at the Cleveland shoreline to approximately 18 meters (61 feet) at the proposed turbine furthest from the shore (Figure 2). Immediately north of the breakwater, the water depth is approximately 10 meters (33 feet), and it steadily increases along the export cable route (CSR, 2016). Bathymetric and side scan sonar results showed that the lakebed at the proposed turbine sites is generally uniform and smooth, and is comprised of soft, silty, sediments. No evidence of ripples or other sedimentary features were observed (VanZandt Engineering, 2015). Within the vicinity of the Project, the lake-bottom sediment is predominantly composed of clay-sized particles with a lesser percentage of silt-sized particles, which trend to increase with depth. Bedrock material beneath Lake Erie may consist of shale, siltstone, sandstone and limestome and ranges from exposed to buried by more than 30 meters (98 feet) of unconsolidated sediment (McNeilan, 2017). No features or artifacts of historical significance were identified during marine archaeology surveys of the areas where Project construction activities are proposed (VanZandt Engineering, 2015, 2017).

2.2.2 Biological Communities

Lake Erie supports approximately 90 different species of fish, including commercial and recreational fisheries for important fish stocks including walleye, yellow perch, and several other species. Additional fish groups present in the basin include trout, bass, smelt, catfish, carp, herring, drum, minnows, and sunfish (ODNR, 2016b). The Central Basin of Lake Erie is dominated by cool-water species, such as yellow perch and walleye, with warm and colder water species also present to a lesser extent. However, in Lake Erie, a hypoxic zone (an area with depleted oxygen), develops at the bottom of the central basin of Lake Erie. This zone can be as large as 10,000 square kilometers (3,860 square miles) and last from July through October (ODNR, 2015). This area is classified by the Ohio Department of Natural Resources ("ODNR") as a "dead zone" due to the hypoxic conditions (ODNR, 2015). Low dissolved oxygen levels during late summer and early fall do not provide enough oxygen for fish and macroinvertebrates to function properly, so there is minimal fish activity in the area. The proposed turbines would be sited in this "dead zone." In addition, the proposed turbine sites are well away from any fish spawning reefs or key habitat. Ludsin et al. (2014) identified the spawning habitats for 24 fish species, including the most harvested commercial and/or recreational fish in Lake Erie, as well as important prey species. None of these fish species have preferred spawning habitat in the offshore region, except lake trout, which had a near-offshore presence.

Use of the lake by most bird species is strongly concentrated along the shoreline and in the nearshore area. Other than spring and fall migration by passerines, the birds known to utilize Lake Erie in the vicinity of the proposed Project are the red-breasted merganser (*Mergus serrator*), common loon (*Gava immer*), horned grebe (*Podiceps auritus*), Bonaparte's gull (*Chroicocephalus philadelphia*), ring-billed gull (*Larus delawarensis*), and herring gull (*Larus argentatus*). Aerial surveys conducted by the ODNR between 2009 and 2011 indicated that abundance of waterbirds was negligible or minimal at distances between 8 to 10 miles from shore, and that only the six species listed above were documented in the vicinity of the Project area on a somewhat consistent basis. Ring-billed gull, herring gull and Bonaparte's gull are the only bird species that utilized the Project Area and vicinity at densities generally greater than one bird observed per survey (Norris & Lott, 2011). While the Central Basin of Lake Erie has been designated an Important Bird Area by the National Audubon Society, studies have shown that the use of the Project area for anything other than migratory transit by bird species is minimal or negligible (Gordon & Erickson, 2016). Similarly, terrestrial mammals are generally confined to the lake shoreline. While bats are known to forage and migrate over open water, the use of the area 8 to 10 miles offshore is low when compared to terrestrial or nearshore portions of the lake (Gordon & Erickson, 2016).

More detail on biological communities located in the vicinity of the proposed Project and the anticipated impacts of the Project on these communities is discussed in Section 3 of the Draft EA.

2.2.3 Anthropogenic Uses

Lake Erie is utilized for a variety of anthropogenic uses including commercial fishing, drinking water, and recreational uses, such as boating, sailing, swimming, and fishing. In 2015, Ohio commercial fishermen harvested 4.6 million pounds of fish with a dockside value of $4.9 million. Yellow perch, freshwater drum, and white bass were the primary fish harvested, accounting for 28%, 20%, and 17% of the total commercial harvest, respectively (ODNR, 2016b). Cleveland is a major hub of shipping commerce in Lake Erie and the Great Lakes. The Cleveland Harbor is the 48th leading United States port with over 12 million tons of material shipped or received in 2007, and is ranked sixth among the Great Lakes ports (USACE, 2010). The Cleveland Harbor also hosts a large number of recreational vessels, including yachts, sailboats, power boats, and fishing boats. In 2015, over 474,000 boats were registered with the ODNR in the state of Ohio, with more than 25,000 in Cuyahoga County alone (ODNR, 2016a). Even though recreational boating is high around the City of Cleveland, very few boats travel 8 to 10 miles offshore, where the turbines are proposed to be sited. A 2016 study of boat usage of the Project Area indicated that only 2% of all boats counted in surveys were within 3 miles of the turbine sites (LimnoTech, 2017).

3.0 PROJECT DESCRIPTION

3.1 Project Components

Proposed components to be constructed as part of the Project include wind turbines, an electrical interconnect system, and a Project substation. Ancillary components to be leased by the Applicant include a laydown yard/construction staging area and an O&M center. Each of these components and facilities are described below.

3.1.1 Wind Turbines

The Facility would consist of six Mitsubishi Heavy Industries Vestas Offshore Wind - Vestas 3.45 MW offshore wind turbines (V126-3.45 MW), to be installed on Mono Bucket ("MB") foundations. The Facility is expected to operate for approximately 8,200 hours annually, and have an approximate capacity factor of 41%, generating approximately 75,000 megawatt-hours of electricity each year.

The MB foundation is made of steel and combines elements of a gravity base, a monopile, and a suction bucket. The interface with the lakebed would be accomplished by means of a steel skirt that penetrates the lakebed. The skirt would be welded to an upper steel transition piece and tube that resembles the elements of a standard monopile above the mudline (Figure 3). Approximate dimensions are listed in Table 1. The foundations would be installed in water approximately 18 meters (61 feet) deep.

Table 1. Approximate Foundation Dimensions

Bucket Diameter	Shaft Diameter	Overall Height
17.0 meters (55.8 feet)	4.5 meters (13.8 feet)	36.9 meters (121 feet)

Each wind turbine would consist of three major components: 1) the tower, 2) the nacelle, and 3) the rotor with blades. The tower would be comprised of multiple sections of conical steel, which would be mounted on the foundation platform, approximately 11 meters (36 feet) above the water line. The tower height for the turbines, or "hub height" (height from the chart datum water level to the center of the rotor), would be approximately 83 meters (272 feet). The main mechanical components of the wind turbine would be housed in the nacelle. These components include the drive train, gearbox, and generator. The nacelle would be housed in a steel reinforced fiberglass shell to protect internal machinery from the environment and dampen noise emissions. The housing would be designed to allow for adequate ventilation to cool internal machinery. The nacelle would be equipped with an external anemometer and a wind vane that signals wind speed and direction information to an electronic controller. The nacelle is mounted on a yaw ring bearing that allows it to rotate ("yaw") into the wind to maximize wind capture and energy production. The turbine would have a rotor diameter of 126 meters (413 feet), resulting in a maximum blade tip height of 146 meters (479 feet). The lowest point of the blades would reach 20 meters (66 feet) above the lake surface. Figure 4 depicts the proposed turbine dimensions.

The majority of turbine components, including the blades, would be painted light gray (RAL 7035) consistent with Federal Aviation Administration ("FAA") and USCG guidance. One red flashing FAA obstruction warning light would be mounted on the nacelle of each turbine and would flash synchronously. In addition, synchronously flashing (flash frequency and duration to be determined) amber marine navigation lights, visible up to 5 nautical miles, would be mounted on the platforms of Turbines 1 and 6 (i.e., at each end of the turbine string). On the platforms of Turbines 2 through 5 the amber lights would have a visibility of 4 nautical miles, and a flash rate of 20 flashes per minute. Two lights would be installed on each of the six turbine platforms to provide visibility 360º around the turbines. In addition to the marine navigation lights, fog horns with visibility detectors would be installed on the platforms of Turbines 1 and 6. The signal on Turbine 1 would sound at 670 megahertz ("MHz") once every 30 seconds and at Turbine 6 the signal would sound at 670 MHz twice every 30 seconds. These would provide audible notice to vessels up to 2 nautical miles away.

3.1.2 Electrical System

The proposed Project would have an electrical system that consists of the following: 1) a system of submerged 34.5 kilovolt ("kV") cables that would collect power from each wind turbine, 2) a submerged 34.5 kV cable that would connect the turbines to the substation at the shore, 3) a Project substation to step up the power from 34.5 kV to 138 kV, and 4) an overhead/underground electrical line to carry the power from the Project substation to the existing point of interconnect ("POI") substation. Each of these components is described below, and their location indicated in Figure 2.

Inter-array and Export Cables: Five inter-array cables would connect the wind turbines together electrically, totaling approximately 2.8 miles in length. One approximately 9-mile long export cable would connect the turbines to the Project substation. The export cable would traverse from Turbine 1 in a southeasterly direction underneath the Cleveland Harbor Breakwater and under the remaining portion of the Harbor to the Project substation located at the CPP Lake Road Substation. Both the inter-array and export cables would be three-conductor, single armored underwater power cables, with an approximate overall diameter of 4.5 inches and rated at 34.5 kV (Figure 5). The cables would be composed of a three-core copper conductor with cross-linked polyethylene ("XPLE") or ethylene propylene rubber ("EPR") insulation. Optical fibers for data transmission would be embedded between the cores. The cables would be buried in the lakebed at an approximate depth of 1.5 meters (4.9 feet).

Full geotechnical and geophysical surveys were conducted in August and September 2016 along the cable corridor. Because an installer has not yet been selected, the exact cable route has not yet been finalized. The final route would be located within the envelope surveyed during the 2016 geotechnical and geophysical surveys (see Figure 2).

Project Substation: The Project substation would collect electricity transmitted through the submerged cables, step up the power from 34.5 kV to 138 kV and transfer it to an overhead electrical line. The Project substation would be located on currently developed land, adjacent to the CPP Lake Road Substation. The Project substation would include a fenced area approximately 88 feet by 110 feet in size that would enclose the station components, including bus structures, switch gear, the step-up transformer, and a 14-foot by 37-foot modular control enclosure for control equipment. There will be no impacts to waters of the U.S. from the construction and operation of the Project substation.

Overhead/Underground Electrical Line: The new Project substation would be connected to the existing 138 kV system at the CPP Lake Road Substation via an overhead uninsulated cable, then transitioned to an underground concrete duct bank. The transition from the duct bank to the termination structures would be through a pre-cast concrete pulling pit. The underground line would be a three-phase, 138 kV circuit, utilizing a 1,000-circular mil ("kcmil") EPR or XLPE insulated and shielded copper conductor. The circuit would run approximately 150 feet in a concrete encased conduit from an above grade termination structure in the Project substation to an above grade termination structure in the existing CPP Lake Road Substation. There will be no impacts to waters of the U.S. from the electrical line connecting the Project substation to the CPP Lake Road Substation.

Point of Interconnection Substation: The POI substation is the existing CPP Lake Road Substation. There will be no impacts to waters of the U.S. from the POI substation.

3.1.3 Construction Staging Area

Construction of the Project would require the development of a temporary staging area to store the major components, including the turbines, foundations, and submarine cable, during construction. The site would also be used to pre-assemble and test some of the components prior to installation. The staging area would be a 12-acre space leased from the Port of Cleveland on currently developed land. Site preparation would be limited to minor and temporary installation of security fencing, temporary office trailers, and secured storage areas. There will be no impacts to waters of the U.S. from the construction staging area.

3.1.4 Operations and Maintenance Facility

The Applicant would lease space from Great Lakes Towing ("GLT"), located on Division Road approximately 1 mile from the Cleveland outer harbor on Old River, to serve as the O&M center. No modifications to the existing structure would be made. There will be no impacts to waters of the U.S. from the O&M Center.

3.2 Project Construction

Pending the receipt of all required permits, Project construction is anticipated to occur in a single phase, which is expected to begin in the spring of 2019 and be completed by the fall of 2019. Prior to any installation work, a full mobilization of all vessels would be conducted, including installation of necessary grillage and sea fastening. Project construction would include the main elements and activities described below.

3.2.1 Foundation Construction

Foundation components would either be fabricated and shipped via barge directly to the installation site or fabricated and shipped via truck and/or barge to the Port of Cleveland, where they would undergo final assembly prior to being towed to the installation site. A heavy lift crane vessel would be utilized to perform the lifting operations related to the foundation and turbine installation process. One of the two vessel configurations described below will be selected. In every case the MB foundations and all turbine components will be transported to the site on a feeder barge that will be towed to the site.

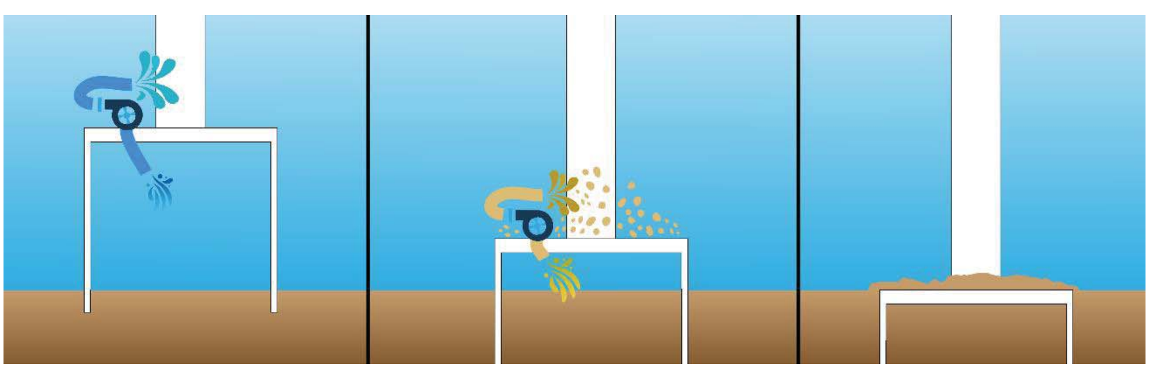
- Configuration A: A jack-up vessel would perform the heavy lift operations for both the foundation and turbine installation. A crane would be deployed on the vessel. A tug boat will be used if the vessel is not self-powered. The jack-up vessel would be a barge or hull outfitted with three to six legs that could be raised and lowered. The legs would be lowered to the lakebed and the vessel would be jacked-up via the legs to stabilize the vessel during lift operations. Each leg may have a pad on the bottom of the leg that contacts the lakebed. The maximum pad dimension anticipated is 34 feet by 18 feet (612 square feet). Assuming six pads, the maximum area that would contact the lakebed is just under 4,000 square feet.

- Configuration B: In this scenario, a non-jack-up vessel would perform the foundation heavy lift operations while a jack-up vessel would perform the turbine installation heavy lift operations. The configuration and specifications of each of the two vessels would be optimized for its specific purpose. The turbine jack-up vessel would be as described in Configuration A and would function in the same manner. The non-jack-up foundation vessel would be self-powered and would not include legs. The vessel would maintain position via anchors or dynamic positioning ("DP").

Prior to any installation work, a full mobilization of all vessels would be conducted, including installation of necessary grillage (structural load distribution elements to avoid excessive local loads on the vessels) and sea-fastening (structural elements providing horizontal and uplift support of a component during transport operations).

The MB would be lifted off the barge, and lowered to 1 meter (3.3 feet) above the lakebed. At that position, the MB would be halted to allow the water column to stabilize and then lowered until it contacts the lakebed. Once the bucket is on the lakebed, it would self-penetrate 3 to 6 feet due to its weight (500 to 600 tons). At this point, technicians in the control room of the heavy lift crane vessel would control the installation via remote operation of the click-on unit.

To achieve penetration, water would be pumped out of the bucket through an exhaust port on the click-on unit into the adjacent water. The water pumped out of the bucket through the exhaust port would be released back into the lake. The exhaust port would be directed toward the lid of the bucket so that any water and the vast majority of the associated sediment would be deposited on the bucket lid (Inset 1).



Inset 1. Sediment Deposition on to MB Foundation Lid

As the water is pumped out of the bucket, the pressure inside the bucket would decrease, which would pull the skirt into the lakebed at a rate of approximately 60 inches per hour. The entire process would be controlled by technicians on the heavy lift crane vessel. After the bucket reaches the desired depth and with the desired verticality, the process would be complete. The click-on unit would be detached remotely and lifted to the surface and onto the deck of the heavy lift crane vessel. This installation method eliminates the need for pile driving or dredging, thereby reducing noise (MB installation noise levels are 73 decibels, while pile driving produces noise levels of 191 dB; Lowara, 2012 and Elmer et al, 2007) and lakebed disturbance when compared to other foundation types (e.g., conventional monopile or jacket foundations). When compared to conventional monopile or jacket foundations, the MB foundation minimizes environmental impacts and eliminates significant installation steps, as well as equipment. Figure 6 depicts the foundation interface with the lakebed. For additional information on the jurisdictional impacts associated with foundation installation, see Section 4.1.

To maintain verticality within specifications (0.5 degrees) as the bucket penetrates the lakebed, two control mechanisms are available, water jets and clay chambers. The water jets are small water nozzles embedded in the wall of the bucket along the bottom of the skirt. The nozzles would be installed in the center of the 1-inch thick skirt and segregated into three 120-degree control zones. The water jets could be activated zone by zone and allow short pulses of water to flow through the nozzles if necessary. When the water jets are activated, the water flowing from the nozzles would loosen/lubricate the lakebed under the nozzles, thereby allowing the bucket to penetrate more readily in that zone. The other control mechanism would be a series of three independently controlled small clay chambers equidistant around the skirt. Suction or pressure could be applied to each chamber independently by the technicians controlling the installation process using remote operation of the click-on unit. This mechanism would allow for raising or lowering each zone of the skirt independently to adjust the verticality of the foundation during the entire penetration process.

3.2.2 Electrical Collection System Construction

As mentioned previously, there are two proposed submerged cable components for the Project: the inter-array cables, which would connect the wind turbines together electrically; and the export cable, which transmits the electricity generated by all the turbines to the shore.

The inter-array cables and the majority of the export cable would be installed using a deck barge with cable installation and burial equipment mobilized on board. The proposed installation technique is bury-while-lay (also referred to as simultaneous lay burial). The cable would be buried by using either a cable plow or a jetting tool. A cable plow is a tool that typically sits on skids (skis) and is pulled by a vessel. The plowshare would cut into the sediment forming a trench into which the cable is laid. A cable burying jetting tool is equipped with high-pressure water jets that assist the burial process by fluidizing the sediments within a narrow trench into which the cable would be placed (Appendix A). The targeted depth for cable burial would be approximately 1.5 meters (4.9 feet). As an installer has not yet been selected for the Project, the final installation method (cable plow versus jetting tool) has not yet been determined. The sediments that are disturbed by either process would subsequently settle back onto the lakebed, providing a degree of backfill. Figure 6 depicts the cable interface with the lakebed. For additional detail regarding jurisdictional impacts associated with the cable installation, see Section 4.1.

The proposed export cable would be brought ashore under the Cleveland Harbor and the associated breakwater through a conduit installed using horizontal directional drilling ("HDD"). HDD is a method of steerable trenchless technology commonly used in the installation of various utility pipelines and conduits using a surface-launched drilling rig. It is a common way of getting utility lines from one point to another by directionally boring under obstacles or environmentally sensitive areas. For example, HDD may be used in traversing under rivers, roadways or steep slopes where typical trenching technologies would not be feasible, cost effective, or an appropriate means of minimizing environmental impact. The use of HDD to install crossings under a vast range of surface obstacles was developed in the 1970s, combining techniques used in conventional road boring and those used in oil and gas directional drilling. This method is currently used to install pipelines for oil, natural gas, water, and wastewater, as well as conduits for electric power and fiber optic cables.

There are several advantages to HDD as opposed to traditional trenching methods, including:

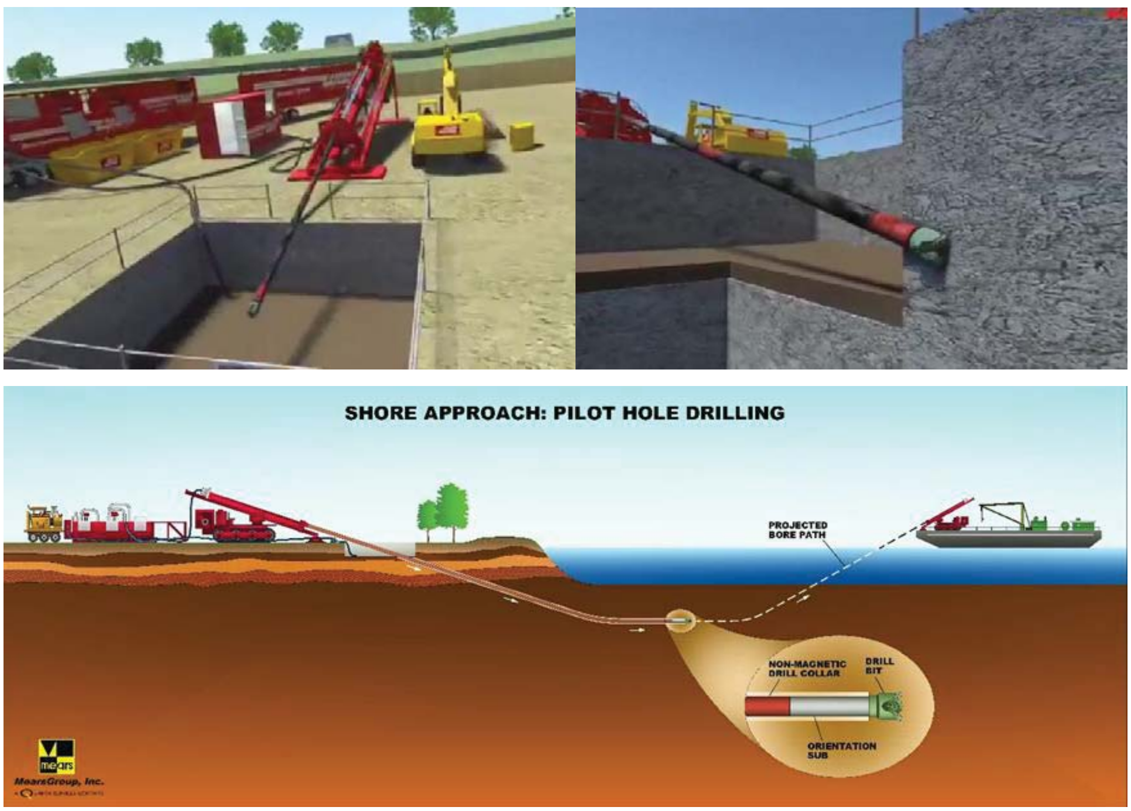
- Less invasive than the traditional open cut.
- Requires a relatively short set up time.
- Surface disruption is minimized.
- More secure than above ground or trenched installations.
- Can make deep installations and avoid surface obstacles such as rivers, railways, or highways.
- Results in less environmental impact overall.

HDD is being used for Icebreaker so that the cable can be placed in a conduit under the Cleveland Harbor Navigation Channel and Breakwater. Placement of the cable in a conduit will provide greater protection for the cable where ships and anchors are most likely to be encountered. The specific characteristics of each drilling project are important factors. For Icebreaker, the soil conditions are primarily silty clay with low plasticity. The crossing is approximately 1,100 meters (3,600 feet) in length, and the diameter of the conduit is approximately 18 inches.

The HDD sequence of events is as follows:

<u>Pilot Hole Drilling</u>

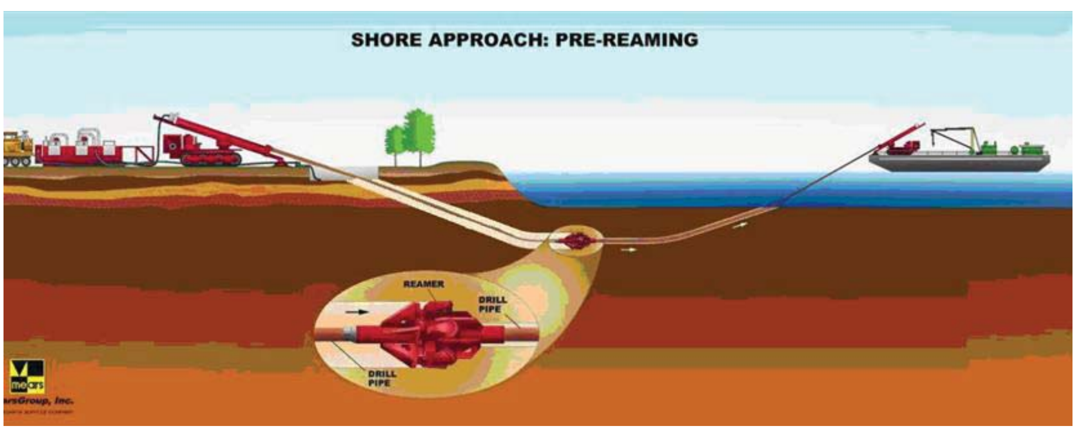
The first step is to drill a pilot hole. The drilling tools and rig equipment selected for each job are largely determined based on the results of the geotechnical investigation and the size of the crossing (length and diameter). During the pilot hole drilling, a directional guidance system is used to navigate the pilot hole along its pre-designed profile. The pilot hole is drilled from the primary drilling rig at the entry point onshore (at the substation) to the secondary rig located at the exit point offshore (outside the Breakwater) following a previously designed profile and alignment (Inset 2). For this Project, following drilling of the initial pilot hole, the “bottom hole assembly” (the drill bit and the non-magnetic drill pipe encasing the survey instrument at the end of the drill string) would be lifted to the deck of a work barge and removed.



Inset 2. Shore Approach: Pilot Hole Drilling

Hole Enlargement

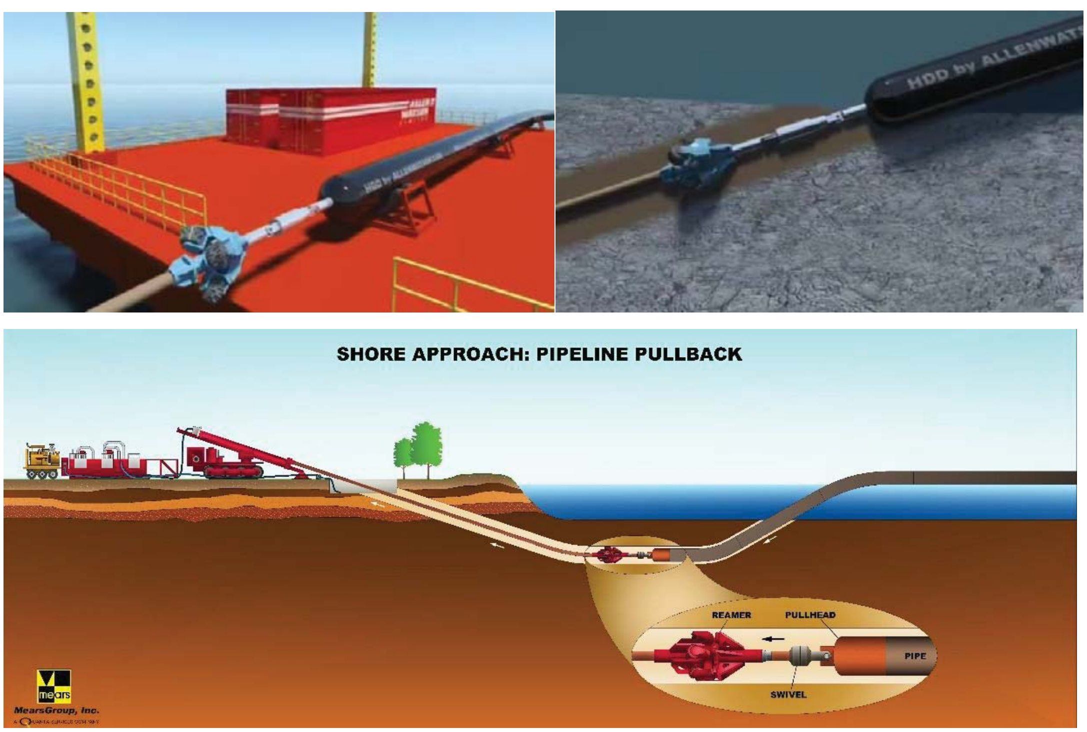
The pilot hole is then enlarged using a reamer. This is known as “pre-reaming” and provides a bore diameter large enough so that the conduit can be installed in the bore hole. The hole would be “pre-reamed” to approximately 12 inches larger than the outside diameter of the proposed high density polyethylene (“HDPE”) conduit (i.e., to approximately 28 to 30 inches in diameter). The driller would most likely do this by progressing the reamer (a 30 inch diameter cutter) through the drilled hole from the onshore end towards the offshore “exit” (Inset 3), thereby transmitting the large majority of the pre-ream cuttings and drilling fluid back to the land surface at the onshore drill site. Drilling operations would use drilling fluids to stabilize the bore hole and to lubricate the drilling process. The proposed drilling mud (a clay-based compound such as Bentonite) is National Sanitary Foundations (“NSF”) approved for drinking water applications such as water wells. Spent drilling fluids containing solely bentonite clay are considered “earthen material” and may be buried or land applied on-location within the right-of-way of the drilling operation or at a designated property. Drill cuttings resulting from HDD using solely bentonite clay and water are also considered “earthen material” and may be managed similarly. Based on the final desired diameter and soil conditions, this process may include one or more stages.



Inset 3. Shore Approach: Pre-Reaming

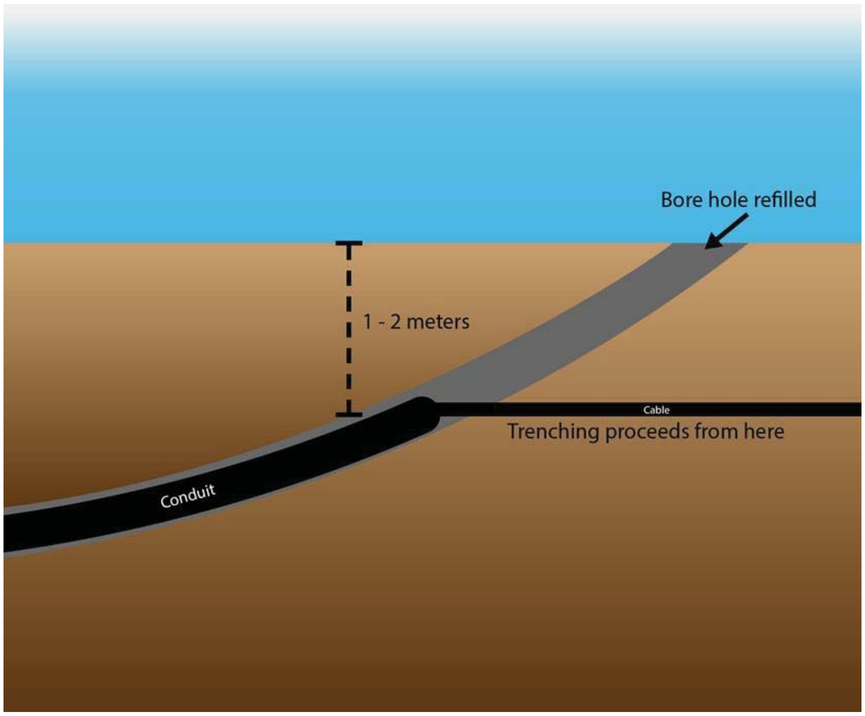
Pullback

Once the drilled hole has been enlarged to the required diameter, the HDPE conduit, which will have been preassembled offshore or assembled onshore and then towed offshore to the barge, is readied for installation. The conduit is pulled through the drilled hole toward the shore using the drill "string" (pipe). The conduit would be prefabricated in a single string prior to it being pulled back through the drilled and reamed hole. The driller anticipates that the HDPE string would be towed out to the exit point where, on the deck of the barge, it would be attached to the drill pipe by way of a pull-head at the front of the HDPE pipe, along with a swivel and a reamer (Inset 4). That assembly would be lowered overboard and the onshore drilling rig would then pull the HDPE pipe through the drilled and reamed hole and into the drilling pit onshore (Appendix B).



Inset 4. Shore Approach: Pipeline Pullback

The electric cable is installed from outside the Breakwater toward the shore through the conduit. The cable is pulled into the conduit from the shore entry point using the “pull string” previously placed in the conduit. The trenching/cable installation process proceeds from this point toward the turbines using a cable plow or jetting tool (Inset 5).



Inset 5. Connection Between HDD and the Export Cable

3.2.3 Wind Turbine Assembly and Erection

It is anticipated that turbine components, including the nacelle, blades, and tower, would be transported to the Port of Cleveland by barge. A heavy lift crane vessel would be utilized for turbine installation. Installation of the turbines would occur after the installation of the MB foundations and the electric collection lines is complete. The heavy lift crane vessel would already be positioned at the respective turbine site ready for turbine erection. A load-out crane in port would load tower sections for the first turbine onto the feeder barge, which would then transit to the first installation site. The tower sections would be picked off the feeder barge and installed on the foundation using the crane mounted on the heavy lift crane vessel. Assembly work inside the towers would begin as the feeder barge returns to port for the nacelle and blades. Once the feeder barge returns to the site, the nacelle and blades would be installed using the crane. Upon completion of a turbine installation, the heavy lift crane vessel would reposition to the second turbine location while the feeder barge returns to port for the load-out of towers.

3.2.4 Substation Construction

The Project substation would be constructed on CPP property, adjacent to the existing Lake Road Substation. The area surrounding the substation is developed, consisting almost entirely of unpaved, but previously disturbed, outdoor storage space with no significant ecological resources. The Project substation would include a fenced area approximately 88 feet by 110 feet in size that would enclose the station components, including bus structures, switch gear, the step-up transformer, and a 14-foot by 37-foot modular control enclosure for control equipment. The entire Project substation area would be excavated to a depth of approximately 3 feet for the installation of the substation grounding grid. All unused excavated backfill would be removed from site for disposal in an upland location. Compacted backfill would be placed over the ground grid with a final 18-inch layer of coarse aggregate as the final substation surface. Bus support structures, overhead line dead-end structure, and the control house would be placed upon drilled caisson foundations with elevated piers. The entire station would be enclosed by chain link fence installed around the perimeter. There will be no impacts to waters of the U.S. from the construction and operation of the Project substation.

4.0 JURISDICTIONAL ACTIVITIES

Through an iterative design process, the Project has been sited to minimize impacts to Lake Erie. In 2009, the Project was originally proposed to be located 3 to 5 miles off the coast of Cleveland. In 2009, the ODNR issued a Wind Turbine Placement Favorability Analysis Map to indicate the most favorable and least favorable locations in Lake Erie for wind turbine placement. The analysis took many factors into consideration, including shipping lanes and navigable waterways, distance from shore, fish and bird presence and habitat, natural heritage observances, reefs, shoals, and artificial reefs, lakebed substrates, salt mine and sand and gravel operations, military exercise area and danger zones, confirmed shipwrecks, sport and commercial fishery efforts, and dredge disposal areas (ODNR, 2009). After the issuance of this analysis, the Applicant shifted the proposed location of the Project further offshore to avoid limiting factors identified by the ODNR. The original layout was in an area with extensive limiting factors, as identified by the ODNR. The current proposed location is in an area that the ODNR has identified as having moderate-low limiting factors. However, unavoidable temporary disturbance and long-term loss of a small amount of lakebed would result from Project activities. These impacts are described below.

4.1 Project Component Installation

Construction of the onshore Project components, including the O&M center, the Project substation, and the temporary staging area, would not result in any impacts to water resources. All of these Project components are located entirely on currently developed or disturbed upland sites, and therefore, do not include any jurisdictional activities.

Installation of the MB foundations would not require vegetation removal, dredging or drilling prior to, or during, the installation process. Installation of the six foundations will directly disturb approximately 0.34 acre of substrate habitat for the turbine foundation. There also is potential for localized, short-term impacts as a result of water withdrawal from inside the foundations and discharge of this water to the lake.

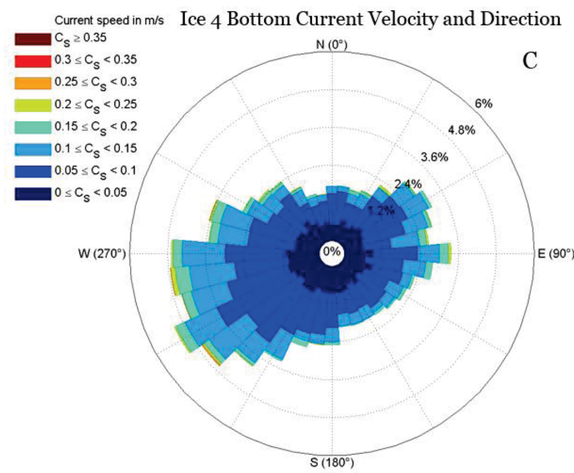
During the installation process, approximately 810,000 gallons of water would be extracted from inside the foundation bucket and released back into the lake. Sediment from the top 0.1 to 0.3 meter (0.3 to 1.0 foot) of the lakebed could be sucked into the pump and mixed with the discharge water during the last approximately 1 meter (3 feet) of the penetration process. The water and the vast majority of suspended sediment removed during the MB installation would be pumped from the inside of the bucket back on to the lid of the MB. The quantity of sediment that would be pumped out may vary by location and the particular composition of the sediment at each of the six turbine sites. Finer grained sediments would become more easily entrained in the discharge water when compared to coarser grained sediments. The amount of sediment that could potentially become entrained in the discharge water and released from the exhaust port is anticipated to be up to 75 cubic meters (98 cubic yards). The vast majority of the sediment would be returned to the lakebed on top of the MB lid, with a small amount possibly falling to the lakebed beyond the diameter of the lid (Inset 1). This fallback of sediment onto the lid would reconstitute portions of the benthic habitat that would be lost due to the installation of the MB.

Burial of the inter-array cables and export cable during construction would also temporarily impact the lakebed. The proposed inter-array cable and export cable would be installed beneath the lakebed using a cable plow or jetting tool. Along the proposed approximately 12-mile cable route, the direct disturbance resulting from cable installation would be approximately 15 feet wide. During installation of the cable, bottom sediment would become suspended within the water column; however, the impact would be short-term and localized. Lake Erie has low current velocities; therefore, bottom sediments suspended during jetting installation would be expected to settle back to the lake bottom with minimal transport of suspended sediments from the localized area. Potential impacts from suspended sediments are discussed below and in greater detail in a Sediment Transport Memo, prepared by LimnoTech and attached as Appendix __ to this Application.

The *Lake Erie Water Quality Modeling Report* prepared by HDR (2015) for a similar project in Lake Erie, the ITC Lake Erie Connector ("LEC"), was reviewed to assess the potential for increases in suspended sediment from the proposed Project. The LEC is a proposed cable route approximately 80 miles east of the proposed Project. The LEC cable route crosses a similar nearshore to offshore bathymetric gradient and water currents, and encounters a similar transition from sandy nearshore sediments to silt and clay offshore sediments as the proposed Project. Modeling conducted for the LEC project predicted that the highest total suspended solid ("TSS") concentrations would occur around the point of cable installation and then decrease rapidly as distance from the installation area increases. At a lateral distance of 30 meters (98 feet) from the cable installation point, the TSS concentration increases were predicted to be less than 3 mg/L above background conditions. TSS concentrations were predicted to drop to 100 mg/L above background TSS levels within the first hour and to less than 3 mg/L above background TSS levels within 1 to 4 hours, depending on the representative location. In the vertical direction, the model predicted that increased TSS concentrations would be limited to the bottom 5 to 11 meters (16 to 36 feet) of the water column depending on the representative location. Above these depths, the model predicted TSS concentrations of less than 3 mg/L above background conditions. Similar short-term and localized increases in TSS are expected to occur during installation of the proposed inter-array and export cables.

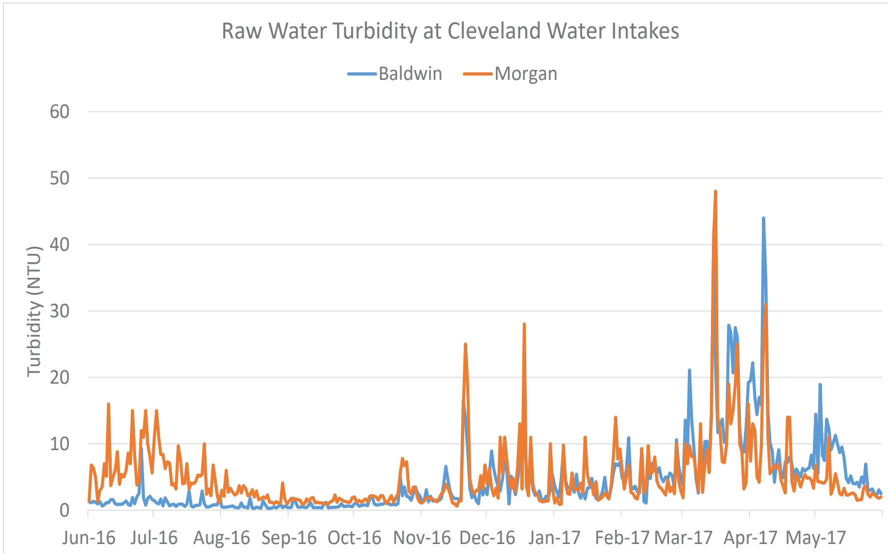
A variety of site-specific factors can affect the concentration and transport of suspended sediment, including the specific type of sediments and the speed and direction of water currents. Depending largely on the quantity of fine grained sediments suspended and the properties of these sediments after suspension, the suspended sediments could remain concentrated above background levels for minutes to many hours after installation. Near the proposed turbine locations and within 2 kilometers (1.2 miles) of the proposed turbines, surficial sediments are fine grained and typically composed of 34 to 58% clay, 34 to 50% silt, and less than 8 to 17% sand and gravel (CSR, 2016). Along much of the export cable route (i.e. from shore to 8 miles offshore), surficial sediments are sandy sediments, which when suspended during cable installation would settle immediately adjacent to the trench carrying the cable. Pockets of finer-grained sediments also exist along some portions of the proposed export cable route. These finer-grained sediments would remain suspended longer and travel farther than sands. Resuspended fine-grained surficial sediments would tend to be resuspended as flocs or masses rather than as individual particles. Consistent with this, the minimum settling rate of sediments can range from 1 meter/day (for floc settling of fine grain material) to over 100 meters/day (for coarse sand).

Ambient currents were monitored in 2016 as part of a pre-construction monitoring study conducted by LimnoTech. Lake currents from May to October 2016 were more frequently directed toward the southwest than to the northeast. Inset 6 below shows a summary of wind direction frequency for current measurements near the bottom of the lake at the proposed location of one of the Project turbines, ICE4 (the spokes represent the frequency of moving towards a particular direction). Typical persistent current speeds are low (about 4 centimeters per second). At this average current speed, fine-grained sediments (with slow settling rates) could travel 3.5 kilometers (2.2 miles) in a 24 hour period if their characteristics are such that they remain suspended for this duration. Most of the time, current speeds are less than 10 centimeters per second with occasional short-term excursions to 20 centimeters per second.



Inset 6. Bottom Current Velocity and Direction at Turbine ICE4 from May to October 2016.

Impacts on aquatic and benthic organisms including invertebrates and fish are expected to be negligible and in line with other natural and anthropogenic factors that cause temporary increases in turbidity and sediment disturbance. Ice scouring during winter months frequently creates large cuts/scars in the sediment bed that frequently disturb sediment and displace aquatic life (USACE, 2000). Wind-driven resuspension can also increase ambient turbidity levels well above background levels. Natural fluctuations in turbidity have also been measured by at the City of Cleveland at their water intake cribs in Lake Erie (Moegling, 2017, pers. comm.). Inset 7 below shows the daily average of turbidity measurements from two of the four water intakes (Morgan and Baldwin) located approximately four miles offshore during the 2016/2017 season. Frequent turbidity spikes were observed at both intake locations.



Inset 7. Turbidity Measurements at Two Cleveland Area Water Intake Cribs from June 2016 to May 2017

The closest water intake and associated Source Water Protection Area (1,000-foot radius around the intake), is between approximately 2,900 and 3,300 meters (1.8 and 2.1 miles) from the proposed export cable and approximately 6.8 kilometers (4.2 miles) from the closest proposed turbine The potential for impacting water quality at the intakes depends on the prevailing lake currents during installation, precise type of sediment encountered along the cable route, installation method (e.g., ship speed, trench depth/width, jet nozzle configuration), water intake design, and water plant pumping characteristics. Water current data collected by LimnoTech, shown in Inset 6, shows that water currents could carry sediments in the direction of the intakes, and surficial sediment data from Canadian Seabed Research show areas of fine grained sediment are located along the cable route in the region near the intakes.

Discussions with Cleveland Water indicate they frequently deal with natural increases in suspended sediment at their intakes (Inset 7). The Cleveland Water conventional surface water treatment plant removes turbidity continuously as part of their treatment process to clarify and disinfect water (clarification to remove particulates, filtration to remove finest of particles and some dissolved chemicals if biological filtration is occurring, and disinfection with chlorine). The range of turbidity to be removed is part of the design process and uses worst case scenarios (from historical turbidity data) to establish the design capacities (Moegling, 2017, pers. comm.). Inset 7 shows the range of turbidity measured at the two intakes closest to the export cable route. It ranges from very low (under 10 Nephelometric Turbidity Unit ["NTU"]) to very high (30 to 50 NTU and higher), typically after a rain event or choppy or very choppy conditions on Lake Erie. The Cleveland Water treatment plant is large and therefore can handle most short-term variations in turbidity from within the plant. For longer term events, Cleveland Water may adjust doses within the treatment process (Moegling, 2017, pers. comm.).

In addition, the configuration of the two water intakes only begins to let water flow in at depths of 5 to 10 feet above the lakebed, further limiting potential impacts.

To limit potential impacts the Applicant will work with the selected cable installation contractors to monitor and mitigate the amount of suspended sediment during cable installation. This would include careful review of selected contractor's equipment and installation method, initial monitoring of cable installation to ensure minimal impact, and adjustments to installation speed or jet pressure to limit suspension. The Applicant will continue discussions with the City of Cleveland and develop a communications and monitoring plan that would inform plant operators of construction schedule and provide field measures of turbidity to optimize water treatment plant operation (as would occur under regular operating conditions during storm events). These precautions and mitigation measures will greatly reduce the potential for any negative impacts on drinking water supply. Any temporary impacts are expected to mirror other naturally occurring sediment resuspension events on Lake Erie.

The use of HDD would minimize impacts to sensitive nearshore areas by taking the cable under the lakebed. At the offshore end of the conduit the trenching/cable installation process using either the cable plow or jetting tool would proceed (Inset 5). As such, no impacts are anticipated as a result of routine HDD installation practices. Though precautions would be taken to minimize the chances of a drilling fluid leak (i.e., an inadvertent return), there is still a potential risk of leaks through unidentified soil weaknesses. An Inadvertent Return Contingency Plan ("Frac-out" Plan) was prepared by the Applicant to address the potential risk of an inadvertent release of drilling fluids (Appendix D). The plan describes the procedure the Applicant and the contractors would implement to avoid, minimize, and remediate potential environmental impacts that could result from an inadvertent release. A final, site specific Inadvertent Return Contingency Plan will be developed by the Applicant's HDD contractor prior to the start of construction. While the Applicant will not make final plans until a contractor is selected, they will consider the following options described below.

In the rare chance of an Inadvertent Return, containment can be achieved by sealing the leak point using loss control materials ("LCMs"). The use of LCMs is an industry standard for HDD projects to control the flow of fluids that may inadvertently escape from the drill bore. LCMs are generally environmentally benign materials that slow or stop the release of fluid from the unintended opening of the HDD bore. Once selected, the Applicant's HDD contractor would provide safety data sheets ("SDS") for LCMs prior to the start of drilling. An open water frac-out can be contained through the installation of a gravity cell. The gravity cell is a box-like structure that is placed over the location of the release to prevent the migration of drilling fluids away from the location. The gravity cells are constructed of steel and, once lowered into place, provide a seal at the interface with the sea floor or lake bottom. Once the unintended return has been stabilized, the contractor will send a diver down to the gravity cell with a hose to vacuum out the contained drilling fluids. The captured fluid will be pumped to a holding tank on the work vessel for proper handling and disposal. During the HDD operation, the contractor shall have a barge with a dive team stationed offshore.

Turbidity curtains are generally ineffective for confining an inadvertent return of drilling fluids because the drilling fluids are heavier than water and turbidity curtains cannot effectively seal the interface with the sea floor or lake bottom. Released fluids will tend to sink directly to the lakebed. The gravity cells described above are the industry standard and are far more effective at containing fluids that may be released to the environment during an inadvertent return.

Sampling conducted by LimnoTech in 2016 at three of the proposed turbine locations indicate that the lake bottom dissolved oxygen levels were between 2 and 4 milligrams per liter ("mg/L") in July and dropped to near 0 mg/L in the month of August (LimnoTech, 2017). These results confirm that the proposed turbines would be located in the "dead zone" of Lake Erie. Impacts to biological resources in this "dead zone" of Lake Erie from the release of water and sediment from the MB installation would be negligible due to the short-term nature of the disturbance, the anticipated return of the vast majority of the sediment on to the lid of the bucket, and the lack of biologic organisms due to the low dissolved oxygen levels.

In addition to a temporary increase in turbidity and suspended sediment concentrations during the construction phase of the proposed Project, temporary impacts to water quality from the disturbance of potentially contaminated sediment may occur. Lake Erie bottom sediments in areas offshore of Cleveland may contain elevated levels of contaminants, including metals, hydrocarbons, and PCBs. Limited bottom sediment samples were collected during a site-specific geotechnical survey in the vicinity of the proposed turbine sites and export cable route. Sediment results were compared to ecological sediment quality guidelines following the process outlined in OEPA's *Guidance on Evaluating Sediment Contaminant Results* (2010). Results from this evaluation indicate that existing sediment quality at these four locations would pose a low potential for toxicity to aquatic receptors. Mobilization of potentially contaminated sediments could have a temporary indirect impact on water quality in the immediate vicinity of proposed Project activities, primarily related to increased turbidity/suspended sediment; however, these impacts are expected to be temporary, localized and minor when compared to the surrounding natural sediment and water quality conditions in the Project Area.

4.2 Project Operation

The onshore Project components, including the O&M center, the Project substation, and the temporary staging area, would not result in any impacts to water resources during the operational phase of the Project. All of these Project components are located entirely on currently developed or disturbed upland sites and, therefore, do not include any jurisdictional activities.

The presence of the MB foundation will result in a long-term loss of a small amount of lakebed habitat for benthic communities, as it exists in its current form. However, any sediment that becomes entrained in the discharge water during the installation of the MB foundation would be pumped back on to the lid, where the vast majority of the sediment would remain. This sediment would reconstitute a portion of that lakebed habitat on top of the MB lid. Preliminary designs indicate that the diameter of the foundation will be approximately 17.0 meters (55.8 feet; Table 1). For the proposed six foundations, this would lead to a total loss of lakebed of 0.34 acre (Figure 7). As mentioned previously, the area impacted by foundation installation includes no aquatic vegetation or significant fish habitat. In addition, the footprint of the foundations represents an insignificant loss of lakebed and aquatic habitat when compared to the total area of Lake Erie. Upon completion of the cable installation, the cable would be buried under the lakebed at a targeted depth of 1.5 meters (4.9 feet). The cable would result in no permanent impact to the lake or loss of lakebed.

The turbines would be marked and lighted in accordance with USCG and FAA regulations. A Navigational Risk Assessment was prepared for the Project and concluded that the Project would not adversely affect navigational safety in the Project area (Appendix E).

The operation of the proposed Project may also have minor environmental impacts, including impacts to birds and bats and visual aesthetics. A discussion of these impacts can be found in the Draft EA that was issued for the NEPA review.

4.3 Summary of Jurisdictional Impacts

Impacts to Lake Erie as a result of Project construction and operation are limited to the loss of 0.34 acre of existing lakebed resulting from foundation installation and temporary disturbance of 21.8 acres (63,360 linear feet x 15-foot width) of bottom sediments associated with installation of the submerged cables, as indicated in Table 2 and shown on Figure 7. The decision to use the MB foundation design, HDD to install cable in the nearshore area, and jet-plow/cable plow technologies to install the remainder of the cable, avoids and/or minimizes discharge of dredged or fill material as defined under Section 404 of the Clean Water Act. These installation methods significantly reduce construction-related discharges of any dredge or fill material and overall environmental impacts.

Table 2. Impacts from the Proposed Project

Component	Impact (acres)[1]	Impact (linear feet)[2]	Impact Type
MB Foundations (6)	0.34	--	Permanent
Electric Collection Cable	21.8	63,360	Temporary

[1] Area of impact calculated from the MB foundation diameter of 17 meters (55.8 feet), included in Table 1.
[2] Linear feet of impact calculated from the approximate length of the electric collection cable (export and inter-array) of 12 miles.

By siting the proposed turbines in an area that generally lacks sensitive environmental resources (according to the 2009 ODNR Wind Turbine Placement Favorability Analysis), making landfall in a developed area that lacks wetlands or undisturbed ecological communities, and proposing component designs and installation techniques that would minimize the disturbance/dispersal of lake sediments, the Applicant has avoided and/or minimized potential temporary and permanent impacts to jurisdictional resources to the maximum practicable extent. Temporary impacts from the Project will be limited to localized, short-term, elevated suspended sediment levels in the offshore waters of Lake Erie. A sediment quality evaluation indicated that there is a low potential for toxicity in the Project Area and, as a result, aquatic receptors are not likely to be impacted by disturbed sediment. Given the location, proposed marking and small number of proposed turbines, no significant impacts to terrestrial or aquatic biological resources, municipal water supplies, or navigation are anticipated. The Project would result in the long-term loss of approximately 0.34 acre of Lake Erie lakebed, which represents an insignificant proportion of the lakebed.

5.0 ALTERNATIVES ANALYSIS

5.1 Alternative Project Sites

5.1.1 Regional Siting Considerations

The selection of appropriate sites was constrained by numerous factors that are essential considerations for the Project to operate in an environmentally, technically, and economically viable manner. Criteria evaluated during the siting process are discussed below. Nine potential project areas and several designs were considered before selecting the ultimate Project location and design, as discussed in detail below.

Existing Uses

The proposed location was selected to avoid competition with, or impacts to, existing public and private uses. The turbines would be located outside of commercial shipping lanes and the flight paths of Burke Lakefront Airport and Cleveland Hopkins Airport. The location of the turbines would not interfere with NEXRAD weather radar or military radar. The turbines would also be located away from reefs, shoals, dumping grounds, a sub-lake salt mine, shipwrecks, water intakes, and sewer outfalls. The turbines would be outside of any high impact areas identified by the ODNR's Wind Turbine Placement Favorability Analysis (ODNR, 2009), and are not near any competing submerged lands leases.

Wind Resources

Wind measurements were collected at a meteorological tower stationed atop the Cleveland Water Intake Crib located 3 miles off the coast of Cleveland. Project siting took dominant wind direction into consideration in order to maximize the power output of the turbine configuration and to reduce stress on turbine components. Turbines would be oriented to the cross-wind direction north-northwest to south-southeast and would be spaced approximately six rotor diameters apart to minimize wake effects from the adjacent turbines.

Environmental Conditions

Natural resources such as water quality and avian, bat, and aquatic communities were also evaluated when considering alternate locations for the proposed Project. Avian and bat risk studies, risk assessments and radar analyses completed in 2005, 2008, 2013, 2016, and 2017 for the Project cited the small size of the Project, distance of the turbines from the coast, absence of waterbirds at the 8 to 10 mile distance from shore, considerably fewer night migrants over the Project location as compared to over land and the eastern end of the lake, rare and infrequent presence of any state- or federally-listed threatened or endangered ("T&E") species or species of special concern, and the lack of nesting/roosting and foraging areas as support for the conclusion that the Project would have minimal impacts to avian, bat, and T&E species. A risk assessment and a sampling plan for aquatic communities were also prepared in 2016 and 2017; it was concluded that risk to any aquatic resources is minimal. The Applicant has entered into two Memoranda of Understanding ("MOU") with the ODNR setting forth agreement on monitoring protocols for aquatic resources and fisheries, as well as for birds and bats, pre-, during, and post-construction to ensure that the project has no significant adverse impact on these fish and wildlife resources. These MOUs were submitted to the Ohio Power Siting Board in support of the Applicant's permit application on July 20, 2017. The geology of the lakebed was evaluated to ensure turbine foundations would be supported by the lakebed sediments, and ice conditions and wave action were studied to determine loading on the foundation and to ensure that the turbines would be able to withstand ice and wave loads.

Foundation Design

The Applicant performed a detailed comparative review of five different turbine foundation designs, resulting in the identification of two turbine foundation options; the Monopile with a Friction Wheel ("MP/FW") and the MB. After a technical assessment of the two foundations, the MB was selected as the Project turbine foundation in 2015. See Section 5.2.2 for further detail on turbine foundation selection.

Interconnection and Offshore Cabling

Offshore cabling was an important cost factor for the Project. Cable distances are dependent on the turbine location relative to the onshore interconnection location. Three potential interconnection locations were evaluated. Feasibility, cost of required equipment, and anticipated impacts were considered. The CPP Lake Road Substation was chosen as it was the closest potential interconnection location to the Project, thereby reducing cabling distance and cost. Its location in a developed/disturbed setting also minimized potential environmental impacts.

5.1.2 Potential Project Sites

In 2009, nine potential Project sites were identified 3 to 5 miles offshore (Figure 8). Each site was capable of supporting approximately 20 MW of power, but varied in location, number of turbines that could be accommodated, and available turbine spacing. The alternate Project sites were evaluated with respect to important siting criteria, including shipping channels, water depth, distance to possible onshore interconnection locations, wind resources, air navigation and radar, and the locations of lakebed factors such as dumping sites, artificial reefs and shoals, water intakes and sewer outfalls, and shipwrecks.

After these sites were evaluated, the ODNR Office of Coastal Management released its 2009 Wind Turbine Placement Favorability Analysis, and potential Project locations were subsequently re-evaluated. The ODNR Favorability Analysis identified additional siting constraints including bird habitat, fish habitat, commercial and sport fishery efforts, lakebed sediments, utilities, shipwrecks, natural heritage observances, shipping lanes, distance from shore, and industries. In general, the Favorability Analysis identified more extensive limiting factors closer to shore, and only minimal limiting factors further offshore. The Favorability Analysis was one important resource in assessing the suitability of the project sites and was relied upon extensively in the Applicant's decision to shift the Project further offshore.

In 2014, a Project consisting of six turbines sited 7 to 10 miles off the coast of Cleveland was proposed. Subsequently, the Project was shifted to the current site, located 8 to 10 miles offshore, in response to all of the siting considerations listed in Section 5.1.1.

5.2 On-Site Alternatives

5.2.1 Alternate Project Layout and Size

An optimization study was conducted by the National Renewable Energy Laboratory ("NREL") in 2014 to evaluate potential Project layouts in terms of net energy production, turbine net capacity factor, and wake losses. Potential layouts studied included linear layouts varying from five to nine turbines, two-row layouts, and a three-row layout. The linear, six turbine layout had one of the highest net energy outputs per turbine. In 2016, the Applicant selected the final layout of a linear, six turbine array spaced approximately six rotor diameters apart with the potential to generate 20.7 MW of energy located 8 to 10 miles off the coast of Cleveland.

5.2.2 Alternate Project Foundation Design and Turbine Model

A MP/FW foundation concept was the original foundation design chosen by the Applicant in 2013 after an examination of four foundation types (circular cell, tripod pile, gravity base, and MP/FW) and their performance in lakebed sediments similar to those found in the Project area. The friction wheel consists of an outer steel ring with a concentric inner ring connected via structural members to form a wheel. The wheel is embedded in the top layer of sediment surrounding the monopile and filled with aggregate to stabilize the soil and increase resistance to deformation from lateral forces in response to loads on the monopile. The monopile alone is a well-developed and established design and has been used at approximately 70% of the existing offshore wind farms in Europe. However, there are not currently any wind turbines operating on MP/FW foundations.

As the Project design progressed, the Applicant considered a fifth foundation type, the MB suction pile. The MB suction pile is also a well-proven concept for offshore foundations in the oil and gas industry, with more than 2,000 suction technology-based installations. These range in size from relatively small suction anchors to enormous suction buckets holding in place the world's largest offshore oil platforms (Troll A off the coast of Norway). The proposal to use a single large bucket suction pile foundation for a wind turbine was developed in Norway and Denmark in the late 1990's, leading to installation of a 3 MW Vestas turbine at an offshore location in 2002. As described previously, the structure consists of an open-ended steel bucket that is placed open end down on the lakebed. As described in more detail above, after a small amount of self-penetration into the sediment under its own weight, the pressure within the foundation is reduced by pumping water out of the bucket, which pushes the foundation into the seabed. Once installed, the foundation captures all of the sediment inside the bucket and acts like an embedded gravity footing. Use of this technology is increasing in Europe, where 4 to 8 MW turbines are being placed on foundations using suction buckets.

A comparative analysis between the MP/FW and the MB suction pile was completed in 2015 to determine the most suitable foundation design for the proposed Project. Selection of the preferred foundation considered all aspects of both technologies, and while the MP/FW uses well-proven monopile technology, its large size and pile driving equipment would make installation challenging, requiring three offshore lifts. Pile driving would also result in much greater underwater noise impacts (191 dB) as compared to MB installation (73 dB), and the fly wheel would require the addition of a significant amount of fill to the lakebed (Lowara, 2012 and Elmer et al., 2007). The MB would only require the use of one offshore lift, and would not require any pile driving or placement of fill. Therefore, the installation costs and environmental impacts would be significantly lower for the MB. While both foundations meet the technical performance requirements for Lake Erie's lakebed sediments and winter weather conditions, the MB would be lighter, quicker to install and can be fabricated in the U.S. By eliminating pile driving and reducing soil disturbance, the MB foundation would lessen environmental impacts when compared with conventional foundations. Given these advantages, the MB was selected as the foundation for the proposed Project in March 2015.

5.2.3 Substation Location

Three potential interconnection locations were evaluated: the Cleveland Electric Illuminating Co. ("CEI") Lakeshore Substation, the CEI Oglebay-Norton Tap, and the CPP Lake Road Substation. Feasibility, cost of required equipment, and anticipated impact were elements considered. The CPP Lake Road Substation was chosen as it was the closest potential interconnection location relative to the proposed turbines, thereby reducing cabling distance, environmental impacts, and cost. This site also requires minimal upgrades to existing infrastructure, and has sufficient land to construct necessary new substation equipment without impacts to water resources.

5.2.4 Submerged Cable Route

A comparative analysis was conducted to assess the benefits and risks of each cable route option considered for the Project (see Table 3). Cable length, utilization of HDD, potential damage from third parties, environmental aspects, permitting considerations, and potential Port of Cleveland, City of Cleveland, and USACE development plans near the shore crossing were evaluated in the analysis.

To connect the export cable to the substation, the cable route would have to cross or go around the Cleveland Harbor Breakwater, then cross the Cleveland Harbor to the substation. A man-made confined disposal facility ("CDF") is located within the harbor along the direct path to the substation. Originally, three different cable route options were assessed. These alternatives are illustrated in Figure 9, and included the following:

- Option 1 would be the most direct route. The route would be a straight path perpendicular to the general shoreline from the substation, crossing under the CDF and the breakwater to the open water of Lake Erie, and then continuing in a straight path to the nearest turbine. Within this option, three different scenarios were evaluated: a) route the cable completely under the harbor, CDF, and breakwater using HDD; b) route the cable under the harbor and breakwater using HDD and a trench across the CDF; and c) float out installation[2], trench across the CDF, and HDD from the CDF under the remaining harbor and breakwater. All options would use trenching to install the cable on the lakeside of the breakwater.
- Option 2 would include a conventional landfall at the substation, be routed around the CDF by float out installation, and utilize HDD under the breakwater. From the HDD exit point toward the turbines, the cable would be installed using trenching.
- Option 3 would include a conventional landfall at the substation, bypassing both the CDF and breakwater, the bending after the end of the breakwater to continue along a straight path toward the turbines using trenching.

A quantitative assessment and ranking of the cable route options was conducted by DNV GL. The cable route options were assessed for cable length, application of HDD, external damage by third parties, environmental aspects, thermal bottleneck, and future development plans in the region. Each option was assigned a score from 1 to 5 (1 indicating high benefit/low risk and 5 indicating low benefit/high risk). The results of the assessment are included in Table 3.

Table 3. Quantitative Assessment and Ranking of the Different Cable Route Options

Criteria	Option					Weight
	1a	1b	1c	2	3	
Cable length	1	1	1	1	2	20%
Application of HDD	3	5	3	4	1	20%
External damage by third parties	1	2	2	3	4	20%
Environmental aspects	3	3	3	4	4	10%
Thermal bottleneck	5	4	4	4	2	15%
Future development plans	1	5	5	4	3	15%
Weighted average score	2.20	3.25	2.85	3.20	2.55	-

[2] Floatation would be attached to the cable and the cable would be held in position by small workboats. Tension would be applied to the cable and a pull-in wire from a shore based pull-in winch would be connected to the cable end. The cable would be pulled through a pre-excavated trench at the shore crossing, and the floatation would be removed to allow the cable to be laid in the trench.

Criteria	Option					Weight
	1a	1b	1c	2	3	
Ranking	1	5	3	4	2	-

The table was adapted from DNV GL's Substation and Cable Route Design Report, 2016.

The assessment concluded that Option 1(a) represented the best option for cable installation. While the cost of HDD would be greater, the option would require no trenching in the harbor. Therefore, potential sediment disturbance would be minimized in potentially sensitive nearshore habitats and the cable would be completely protected during its design life, well under the specified dredge depth of the channel. As the Project progressed, a fourth option, not considered in the original evaluation, was considered and ultimately selected as the optimal route over Option 1(a). This option would route the cable under the harbor using HDD, but route the cable to the east of the CDF, instead of under the CDF. The option was selected to completely avoid the CDF, due to the uncertainty of the impact on the buried cable from future dredge material deposits in the CDF.

5.3 Alternate Construction Techniques

Because the water pumped from the interior of the MB through the exhaust port would likely include some suspended solids due to minor disturbance at the lakebed/water column interface, alternative approaches to direct discharge of pumped water to the lake were considered.

In order to ensure that the water from inside the bucket that is released into the water column outside the bucket does not contain more than *de minimis* sediment/solids, the water could be processed before being returned to the lake. In order to accomplish this, a hose between the deck of the heavy life crane vessel and the exhaust port would be employed. As the water is pumped out of the bucket, it would be pumped to the deck of the vessel. Two options are available to treat the water. The first option would be to treat the water on the vessel by filtering out the solids prior to returning the water to the lake, and disposing of the solids at an appropriate confined disposal facility. The second option would be to transport the entire solution (discharge water and sediment) to a confined disposal facility. Both alternatives were dismissed as unnecessary, given the extremely small amount of suspended sediment that would be introduced to the water column, the limited dispersal of those sediments, and the return of the vast majority of these sediments onto the MB lid. The substantial additional cost of these treatment options could not be justified given the limited impact of the preferred alternative.

The method of cable installation described in Section 3.2.2 of this application is simultaneous lay burial (SLB). Two alternative methods of cable installation (burial) were considered, post-lay burial and pre-trenching. These methods are described as follows.

Post Lay Burial: Post lay burial ("PLB") involves a temporary laydown of the cable onto the lakebed and a subsequent, separate burial operation. The burial phase of PLB can either be performed with a plow or jetting tool. The key aspect of PLB is the decoupling of work steps, which typically requires separate dedicated vessels for laying and burial. Although PLB allows for faster progress during cable laying, the cable remains unprotected for some time. On-bottom stability of the cable is a concern, and guarding may be required before full protection is achieved by burial. Cable loading (for a plow) in PLB applications may also require diver assistance for some models or applications.

Given that the PLB approach would require separate operations for laying the cable, and then for trenching and installation, more handling would be required, thus increasing the risk for damage to the cable and adding to the cost. Also, the requirement for having an exclusion zone and guard vessel over the cable during the time lag between the separate lay/burial operations is likely to be unpopular with lake users and the USCG.

Pre-trenching: Pre-trenching cable burial consists of first plowing a trench in the sediment, laying the cable in the pre-cut trench, and then finally covering the cable with the removed sediment, or allowing bottom currents to fill in the trench with mobile bottom sediments. As with PLB, each step is completed individually rather than simultaneously. Pre-trenching is usually suited to locations where the soil is suitably firm and cohesive to prevent the trench from re-filling before it is possible for the cable to be laid in it. This may be a preferred solution if the presence of rocks or boulders is anticipated. In very hard soils or rock, pre-trenching is performed by hydraulically-driven, underwater cutting wheels or chains, either mounted upon a self-propelled unit, or suspended from a barge. However, given the slow speeds of these approaches, rock-trenching is normally only appropriate for relatively short cable runs. Due to the relatively soft soils along the proposed cable route, pre-trenching is not considered a viable option for the Project.

Two alternative options for cable protection were also considered for the Project. These options were mattressing and rock dumping, which are described below.

Mattressing: If the cable does not require burial in the sediment, or if a hard/rocky substrate is present, other materials may be used to cover the cable. Under this scenario, the cable would be laid on top of the lakebed and covered with mattresses. Mattresses are flexible matrices often consisting of concrete weights or rocks encased in netting. The mattresses protect the cable from anchor drag, fishing, and other activities. Mattresses are a relatively expensive solution for a whole cable route, and are more commonly used for smaller sections where the cable cannot be buried. The Applicant does not plan to use this option; however, it will be considered by the Applicant if after installation, a portion of the cable remains unburied.

Rock Dumping: Rock dumping utilizes accurate placement of rock to cover a cable laid on top of the sediment or to backfill a pre-cut trench when the substrate is hard. This method uses a fall-pipe vessel, sometimes in conjunction to a remote-operated vehicle, to ensure accurate placement of the rock. Another installation method uses an over-the-side dumping method, which is less accurate in deeper waters.

The external protection methods described above are costly in comparison to cable burial and are typically used in areas with a hard/rocky substrate. For a project such as Icebreaker, with soft lakebed sediments along the entire cable route, these methods would not be suitable, as they add significant cost and could apply loading onto the cable as it is pushed into the lakebed. For these reasons, simultaneous cable lay and burial was selected as the preferred form of cable installation.

5.4 No Action

The purpose of the Project is to develop, construct, and operate an offshore windfarm in Lake Erie, off the coast of Cleveland, Ohio. The Project would be the first freshwater offshore wind farm in North America and would deliver clean, renewable electricity to the Ohio bulk power transmission system to serve the needs of electric utilities and their customers while adding fuel diversity and reducing air pollution. Currently, only 2.3% of Ohio's electric energy mix is produced from renewable energy, while over 80% comes from fossil fuels that emit harmful air pollutants and greenhouse gases. The Midwest has been identified by the DOE as a region that will need significant new energy resources. The DOE has provided funding for the Icebreaker Project as an Advanced Technology Demonstration Project. By providing funding, technical assistance, and government coordination to accelerate deployment of these demonstration projects, DOE can help eliminate uncertainties, mitigate risks, and help create a robust U.S. offshore wind energy industry. Although the no-action alternative would have no impacts to certain environmental resources, because the Project would reduce emissions of air pollutants and greenhouse gases, no-action would result in higher emission levels (including emissions of mercury, which do end up in the lake) over the longer term. No action would also not meet the Project's purpose, or help the region meet its energy needs in a manner that does not exacerbate the climate change and air quality challenges posed, or provide the benefits described above.

6.0 AVOIDANCE, MINIMIZATION, AND MITIGATION

The Applicant sited and designed the Project in a manner that would achieve its purpose and benefits while avoiding and minimizing impacts to Lake Erie, and reducing construction costs by:

- Siting the onshore Project components (substation, staging areas, O&M center) on previously disturbed or currently developed land that lacks wetlands or other undisturbed ecological communities;
- Siting the proposed turbines 8-10 miles off shore to reduce potential impacts to birds and bats, as well as noise and visual impacts on shoreline residents;
- Siting the turbines in a “dead zone” of Lake Erie that lacks aquatic vegetation or significant fish habitat due to low dissolved oxygen levels at the turbine sites (see Section 4.1 for additional information);
- Selecting the substation location closest to the turbines, thereby reducing length of electric cable and associated disturbance of lakebed sediment;
- Using HDD to avoid impacts to sensitive nearshore habitats, and reduce sediment disturbance associated with cable installation;
- Utilizing a bury-while-lay installation method for the electric cable, which would reduce installation time and the duration and extent of sedimentation impacts on surrounding areas when compared to open trench installation methods;
- Limiting the Project to six turbines, thus minimizing the overall permanent impact of the Project to 0.34 acre of lakebed;
- Using a turbine foundation (MB) that requires no dredging, drilling, pile driving, and minimal lakebed disturbance prior to and during installation; and
- Conducting pre-construction ecological surveys and developing post-construction mitigation and monitoring plans to minimize and engage in adaptive management with regard to any demonstrated actual impacts on fish and wildlife resources.

6.1 Mitigation

Only 0.34 acre of lakebed would be removed during installation of the six foundations, and the vast majority of the sediments removed during the MB installation are anticipated to be redeposited on the MB lid once the installation is complete. The footprint of the Project would be insignificant when compared to the size of Lake Erie. Adaptive management and post-construction mitigation and monitoring plans have been developed for aquatic and bird and bat communities (discussed in further detail in the Draft EA prepared by the DOE, in the Application for a Certificate of Environmental Compatibility and Public Need filed with the Ohio Power Siting

Board ("OPSB")[3], and in Memoranda of Understanding between the ODNR and the Applicant). No other mitigation is proposed for the Project.

7.0 COMPLIANCE WITH THE ENDANGERED SPECIES ACT

The DOE is the lead agency for the NEPA process, and as such has prepared a Draft EA for the Project. Compliance with the Endangered Species Act is discussed in detail in the draft EA.

8.0 COMPLIANCE WITH THE NATIONAL HISTORIC PRESERVATION ACT

Compliance with Section 106 National Historic Act is discussed in detail in the NEPA Draft EA prepared by the DOE.

9.0 COASTAL ZONE CONSISTENCY

Section 307 of the Coastal Zone Management Act of 1972, also called the "federal consistency" provision, gives states a strong voice in federal agency decision-making for activities that may affect a state's coastal uses or resources. Generally, federal consistency requires that federal actions that would have reasonably foreseeable effects on any coastal use or natural resource of the coastal zone be consistent with the enforceable policies of a state's federally approved coastal management program. The Ohio Coastal Management Program ("OCMP") was developed by the State of Ohio to describe current state coastal legislation and management policies. It is made up of several Ohio natural resource protection and hazard management programs and is regulated by the ODNR Office of Coastal Management.

The 41 policies included in the OCMP are organized into the following nine issues:

- Coastal Erosion and Flooding – Policies 1 – 5,
- Water Quality – Policies 6 – 11,
- Wetlands and Other Ecologically Sensitive Resources – Policies 12 – 15,
- Ports and Shoreline Development – Policies 16 – 20,
- Recreation and Cultural Resources – Policies 21 – 26,
- Fish and Wildlife Management – Policies 27 – 29,
- Environmental Quality – Policies 30 – 33,
- Energy and Mineral Resources – Policies 34 – 38, and
- Water Quantity – Policies 39 – 41.

[3] The OPSB Certificate Application is available at: http://dis.puc.state.oh.us/CaseRecord.aspx?CaseNo=16-1871.

A Coastal Zone Consistency Analysis was prepared to assess Project consistency with the OCMP (Appendix F). As per this analysis, the Project would comply with the 41 policies detailed in the OCMP. The Coastal Zone Consistency Analysis will be reviewed by the ODNR. A Section 404 Permit will not be issued until the proposed Project receives a Coastal Zone Management Federal consistency determination.

10.0 OTHER PERMITS AND APPROVALS

10.1 Ohio Permits and Approvals

10.1.1 Ohio Power Siting Board

The OPSB regulates the siting of wind farms with a generating capacity of 5 or more megawatts. The Applicant submitted an application to the OPSB for a Certificate to Construct a Wind-Powered Electric Generation Facility on February 1, 2017. On April 3, 2017, the OPSB determined that the Applicant must file Memoranda of Understanding between it and ODNR that laid out pre-, during, and post-construction monitoring protocol for aquatic resources/fisheries and birds/bats before a determination of completeness would be made. The MOUs were filed with the OPSB on July 20, 2017. On July 31, 2017, the OPSB issued its letter finding the Application was in compliance and that the Staff could begin its review. On August 15, 2017 the OPSB issued its entry setting forth its schedule for processing the permit application.

10.1.2 Section 401 Water Quality Certification

Section 401 of the federal Clean Water Act ("CWA") delegates state agencies the authority to evaluate projects that would result in the discharge of dredged or fill material into Waters of the United States to determine whether the discharge would violate the state's water quality standards. Activities typically requiring 401 Certification include stream rerouting, culverting streams, filling wetlands, and dredging and filling in lakes. Typical projects include highway construction, marina and dock construction, shopping mall construction, strip mining operations or housing subdivisions. A Section 401 Certification is also required for activities that require a Section 404 permit. In Ohio, water quality certifications are administered by the Ohio EPA. The Applicant has had several pre-application meetings with Ohio EPA staff. Upon receiving a jurisdictional determination letter and a USACE Public Notice indicating that a Section 404 Permit is required, the Applicant will submit a Section 401 Water Quality Certification ("WQC") Application to the Ohio EPA. The USACE Section 404 Permit will not be issued until a Section 401 Water Quality Certification has been issued by the Ohio EPA.

10.2 Other Federal Permits and Approvals

10.2.1 Section 408

Section 408 provides that the Secretary of the Army may grant permission to other entities for the permanent or temporary alteration or use of any USACE Civil Works project, upon the recommendation of the Chief of Engineers. The USACE has constructed many Civil Works projects across the Nation's landscape. Given the widespread location of these projects, with many embedded within communities, there may be a need for others outside of USACE to alter or occupy these projects and their associated lands. Reasons for alterations could include improvements or making repairs to the projects; relocation of part of the project; or installing utilities or other non-project features. USACE would ensure that any alteration proposed would not be injurious to the public interest and would not affect the USACE project's ability to meet its authorized purpose. USACE accomplishes this through the authority of Section 14 of the Rivers and Harbors Act of 1899, as amended, and codified in 33 USC 408 ("Section 408").

To address the HDD installation of the export cable beneath the Cleveland Harbor breakwater and navigation channel, the Applicant submitted a Section 408 Request to Alter, Impact or Encroach upon a Buffalo District Navigation Project on February 3, 2017. Correspondence with the USACE indicated that the approval letter will be sent to the Applicant by late August 2017.

10.2.2 Federal Aviation Administration

The Federal Aviation Administration ("FAA") is the organization in the U.S. government that is responsible for the evaluation and issuance of determination on petitions on objects that penetrate the nation's airspace. The FAA conducted aeronautical studies of the proposed turbine layout under the provisions of 49 USC 44718, applicable 14 CFR 77, and Ohio Revised Code ("ORC") Section 4561.32. The FAA can issue two types of determinations, one that identifies a hazard and another that identifies no hazard. Proposed structures over 200 feet must undergo an Obstruction Evaluation by the FAA and be permitted through a Form 7460-1 filing prior to construction. Form 7460-1 was submitted for the proposed Project on July 22, 2016. The FAA issued its determination of no hazard to air navigation if the structure is marked and/or lighted in accordance with the FAA Advisory circular 70/7460-1 L Change 1, *Obstruction Marking and Lighting* on February 22, 2017. Construction and operation of the proposed Project would be designed according to FAA standards and would not result in any adverse effects to the regional air transportation network.

Wind turbines have the potential to create clutter interference and possibly significant Doppler interference with sensitive radars fielded by the FAA, Department of Defense, NOAA, and other agencies. Written notification of the proposed Project was provided on August 11, 2016 to the National Telecommunications and Information Administration (“NTIA”) of the U.S. Department of Commerce (“DOC”), which the provides plans for the proposed Project to the federal agencies represented in the Indepartment Radio Advisory Committee (“IRAC”), including the Department of Defense, the Department of Education, the Department of Justice, and the FAA. The NTIA then identifies any potential Project-related concerns detected by the IRAC during the review period. A NTIA response received on October 13, 2016 identified a DOC concern regarding the proposed Project impacting its radar systems and the potential degradation of the detection of lake effect snow. Further consultation by the Applicant with DOC determined there would be minimal impacts to the radar (Appendix G). There were no concerns from any other IRAC agencies.

10.2.3 United States Coast Guard

A Private Aid to Navigation is a buoy, light, or daybeacon owned and maintained by any individual or organization other than the USCG. Private aids to navigation are designed to allow individuals or organizations to mark privately owned marine obstructions or other similar hazards to navigation, or to assist their own navigation operations. Approval for Private Aids to Navigation is regulated by USCG under Title 33 of the Code of Federal Regulations, Part 66 (33CFR66). Private aids to navigation are required to be maintained by the owner as stated on the USCG permit. The Applicant would apply for this after the NEPA process is complete and results in a Finding of No Significant Impact.

10.3 International Joint Commission

Many rivers and lakes flow along or across the border between Canada and the United States. The International Joint Commission (“IJC”) was established in 1909 by the Boundary Waters Treaty (“Treaty”) to help prevent and resolve disputes that may arise in these shared waters. The IJC acts as a quasi-judicial body by deciding whether certain types of projects (e.g., dams, diversions, or bridges) can be built or undertaken in rivers or lakes that flow along or across the international boundary. The IJC considers interests in both countries in accordance with the Treaty and may require that certain conditions in project design or operation be met to protect interests on either side of the boundary. If the IJC approves a project in response to an application, it issues an ‘Order of Approval.’ A request for approval under the Boundary Waters Treaty of 1909 was sent to the U.S. State Department on December 9, 2016. The U.S. State Department and Global Affairs Canada determined that the proposed Project would not require approval under the Boundary Waters Treaty and therefore would not require further action with the IJC.

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Summary: Response to the Second Set of Interrogatories from the Staff of the Ohio Power Siting Board electronically filed by Christine M.T. Pirik on behalf of Icebreaker Windpower Inc.