Ocean Wind
An Ørsted Initiative

Appendix R – Noise Supplementary Material

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Appendix R-1. Over-air Noise Supplementary Material

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Ocean Wind Offshore Wind Farm COP

1. Introduction

The Ocean Wind Offshore Wind Farm Project (Project) is an offshore wind farm near New Jersey. It will have a maximum of 98 wind turbine generators (WTGs). Additional key components include up to three offshore substations, array and interconnector cables between turbines and offshore substations, offshore export cables from substations to landfall, onshore export cables, and onshore substations. The Project will be installed during 2023 through 2024 and commissioned and operational in 2024. The purpose of this appendix is to identify noise regulations that are potentially applicable to the onshore construction and operation components of this Project, and to present results of a desktop analysis and literature review for applicable noise regulations, as well as airborne construction and operational noise.

2. Noise Regulations

2.1 Federal

There are no Federal limits enforced on noise from offshore wind farms or associated construction.

2.2 State

The State of New Jersey Administrative Code (N.J.A.C. 7:29) sets forth limits on continuous noise from industrial, commercial, or community service facilities as shown in Table 1 below. These limits could apply to operational noise from substations, but not to construction noise.

Table 1 - New Jersey limits on continuous noise from industrial, commercial, or community service facilities (N.J.A.C. 7:29).

Octave Band Center Frequency (Hz)	Limit measured at residential property line (dB)		Limit measured at industrial, commercial, or community service facility (dB)
	7:00 a.m. to 10:00 p.m.	10:00 p.m. to 7:00 a.m.	24 hours
31.5	96	86	96
63	82	71	82
125	74	61	74
250	67	53	67
500	63	48	63
1000	60	45	60
2000	57	42	57
4000	55	40	55
8000	53	38	53
dBA	65	50	65

Hz = hertz
dB = decibel
dBA = A-weighted decibel

The ordinance also does not allow for impulsive noise in excess of 80 dBA during the day and 50 dBA at night if the noise repeats more than four times in an hour. Impulsive noise is defined as noise that causes a distinct peak in sound levels with a duration less than one second, such as pile driving.

The ordinance does not set forth specific limits or conditions on construction noise or activities.

2.3 County

Construction would take place in Cape May, Atlantic, and Ocean counties. None of these counties has a noise ordinance.

2.4 Municipal

Construction would take place in the following municipalities: Ocean Township, Lacey Township, Berkeley Township, Upper Township, Ocean City, and Egg Harbor Township.

2.4.1 Ocean Township

The noise policy for the Ocean Township is in Chapter 245 of its Code of Ordinances. It sets forth limits on continuous noise defined in Table 2 below, which is a synthesis of table 1 and table 2 from Section 245-4.

The ordinance also states that construction and demolition activity, excluding emergency work, shall not be performed between the hours of 6:00 p.m. and 7:00 a.m. on weekdays, or between the hours of 6:00 p.m. and 9:00 a.m. on weekends and federal holidays, unless such activities can meet the limits set forth in the table above. All motorized equipment used in construction and demolition activity shall be operated with muffler. At all other times, the limits set forth do not apply to construction and demolition activities.

2.4.2 Lacey Township

Lacey Township's noise code is in Chapter 242 of its Code of Ordinances. The code does not include any quantitative noise limits. It does prohibit construction work or activities relating to construction work to occur between the hours of 10:00 p.m. and 7:00 a.m. of the following day on weekdays and 10:00 p.m. and 9:00 a.m. of the following day when the following day is a Saturday or Sunday, in such a manner as to cause a noise disturbance across a residential real property boundary or within a noise-sensitive zone. Lacey Township defines a noise disturbance as any noise which endangers or injures the safety or health of humans or animals or annoys or disturbs a reasonable person of normal sensitivities or endangers or injures personal or real property.

2.4.3 Berkeley Township

Berkeley Township's noise code is in Section 4-14 of its Municipal Code. The code does not include any quantitative noise limits. Regarding construction activities, the code states that operating or use of any pile driver, steam shovel, pneumatic hammer, derrick, steam or electric hoist or any tools or equipment which shall make any loud or disturbing noise on any weekday between the hours of 9:00 p.m. and 7:00 a.m. or on any weekend day or legal holiday between the hours of 8:00 p.m. and 9:00 a.m. in conducting any excavation, demolition, erection, alteration, repair or other building operation within 1,000 feet of any dwelling or business property, except in the case of urgent necessity in the interest of public safety and then only upon obtaining the consent of the proper authority of the Township or the Police Department of the Township, as the case may be, which permission must be renewed every three days.

Table 2 - Ocean Township limits on continuous noise.

	Residential property, or residential portion of multiuse property				Commercial facility, public service facility, nonresidential portion of multiuse property, or community service facility	Commercial facility*, or nonresidential portion of multiuse property
	OUTDOORS		INDOORS		OUTDOORS	INDOORS
Octave Band Center Frequency, Hz	Octave Band Sound Pressure Level, dB		Octave Band Sound Pressure Level, dB		Octave Band Sound Pressure Level, dB	Octave Band Sound Pressure Level dB
	7:00 a.m. - 10:00 p.m.	10:00 p.m. - 7:00 a.m.	7:00 a.m. - 10:00 p.m.	10:00 p.m. - 7:00 a.m.	24 hours	24 hours
31.5	96	86	86	76	96	86
63	82	71	72	61	82	72
125	74	61	64	51	74	64
250	67	53	57	43	67	57
500	63	48	53	38	63	53
1,000	60	45	50	35	60	50
2,000	57	42	47	32	57	47
4,000	55	40	45	30	55	45
8,000	53	38	43	28	53	43
dBA	65	50	55	40	65	55

*In those instances when commercial facility shares common wall/ceiling/floor with another commercial facility that is producing the sound.
Hz = hertz; dB = decibel, BA = A-weighted decibel

2.4.4 Upper Township

Upper Township does not have a quantitative noise policy.

2.4.5 Ocean City

Ocean City's noise policy is in Section 4-15 and 4-16 of its Code of Ordinances. The noise limits are identical to those set forth in N.J.A.C. 7:29. In addition, the ordinance forbids operating or permitting the operation of any tool or equipment used in exterior construction, drilling, earth moving, excavating, pile driving and demolition between the hours of 6:00 p.m. and 8:00 a.m., Monday through Friday, inclusive, and 5:00 p.m. to 8:00 a.m. on Saturday and any legal holiday.

2.4.6 Egg Harbor Township

Egg Harbor Township's noise ordinance is in Chapter 158 of its Township Code. Its limits on noise are identical to those found in Table 2 above. It also restricts the production of noise such that it would cause a 3 C-weighted decibel (dBC) increase within a residential building on weeknights between 10:00 pm and 7:00 am and weekend nights between 11:00 p.m. and 9:00 a.m., or a 6 dBC increase at any other time. The ordinance

also forbids construction activity to between the hours of 6:00 p.m. and 7:00 a.m. on all days unless the activities can meet the noise limits specified in Table 2 above. At other times, the above limits do not apply.

2.5 Construction Noise

Onshore construction activities will include substation construction, as well as open trench excavation and trenchless technologies such as horizontal directional drilling (HDD) or direct pipe for cable installation. Typical noise levels and usage data for common construction equipment are given in Table 3.

Table 3 - Noise levels of typical construction equipment.

Equipment Description	Impact Device?	Acoustical Usage Factor (%)	Spec. 721.560 L_{max} at 50 feet (dBA, slow)	Actual Measured L_{max} at 50 feet (dBA, slow) (Samples Averaged)
All Other Equipment > 5 horsepower (hp)	No	50	85	N/A
Auger Drill Rig	No	20	85	84
Backhoe	No	40	80	78
Bar Bender	No	20	80	N/A
Blasting	Yes	N/A	94	N/A
Boring Jack Power Unit	No	50	80	83
Chain Saw	No	20	85	84
Clam Shovel (dropping)	Yes	20	93	87
Compactor (ground)	No	20	80	83
Compressor (air)	No	40	80	78
Concrete Batch Plant	No	15	83	N/A
Concrete Mixer Truck	No	40	85	79
Concrete Pump Truck	No	20	82	81
Concrete Saw	No	20	90	90
Crane	No	16	85	81
Dozer	No	40	85	82
Drill Rig Truck	No	20	84	79
Drum Mixer	No	50	80	80
Dump Truck	No	40	84	76
Excavator	No	40	85	81
Flat Bed Truck	No	40	84	74
Front End Loader	No	40	80	79
Generator	No	50	82	81
Generator (<25 KVA Variable Message Signs)	No	50	70	73
Gradall	No	40	85	83
Grader	No	40	85	N/A
Grapple (on backhoe)	No	40	85	87
Horizontal Boring Hydraulic Jack	No	25	80	82
Hydra Break Ram	Yes	10	90	N/A

Equipment Description	Impact Device?	Acoustical Usage Factor (%)	Spec. 721.560 L_{max} at 50 feet (dBA, slow)	Actual Measured L_{max} at 50 feet (dBA, slow) (Samples Averaged)
Impact Pile Driver	Yes	20	95	101
Jackhammer	Yes	20	85	89
Man Lift	No	20	85	75
Mounted Impact Hammer (hoe ram)	Yes	20	90	90
Pavement Scarifier	No	20	85	90
Paver	No	50	85	77
Pickup Truck	No	40	55	75
Pneumatic Tools	No	50	85	85
Pumps	No	50	77	81
Refrigerator Unit	No	100	82	73
Rivet Buster/Chipping Gun	Yes	20	85	79
Rock Drill	No	20	85	81
Roller	No	20	85	80
Sand Blasting (single nozzle)	No	20	85	96
Scraper	No	40	85	84
Sheers (on backhoe)	No	40	85	96
Slurry Plant	No	100	78	78
Slurry Trenching Machine	No	50	82	80
Soil Mix Drill Rig	No	50	80	N/A
Tractor	No	40	84	N/A
Vacuum Excavator (Vac-Truck)	No	40	85	85
Vacuum Street Sweeper	No	10	80	82
Ventilation Fan	No	100	85	79
Vibrating Hopper	No	50	85	87
Vibratory Concrete Mixer	No	20	80	80
Vibratory Pile Driver	No	20	95	101
Warning Horn	No	5	85	83
Welder/Torch	No	40	73	74

Source: Federal Highway Administration (FHWA), 2017
Spec. 721.560 gives FHWA-specified noise limits for construction equipment.
L_{max} = maximum sound pressure level
dBA = A-weighted decibel
KVA = kilovolt-amps

In order to minimize impacts, all onshore construction activities will follow the restrictions on noise levels and operating times within each jurisdiction. Other strategies for reducing noise may include limiting idling time, ensuring that all equipment is outfitted with mufflers that meet or exceed original equipment manufacturer specifications, or erecting temporary noise barriers where needed.

Offshore construction activities that would generate airborne noise would include pile driving and increased vessel traffic. Airborne noise monitoring was conducted during active construction periods at the Block Island Wind Farm Project to observe and measure levels of airborne noise produced during installation of the wind turbine foundations (HDR 2018). Noise levels were measured at onshore and offshore locations. Noise during piling was always audible at the closest coastal measurement station (3.1 miles [mi] from piling), intermittently audible at a mid-point coastal location (7 mi from piling), and was never audible at the furthest location (17 mi from piling). At the closest station (3 mi from piling), measured noise levels were more than 10 decibels (dB) above background noise levels. Overwater, the piling noise was barely audible at 7 miles downwind. Of all construction-related sources of noise, pile driving generates the highest level (HDR 2018); therefore; the noise generated by other sources would be expected to emit substantially lower levels. As the proposed Project will be built 15 miles offshore, noise effects to recreation and tourism from offshore construction noise will be temporary and negligible.

2.6 Operational Noise

During operation of the Project, the only source of airborne noise will be the turbines, and to a lesser degree the substations. Turbine noise originates from the gearbox, as well as turbulent noise from the blades. The turbines will be located approximately 15 miles offshore, and are not expected to produce sound in excess of background levels at any onshore locations.

Ocean Wind will coordinate with State and local agencies during Project permitting. Substation noise will be within the limits specified in the permit conditions.

3. Literature Cited

Federal Highway Administration. Construction Noise Handbook. Chapter 9. Updated 8/24/2017. https://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm.

HDR. 2018. Field Observations during Wind Turbine Foundation Installation at the Block Island Wind Farm, Rhode Island. Final Report to the U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs. OCS Study BOEM 2018-029. 175 pp.

Minerals Management Service (MMS). 2008. Cape Wind Energy Project Nantucket Sound Biological Assessment (Appendix G). In MMS January 2009 Cape Wind Energy Project Final EIS. p. 296.

Appendix R-2. Underwater Noise Supplementary Material

This evaluation will be submitted in the Supplemental COP per the departure schedule.