Sunrise Wind Farm Project

Appendix I2
Onshore Acoustic Assessment

Prepared for:

Sunrise Wind | Powered by Ørsted & Eversource

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Onshore Acoustic Assessment

Sunrise Wind Farm Project

Prepared for: Sunrise Wind LLC

Prepared by: Exponent Engineering P.C.

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Acronyms and Abbreviations

ANSI	American National Standards Institute
AHU	Air handling unit
ASA	Acoustical Society of America
BMP	Best Management Practice
BTS	Bureau of Transportation Statistics
C	Commercial
dB	Decibel
dBA	A-weighted decibel
DC	Direct current
EPA	US Environmental Protection Agency
EM&CP	Environmental Management and Construction Plan
Eversource	Eversource Investment LLC
FHWA	Federal Highway Administration
ft	Feet
FTA	Federal Transit Administration
HAB	Horizontal auger boring
HDD	Horizontal directional drill
HVAC	Heating, ventilation, and air conditioning
I	Industrial
ICW	Intercoastal Waterway
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Organization for Standardization
kHz	Kilohertz
km	Kilometer
LIE	Long Island Expressway
LIPA	Long Island Power Authority
LIRR	Long Island Railroad
L_{10}	Sound level that is exceeded 10 percent of the measurement period
L_{50}	Sound level that is exceeded 50 percent of the measurement period
L_{90}	Sound level that is exceeded 90 percent of the measurement period
L_{A}	A-weighted continuous equivalent sound pressure level (sound level)
L_{Amax}	Maximum sound level over the measurement period
L_{ANS}	Natural sound weighted continuous equivalent sound pressure level
L_{eq}	Continuous equivalent sound pressure level
L_{dn}	Day-night average sound pressure level
L_{W}	Sound power level
mi	Mile
MPH	Miles per hour
MVAr	Megavolt ampere reactive
OCS	Outer Continental Shelf
OnCS–DC	Onshore converter station–direct current
OREC	Offshore Wind Renewable Energy Certificate
NA	Not Applicable
NEMA	National Electrical Manufacturers Association
NYCRR	New York Codes, Rules and Regulations
nm	Nautical Miles
NPS	National Park Service
NSR	Noise sensitive receptor
NYCRR	New York Codes, Rules and Regulations
NYS	New York State
NYPA	New York Power Authority
NYSERDA	New York State Energy Research and Development Authority
NYSDEC	New York State Department of Environmental Conservation
NYSDPS	New York State Department of Public Service
Orsted NA	Orsted North America Inc.
PDE	Project design envelope

PL	Property Line
Project	Sunrise Wind Farm Project
R	Residential
RCNM	Roadway Construction Noise Model
ROW	Right of way
SCP	Suffolk County Parks
SRWEC	Sunrise Wind Export Cable
SRWEC–NYS	Sunrise Wind Export Cable in NYS waters
Sunrise Wind	Sunrise Wind LLC
TC	Trenchless crossing
TJB	Transition joint bay
UA	Union Avenue

Executive Summary

Sunrise Wind LLC (Sunrise Wind or the Applicant), a 50/50 joint venture between Orsted North America Inc. (Orsted) and Eversource Investment LLC (Eversource) proposes to construct, own, and operate the Sunrise Wind Farm Project (the Project). This Onshore Acoustic Assessment presents an evaluation of the potential impacts from noise associated with construction and operation of the onshore components of the Project. An overview of the construction and operation associated with the onshore components of the Project and the applicable federal, state, and local regulations is included. The methods used to identify noise sensitive receptors (NSR) and conduct a survey of existing acoustic conditions are summarized. The potential impacts from noise associated with onshore components of the Project are assessed. As warranted, strategies for mitigation to comply with applicable regulations are evaluated and best management practices (BMP) to diminish noise impacts to the community are recommended. The approach for construction noise mitigation will be formalized in the Environmental Management and Construction Plan (EM&CP), which will be reviewed and approved by the New York Public Service Commission under Article VII of the New York Public Service Law.

Noise impacts have been evaluated according to New York State Department of Public Service Article VII, Siting of Major Utility Transmission Facilities, of the New York State Public Service Law, and applicable federal, state, and local regulations. Guidance established by the US Environmental Protection Agency (EPA) regarding chronic exposure to pervasive noise has been applied to operational noise from the Project. Policy from the New York State Department of Environmental Conservation (NYSDEC) provides guidance on the evaluation of noise impacts and applies to all onshore facilities and construction activities associated with the Project. The Suffolk County Code, Chapter 618, applies to noise from construction of the Project's Onshore Transmission Cable in County parks and along County roadways. The Town of Brookhaven's Town Code, Chapter 50, applies to both long-term operation of Project facilities and short-term construction activities associated with the Project. All applicable regulatory thresholds are described by the A-weighted equivalent continuous sound pressure level in decibels (dBA).

NSRs in the vicinity of the proposed Onshore Converter Station (OnCS–DC), the Onshore Transmission Cable route, the Onshore Interconnection Cable route, the horizontal directional drills (HDD) associated with the Landfall and the Intracoastal Waterway (ICW) crossings, and other trenchless crossing (TC) locations included nearby residences, public lands, commercial properties, and industrial properties. Existing ambient conditions at NSRs were assessed using analytical methods and the results of a field survey. Unattended long-term monitoring at two locations and short-term attended monitoring at nine locations in the vicinity of Project sites was conducted from September 23 to September 26, 2020. Existing ambient conditions at NSRs were estimated to range from 45 to 65 dBA during the day and from 35 to 64 dBA at night. Existing conditions were measured to exceed one or more regulatory thresholds at NSRs associated with construction and operation.

The construction of the OnCS–DC will result in a temporary increase in noise levels near the construction site. Noise from OnCS–DC construction at the Union Avenue Site will not exceed permissible sound level limits. Construction at the Union Avenue Site will generate noise of approximately 58 dBA at the property line of the nearest residence and lower levels at all other NSRs located in residential areas. At the closest industrial property, construction at the Union Avenue Site will generate noise of approximately 73 dBA. BMPs will be implemented to reduce noise in non-residential areas per NYSDEC policy.

HDD will be used to connect the Sunrise Wind Export Cable (SRWEC) to the Onshore Transmission Cable at Landfall and for the Onshore Transmission Cable to cross the ICW. In addition, HDD or horizontal auger boring (HAB) construction is anticipated at four TC locations along the Onshore Transmission Cable route and one TC location along the Onshore Interconnection Cable route. The primary noise generating construction phases at HDD and HAB sites are site preparation and drilling operations. Construction activities associated with site

preparation at HDD and HAB sites will generate noise of approximately 84 dBA at a distance of 50 feet (ft) (15 meters [m]) after implementing noise control strategies. Permissible noise limits are not expected to be exceeded at the Landfall HDD, the ICW HDD, or TC location along the Onshore Interconnection Cable route since the specified controls are anticipated to keep noise at NSRs within permissible limits. Construction noise from site preparation will exceed the permissible limit at nearby NSRs for all TC locations along the Onshore Transmission Cable route, and BMPs will be implemented to further reduce noise at NSRs. Since the activities associated with site preparation are anticipated to be of relatively short duration and limited to the daytime, site preparation is not expected to cause an adverse impact.

Drilling operations at HDD and HAB sites will require continuous operation over several weeks or months and associated equipment is also expected to run overnight. Mitigative measures are warranted at the Landfall HDD, the ICW HDD, and all HAB and HDD sites along the Onshore Transmission Cable route to attenuate construction noise from drilling operations below permissible noise limits. After implementing feasible noise controls, construction activity at the TCs of Sunrise Highway at Revilo Avenue and Carmans River at Victory Avenue are expected to exceed the permissible sound level as specified by NYSDEC or Suffolk County at one or more NSRs. Drilling operations at all other sites will comply with all applicable regulations. The expected increases in ambient sound levels at NSRs necessitates that BMPs be implemented to further diminish noise from drilling operations at the ICW HDD and most TC locations per NYSDEC policy. Since these construction activities are anticipated to be of relatively short duration and mitigation measures applied as necessary, drilling operations are not expected to cause an adverse impact.

Construction activities associated with installation of the Onshore Transmission Cable and Onshore Interconnection Cable, excluding construction at TC locations, will generate noise that exceeds the NYSDEC permissible sound level limit of 65 dBA at distances of less than 550 ft (168 m). Given the proximity of residences adjacent to the roads along the Onshore Transmission Cable route, the permissible sound level is expected to be exceeded at NSRs. Construction of the Onshore Interconnection Cable is also expected to exceed the NYSDEC noise limits at NSRs adjacent to the proposed routes. Therefore, BMPs will be implemented to minimize noise impacts from construction of the Onshore Transmission Cable and Onshore Interconnection Cable. Since construction of the Onshore Transmission Cable and Onshore Interconnection Cable are anticipated to be of relatively short duration and the majority of the work is anticipated to occur during daytime hours, this construction is not expected to cause adverse impacts. In some areas, construction along the route may be required to occur at night to mitigate traffic impacts, which would conflict with the Town of Brookhaven and Suffolk County noise codes.

Long-term operation of the OnCS–DC will introduce several new noise sources including transformers, reactors, filters, and the heating, ventilation, and air-conditioning equipment associated with cooling of electrical components. This study demonstrates that OnCS–DC operation at the Union Avenue Site will not result in an adverse noise impact. The predicted sound level due to operational noise from an OnCS–DC complies with all applicable criteria as specified by the EPA, NYSDEC, and the Town of Brookhaven regulations. At NSRs in residential areas, existing conditions exceed the nighttime permissible sound level limits for operational noise per the Town of Brookhaven code, and noise mitigation has been specified to avoid increasing the total sound level at these NSRs per NYSDEC policy. For an OnCS–DC at the Union Avenue Site, the converter reactors, converter water cooling, power line carrier filter bank, and the radio interference filter bank will be installed with lower sound ratings. The Project sound level at the closest residence, approximately 900 ft (275 m) away from the property line, will be 41 dBA, which will result in an increase of 0 dBA in the total sound level relative to existing conditions. As the OnCS–DC design advances, specific electrical components will be identified that have specifications meeting the assumptions used in this Onshore Acoustic Assessment such that operational noise from the facility will be consistent with the results presented herein. Alternatively, this assessment could be continued if additional data describing the proposed Project warrant subsequent analysis. Refinement may include a reevaluation of operation noise and whether additional mitigative measures would be necessary.

The designs of the onshore components of the Project will allow them to comply with all applicable federal, state, and local regulations and are not expected to result in noise impacts during operation. The Project is expected, however, to request a waiver of the regulations contained in both the Suffolk County Code (§618-5[B][3]) and the Town of Brookhaven's Town Code (§50-6 [C][7]) to perform certain construction activities. During the decommissioning phase of the Project, all activities are anticipated to be similar to or less than those expected during construction and are not separately addressed in this Onshore Acoustic Assessment.

This revision of the Onshore Acoustic Assessment has been updated to account for changes to the project design envelope including construction along the Onshore Transmission Cable and Onshore Interconnection Cable routes as well as construction and operation of the OnCS–DC.

Note that this Executive Summary does not contain all of Exponent Engineering P.C.'s technical evaluations, analyses, conclusions, and recommendations. Hence, the main body of this report is at all times the controlling document.

1.0 Introduction

1.1 Project Background and Description

Sunrise Wind LLC (Sunrise Wind or the Applicant), a 50/50 joint venture between Orsted North America Inc. (Orsted NA) and Eversource Investment LLC (Eversource), proposes to construct, own, and operate the Sunrise Wind New York Cable Project (the Project). Sunrise Wind executed a 25-year Offshore Wind Renewable Energy Certificate (OREC) contract related to the Project with the New York State Energy Research and Development Authority (NYSERDA) in October 2019. The Project will deliver power from the Sunrise Wind Farm (SRWF), located in federal waters on the Outer Continental Shelf (OCS), to the existing electrical grid in New York State (NYS). The Project includes offshore and onshore components within NYS that are subject to Public Service Law Article VII review and will interconnect at the existing Holbrook Substation, which is owned and operated by the Long Island Power Authority (LIPA).

Specifically, power from the SRWF will be delivered to the existing mainland electric grid via distinct transmission cable segments: the submarine segment of the export cable (SRWEC) in NYS waters (SRWEC-NYS), the terrestrial underground segment of the transmission cable (Onshore Transmission Cable), the new Onshore Converter Station (OnCS–DC), and the underground segment of the interconnection cable (Onshore Interconnection Cable). The Onshore Transmission Cable, the OnCS–DC, and Onshore Interconnection Cable are all located in the Town of Brookhaven, Suffolk County, New York.

The Project will use direct current (DC) technology to transmit power to shore and will be comprised of the following onshore infrastructure located entirely in the Town of Brookhaven:

- Onshore Transmission Cable, and associated transition joint bay (TJB);
- Fiber optic cable co-located with the Onshore Transmission and Onshore Interconnection Cables;
- Onshore Converter Station (OnCS–DC); and
- Onshore Interconnection Cable.

The Onshore Transmission Cable and Onshore Interconnection Cable will likely involve trenchless crossing (TC) installation technologies including a horizontal directional drill (HDD) at several locations.

1.2 Project Design Envelope

A reasonable range of Project designs are being considered to allow for assessments of proposed activities and the flexibility to make development decisions prior to construction. The Project Design Envelope (PDE) involves several scenarios with potential noise impacts that are associated with onshore construction activities and operation of the OnCS–DC. This Onshore Acoustic Assessment for the Project considers the information available at this time; the precise locations, noise sources, schedule of construction, and operation scenarios may be subject to change as the engineering design progresses.

The Onshore Transmission Cable will be constructed to deliver power from the SRWEC to the OnCS–DC, while the Onshore Interconnection Cable will convey power from the OnCS–DC to the existing Holbrook Substation. For installation of the Onshore Transmission Cable, the Project will utilize TC technologies to avoid sensitive environmental resources and other physical obstructions. Two types of TC technology are anticipated along the Onshore Transmission Cable route. These include HDD and horizontal auger boring (HAB). Construction of the Onshore Transmission Cable will originate at the TJB in Smith Point County Park. The Onshore Transmission Cable will then be routed across the Intracoastal Waterway (ICW) via the ICW HDD to a paved parking lot within Smith Point Marina. Smith Point County Park and Smith Point Marina are collectively referred to as Suffolk County Parks (SCP).

In addition to the construction at the Landfall HDD and the ICW HDD, five TCs along the Onshore Transmission Cable and Onshore Interconnection Cable routes have been evaluated. It is anticipated that HDD technology will be used for the TCs at Sunrise Highway and Carmans River. HAB will be used for shorter TCs of the Long Island Expressway (LIE) and the Long Island Railroad (LIRR) at specified roadways. HAB and HDD are expected to require continuous operation with some equipment expected to run overnight.

Power from the Project will be transmitted to shore using DC technology and delivered to the electric grid via an OnCS–DC to be constructed in the Town of Brookhaven, NY. Construction and operation of an OnCS–DC at one location, the Union Avenue Site, in the vicinity of the existing Holbrook Substation has been evaluated as part of the PDE.

In total, 11 onshore acoustic scenarios were evaluated to assess the potential noise impacts associated with construction of the OnCS–DC, construction of the Onshore Transmission Cable, construction of the Onshore Interconnection Cable, and operation of the OnCS–DC. The scenarios, jointly defined by location and activity, are summarized in Table 1. Figure 1 presents an overview map of the possible HDD construction sites, TC locations, Onshore Transmission Cable routes, Onshore Interconnection Cable routes, and location of the OnCS–DC that were considered within the PDE.

Table 1. Onshore acoustic scenarios.

Category	Scenario Description
Construction and operation of the OnCS–DC	OnCS–DC construction at the Union Avenue Site
	OnCS–DC operation at the Union Avenue Site
Construction at SCPs	Landfall HDD construction at Smith Point County Park
	ICW HDD construction at Smith Point Marina
Construction at TCs	HAB construction at the LIRR and Church Road (TC1)
	HDD construction at Sunrise Highway and Revilo Avenue (TC2)
	HDD construction at Carmans River and Victory Avenue (TC3)
	HAB construction at the LIRR and Manor Road (TC4)
	HAB construction at the LIE (TC5)
Construction along onshore cable routes	Onshore Transmission Cable construction
	Onshore Interconnection Cable construction

1.3 Acoustic Concepts and Terminology

Acoustics is the science of mechanical waves in gases, liquids, and solids, including its production, transmission, and effects. The human ear is sensitive to variations in air pressure that are perceived as sound. Noise is generally defined as unwanted sound and exposure to noise at high levels has been associated with negative physiological and psychological outcomes.

Sound pressure levels are measured on a relative logarithmic scale where 0 decibels (dB) represents the threshold of human hearing at 1 kilohertz (kHz) (20 micropascals). The instantaneous sound pressure level varies over time and the average and maximum values are often of interest. The equivalent continuous sound pressure level (L_{eq}) is a metric that represents the average magnitude of sound over time as a single number; it is the level of constant pressure that results in the same total sound energy as the actual time-varying sound during the same time period. L_{eq} is often calculated at the resolution of 1 second or 1 hour.

The perceived loudness of sound varies with frequency as well as with sound pressure, and sound pressure level measurements are often adjusted according to a weighted scale. The A-weighting scale was designed to approximate the subjective response of the ear at low sound amplitudes. Most noise measurements and regulatory thresholds are described by the A-weighted equivalent continuous sound pressure level (the sound level, or L_A) measured in dBA. Note that changes in the sound level do not proportionately translate to changes in apparent loudness. A change in 3 dBA is just perceptible, whereas a change of 5 dBA is clearly noticeable. A change of 10 dBA is often described as a doubling of loudness, although this rule of thumb only holds under certain circumstances.

Ambient sound is the all-encompassing sound associated with a given environment and is usually a composite of sound from many sources and many directions, near and far, including any specific sources of interest. Numerous metrics have been devised to describe ambient sound conditions and the variation of the short-term sound level over much longer periods. Percentile levels indicate the short-term sound level exceeded over a longer period, such as 1 hour. The L_{50} is the sound level exceeded 50 percent of the measurement period (the median sound level) and often is used to summarize inconsistent conditions. Similarly, the L_{10} and the L_{90} are the sound levels exceeded 10 percent and 90 percent of the measurement period, respectively; large differences between these metrics may be indicative of transient events. The L_A can be averaged over a particular period, such as the daytime hours from 7:00 AM to 10:00 PM (the daytime sound level, or day L_A) and the nighttime hours from 10:00 PM to 7:00 AM (the nighttime sound level, or night L_A). The day-night average sound level (L_{dn}) is the annual average sound level over 24 hours with an additional 10 dBA added to nighttime hours. In quiet, natural and residential areas, high-frequency sounds such as measurement equipment's electrical noise, wind-induced sounds, and sound from insects or birds can make large contributions to A-weighted sound pressure levels. However, these sounds do not typically have the capacity to mask, or inhibit perception of, noise sources. In addition to A-weighting, the ANS-weighted sound level (natural sound level or L_{ANS}) is an effective way to characterize conditions (ANSI 2014a). The natural sound level is the standard A-weighted sound level filtered to exclude sounds above the 1 kHz octave band. This weighting can be used to characterize sound levels in natural and quiet residential areas with respect to noise from transportation, construction, and industrial sources.

For reference, Table 2 presents qualitative examples of sounds and corresponding sound levels (Norton 2003). The examples in Table 2 merely illustrate typical sound levels; the actual received sound level in any given situation depends on the sound power level (L_W) of the particular source, the distance from the source, and many other factors that affect acoustic propagation between the source and receiver.

Table 2. Qualitative examples of sound levels.

L_A (dBA)	Qualitative scale
140	Threshold of pain
120	Jet take-off at 200 ft
110	Car horn at 3 ft
100	Shouting into an ear
90	Heavy truck at 50 ft
80	Pneumatic drill at 50 ft
70	Highway traffic at 50 ft
60	Room air conditioner at 20 ft
50	Normal conversation at 10 ft
40	Wind at 11 mi per hour
30	Soft whisper at 10 ft
0	Threshold of hearing

2.0 Regulatory Framework

Potential noise impacts associated with construction and operation of onshore components of the Project have been evaluated according to Article VII, Siting of Major Utility Transmission Facilities, of the New York State Public Service Law (16 NYCRR §86.5, Exhibit 4: environmental impact). This section describes the federal, state, and local noise regulations applicable to onshore components of the Project. Policies and ordinances issued by regulatory agencies specify criteria with which the onshore components of the Project must comply, including permissible noise limits. Table 3 summarizes the agencies, their jurisdictions, and the corresponding noise standards applicable to the Project.

Table 3. Summary of applicable noise regulations.

Agency	Jurisdiction	Policy
Environmental Protection Agency	Federal	Information on the Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety
NY State Department of Environmental Conservation	New York State	Assessing and Mitigating Noise Impacts
Suffolk County	County property	Suffolk County Noise Ordinance (Chapter 618 of the Suffolk County Code)
Town of Brookhaven	Town of Brookhaven	Town of Brookhaven Noise Ordinance (Chapter 50 of the Brookhaven Town Code)

2.1 Environmental Protection Agency

The Noise Control Act of 1972 authorized federal agencies to address sources of noise, including motor vehicles, machinery, and other commercial products, that may endanger the health and welfare of the nation's population. The act authorized the US Environmental Protection Agency (EPA) to issue noise emission regulations for noise sources and the EPA published sound levels of noise that were requisite to protect public health under the act (USEPA 1974). These levels were issued to provide guidelines for state and local governments in setting standards. The primary responsibility of regulating noise has since been delegated to state and local governments, but the Noise Control Act of 1972 and the Quiet Communities Act of 1978 remain in effect today.

To protect public health and welfare regarding interference with outdoor activity, speech intelligibility, and annoyance, the EPA specified a day-night average sound level of 55 dBA for residential areas. The EPA noise guidelines are based on chronic exposure to pervasive noise over a long period. Therefore, these guidelines are not typically applied to short-term activities, such as construction activities. As such, the EPA noise guidelines are only considered in regard to the operational noise from the OnCS-DC at noise sensitive receptors (NSR) in residential areas.

2.2 New York State

The New York State Department of Environmental Conservation (NYSDEC) policy provides guidance on the evaluation of noise, identification of when noise levels may cause a significant environmental impact, and methods for noise impact avoidance and reduction (NYSDEC 2001). The NYSDEC policy addresses noise thresholds and mitigation for both the construction and operation phases of a proposed project. Construction activities are short-term relative to operational noise and the potential impacts are assessed separately.

The NYSDEC guidance recommends that the potential for noise impacts initially be determined by a preliminary noise assessment that considers all construction and operation activities of the project. If this assessment and the subsequent impact analysis indicates that sound levels at NSRs will be "… similar to or only slightly elevated as compared to ambient conditions," no further evaluation is required. When there is an indication that "… marginal or significant noise impact may occur," a detailed noise analysis is required that includes a more comprehensive consideration of acoustic propagation, factors such as land use, and whether or not the introduction of the noise will be "considered annoying or obtrusive." If analyses indicate that a significant noise impact may occur, NYSDEC policy requires implementation of mitigation, such as reducing noise at the source or installing noise barriers, to avoid or diminish the noise effects to permissible levels. Best management practices (BMP) should also be considered to reduce noise by means of modifying noise-generating equipment, limiting the time of noisy operations, or relocating noise sources farther away from NSRs.

The NYSDEC policy includes guidance to assess noise impacts and determine the need for mitigation. The noise thresholds are based on the increase in the sound level from the existing level, which necessitates evaluation of pre-construction ambient (baseline) conditions. As described by NYSDEC's policy, an increase in sound level "… ranging from 0-3 dB should have no appreciable effect on receptors" and does not require mitigation. An increase of greater than 3 dB has the potential for adverse impact and may require mitigation depending on the NSRs present. Mitigation is generally needed in residential areas if a long-term increase greater that 6 dB is anticipated. An increase of 10 dB deserves consideration of avoidance and mitigation measures in most cases, including short-term construction noise at residential properties.

The addition of any noise source should not raise the ambient sound level above 65 dBA in a residential setting, or above 79 dBA in an industrial or commercial area according to NYSDEC policy. If existing conditions exceed the threshold, the total sound level considering contributions from existing sources and expected noise sources should not exceed existing conditions. It is recommended that mitigative measures and BMPs be used to minimize the effects of construction noise if analyses show that an ambient sound level of 65 dBA may be exceeded in a residential, commercial, or industrial area.

2.3 Suffolk County

The Suffolk County Code, Chapter 618, limits the level of noise produced on County-owned properties (Suffolk 1999). It applies to sources of sound located on property owned by Suffolk County, including within the limits of the right-of-way (ROW) of any County highway. Noise from construction of the Project's Onshore Transmission Cable in County parks and along County roadways falls under Suffolk County jurisdiction.

The Suffolk County noise code specifies a maximum permissible sound level that depends on the time of day and receiving property category. The maximum permissible sound level includes both the noise emitted from the Project as well as the existing sound level. The sound level limits are 65 dBA at residential property boundaries between the hours of 7:00 AM and 10:00 PM, 50 dBA at residential properties between the hours of 10:00 PM and 7:00 AM, 65 dBA at commercial properties (all times), and 70 dBA at industrial properties (all times). The code does not specify limits for receivers on County property, and residential property limits are assumed to apply.

Noise from construction activities is exempt from the permissible limits between 7:00 AM and 6:00 PM on weekdays. Noise from construction activities must meet the permissible limits specified above between the hours of 6:00 PM and 7:00 AM on weekdays, and any time on weekends or legal holidays.

2.4 Town of Brookhaven

The Town of Brookhaven's Town Code, Chapter 50, prohibits excessive noise that may jeopardize the health, welfare, or safety of the citizens or degrade the quality of life (Brookhaven 1987). This local noise code applies to sound originating from sources located within the Town of Brookhaven limits and applies to long-term operation and short-term construction activities associated with the Project. The ordinance specifies a maximum permissible sound level that depends on the receiving property category and time of day. The maximum permissible sound level includes both the noise emitted from the Project as well as the existing sound level and is evaluated at or within the property line of the receiving property.

To maintain compliance with the Town of Brookhaven Noise Control ordinance, long-term operation of the Project facilities would be limited to generating a sound level of 65 dBA at residential properties between the hours of 7:00 AM and 10:00 PM, 50 dBA at residential properties between the hours of 10:00 PM and 7:00 AM, 65 dBA at commercial properties (all times), and 75 dBA at industrial properties (all times). Noise from construction activities is exempt from the noise limits between 7:00 AM and 6:00 PM on weekdays. Construction activities are prohibited between the hours of 6:00 PM and 7:00 AM on weekdays, and any time on weekends or legal holidays.

3.0 Methodology

This section describes the methods for conducting noise impact assessments and the assumptions regarding the onshore noise-generating components of the Project. A noise impact assessment was conducted for each onshore acoustic scenario defined in Revised Table 1. In general, conservative assumptions of design parameters have been made to evaluate the greatest potential impact. Compliance of the proposed Project was evaluated in regard to applicable noise regulations for each scenario and strategies for mitigation were evaluated as warranted. The potential impacts from noise associated with onshore construction activities and operation of an OnCS–DC were evaluated in multiple stages which include:

- identifying NSRs;
- characterizing the existing ambient sound environment;
- predicting noise emissions from Project construction and operation;
- assessing potential impacts of noise generated by the construction and operation of the Project; and
- evaluating the need for noise mitigation or BMPs.

The assumptions used to predict noise exposure at NSRs are presented below including the expected activities, noise sources, and emissions associated with construction and operation of the onshore components of the Project.

3.1 Existing Ambient Conditions

A comprehensive sound survey that establishes existing ambient conditions is necessary to assess the potential impacts of introducing new sources of noise. The existing (i.e., baseline or pre-construction) ambient conditions can be compared to the expected noise generated by the Project to calculate the change in sound levels and total sound levels at each NSR. In addition, existing conditions may affect the context in which noise from the Project is assessed.

Several NSRs have been identified in proximity to the proposed onshore Project components. In most cases, the closest residential properties were the most important NSRs and additional NSRs (e.g., hospitals, hotels, and other commercial or industrial properties) were identified as necessary. Georeferenced data describing land use, property lines, and the location of potential NSRs such as public schools have been obtained from Suffolk County (Suffolk 2016). The selection of appropriate survey locations is critical for establishing accurate estimates of existing ambient conditions. Most survey locations were at a corresponding NSR location. Existing ambient conditions at NSRs in some areas were based on a measurement at a representative location nearby. For example, the ambient conditions at two neighboring parcels in a residential community may be essentially equivalent if there are no major noise sources nearby.

For the most precise assessment of existing noise and conclusions concerning potential noise impact, measurements are widely recommended (ANSI 2018; FTA 2018; NYSDEC 2001). Measurements require significant resources, however, and are often rendered impractical for a variety of reasons. Alternatively, analytical methods have been developed for estimating the long-term ambient sound pressure levels. Such methods are generally considered to be less accurate but acceptable in the absence of better data for general noise assessments and situations involving short-term activity, particularly in locations where roadways or railroads are the dominant source of ambient noise (ANSI 2018; FTA 2018). Alternative methods may even be more accurate than field survey measurements in some areas where extended measurement durations are required, such as near large airports and in natural areas, due to the strong influence of weather conditions and other factors that introduce significant variability into field survey measurement data.

Given the spatial diversity of Project activities, a hybrid approach has been used that relied on several methods to estimate the existing sound level depending on the location of and specific conditions at each NSR. Existing ambient conditions have been assessed using field measurement data at most sites including: the Union Avenue Site; the Landfall HDD and ICW HDD; and the five TC locations. Analytical methods have been used to estimate existing conditions along the remainder of the Onshore Transmission Cable and Onshore Interconnection Cable routes.

3.1.1 Analytical Estimates of Existing Conditions

Ambient sound levels often represent the cumulative contributions of numerous sound sources. While physical modeling of acoustic propagation is a mature science, the data and computational resources required typically limit this approach to estimate noise from a few strong sources in small urban areas such as roadways, railroads, and aircraft. Guidance from the Federal Transit Administration (FTA) describes a method to estimate a neighborhood's existing noise exposure based on proximity to nearby major roadways or railroads (FTA 2018). For NSRs in proximity to major roadways along the Onshore Transmission Cable and the Onshore Interconnection Cable routes, the existing sound level was estimated according to FTA guidelines. The type and distance to the roadway was used to determine the daytime and nighttime sound level for each NSR. These levels conservatively underestimate existing conditions to account for the reduced precision compared to field measurements.

In areas near major airports, published aircraft noise contours are recommended to estimate the existing noise exposure. Data describing airport noise contours and road noise were acquired from the National Transportation Noise Map, compiled by the Bureau of Transportation Statistics (BTS), a division of the US Department of Transportation (BTS 2017). Relative to other sources, airport noise did not make a significant contribution at any of the NSR locations associated with the Project. BTS data were also used to verify assumptions of the FTA roadway type. Train operations are intermittent whereas Project noise is expected to be continuous. For NSRs near the LIRR, estimates were based on field data as appropriate to avoid underestimating any potential noise impacts.

In communities far from major sources of transportation noise, contributions from numerous sources and the emergence of patterns in field measurements have suggested a statistical approach to modeling ambient sound levels. A 1974 report by the EPA determined a relationship between population density and L_{dn} (USEPA

1974). This relationship has been an accepted method of estimating community noise exposure in the absence of noise measurements for decades and has since been incorporated into standard procedures (ANSI 2018). More recently, the EPA relationship was re-analyzed with additional empirical data that confirmed its applicability and updated the relationship with a correction factor to improve its accuracy (Schomer 2011). In areas away from airports, railroad tracks, and major roadways, analytical estimates of community noise were estimated based on population density. The onshore activities and facilities of the Project will be located entirely within the Town of Brookhaven, NY. The 2018 population density for the Town of Brookhaven is 1,860 persons per square mile (Suffolk 2019). This yields an L_{dn} of 52 dBA based on the updated relationship for community noise. Guidance from American National Standards Institute/Acoustical Society of America (ANSI/ASA) standards was used to estimate the expected daytime and nighttime levels from the L_{dn} (ANSI 2018).

3.1.2 Field Measurements of Existing Conditions

A field survey of ambient existing conditions onshore was performed in general accordance with ANSI/ASA standards (ANSI 2004; ANSI 2005; ANSI 2018). These standards describe recommended procedures for measurement of environmental sound for environmental assessment as well as other purposes such as noise prediction, validation, and regulation. The survey protocol also conformed to existing noise regulations and ordinances as specified by the NYSDEC (NYSDEC 2001), the relevant local communities, and other authorities as described in the Regulatory Framework section above.

NYSDEC policy requires measurements when there is concern that analytical estimates are not of sufficient accuracy. Short-term attended monitoring was used to characterize existing conditions at NSRs near sites of temporary construction activities. Short-term survey locations were sampled to characterize ambient conditions for 30 minutes or longer during both daytime and nighttime periods. Long-term measurements using continuous unattended monitoring were conducted at sites where greater accuracy was required and access was available. At sites where long-term operational noise sources are expected (i.e., the OnCS–DC), measurements were conducted over 24 hours of the day to quantify the range of existing ambient conditions during both the daytime and nighttime periods. Unattended long-term measurements were also collected in Smith Point County Park due to the prevalence of natural sources of sound and expected duration of construction activities at the Landfall HDD and ICW HDD. The quietest ambient conditions usually occur during the night or early morning hours, but can occur at other times, especially in non-urban environments. At minimum, each long-term measurement occurred over at least two days to assess the variability in environmental sound levels over multiple days.

Measurements of ambient conditions were collected with sound level meters certified to have Class 1 accuracy (ANSI 2014b). A-weighted and one-third octave band sound pressure levels were measured. Sound pressure level data were logged continuously at 1-second resolution allowing for review of acceptable conditions and statistical metrics, such as percentile and continuous equivalent sound pressure levels, to be calculated as necessary. During visits to each survey location, observations of the local weather, terrain, and prominent sound sources were recorded. Unattended long-term monitoring also included collection of high-resolution continuous audio to aid in identification of the specific sources present and interpretation of recorded data. Spurious data from anomalous events that are not representative of baseline conditions were discarded. Meteorological data were also collected on site during all measurements.

3.2 Predictive Noise Modeling

Analyses of the scenarios described in Section 1.2 were conducted to calculate the noise radiated from sources associated with the construction and operation of the Project. The results of predictive noise modeling provide the spatial distribution of the expected sound levels from proposed activities and mitigation, including sound levels at NSR locations. NSRs were evaluated at the location on each parcel with the highest Project sound level.

3.2.1 SoundPLAN

Detailed predictive noise analyses take into account numerous factors that affect acoustic propagation. These factors include the sound power level and location of noise sources, meteorological conditions, ground cover, terrain, and intervening objects such as walls and buildings. The Project scenarios were analyzed with SoundPLAN acoustic modeling software. SoundPLAN is a standards-based software providing industrial noise calculations in accordance with all known international standards, including the International Organization for Standardization (ISO) 9613 standard for sound propagation outdoors (ISO 1996). The ISO 9613 standard describes an analytical method of calculating the attenuation of sound propagation outdoors that accounts for numerous physical effects. The results are often conservative, in part because it assumes meteorological conditions favorable to propagation such as moderate downwind conditions or a temperature inversion.

Assumptions used to assess the Project scenarios include the location, height above ground, size, and sound power level of each noise source. The schedule of activity including duration and time of day were also considered for construction scenarios. Data describing the topographic detail of local terrain was acquired from the Cornell University Geospatial Information Repository at 30-foot (ft) (9-meter [m]) resolution (CUGIR 1995). Ground type such as water, grass, paved, or gravel was inferred from satellite imagery or Project facility layouts as applicable, and absorption coefficients were specified accordingly. A maximum ground factor of 0.5 was specified for the model of operational noise. The interaction between structures (e.g., houses) and propagating sound was accounted for assuming a reflection loss of 1 dB, whereas a reflection loss of 4 dB was specified for noise barriers. Data describing building locations and dimensions were obtained from Open Street Map (OSM 2020) and Project facility layouts. Parameters describing weather conditions were set to annual average conditions for Long Island (temperature of 52.0 degrees Fahrenheit [11 degrees Celsius] and 63 percent relative humidity). Assuming wintertime defoliate conditions, no losses were accounted for due to vegetation intervening with noise propagation. The heights of all NSRs were specified at 5 ft (1.5 m) above ground level.

3.2.2 Roadway Construction Noise Model

The Federal Highway Administration's (FHWA) Roadway Construction Noise Model (RCNM) is a national model for the prediction of construction noise (FHWA 2006). The RCNM was originally developed in support of the Central Artery/Tunnel in Boston, Massachusetts, the largest urban construction project conducted in the United States at the time. As part of that project, a construction equipment noise database was compiled that includes noise emission data and acoustical usage factors for commonly used equipment. In addition to manufacturer data, the RCNM database was used to obtain information regarding the equipment associated with all of the construction noise scenarios.

The noise levels resulting from Project construction activities will vary depending on factors such as the operations performed, environmental conditions, specific equipment model, and condition of the equipment. RCNM provides a standard method for assessing construction noise consistent with federal guidelines. The RCNM database includes usage factors and maximum sound levels for construction equipment. The usage factor is the fraction of time that a given piece of construction equipment is operating at full power during a construction operation. The equivalent continuous sound level of construction equipment is obtained by modifying the maximum sound level by the usage factor. When available, FHWA measured sound levels from the RCNM database were used in RCNM assessments, as opposed to data sourced from manufacturer specifications.

Construction activities will introduce temporary noise that varies depending on the phase of construction and the particular onshore acoustic scenario. All equipment of a given phase of construction was assumed to be operating simultaneously and the total noise was modeled using RCNM assumptions. Construction equipment will often consist of both stationary equipment (e.g., pumps and generators), mobile equipment (e.g., loaders and jackhammers) that is expected to move around the construction site, and equipment that moves to and from the site and laydown area (e.g., trucks). Per FTA guidance, equipment was assumed to operate at the center of the construction site footprint. At HDD and HAB sites, construction equipment was positioned at the center of the entry or exit pit location, as appropriate.

3.3 Construction Noise

3.3.1 OnCS–DC Construction

The phases of OnCS–DC construction generally consist of site preparation, construction of foundations and buildings, installation of equipment, and finishing. Site preparation consists of minimal clearing, excavation, and grading. Foundation work includes construction of reinforced concrete foundations for structures such as the control building, transformers, reactors, and switchgear. Installation includes construction of all underground electrical conduits and drainage systems as well as above-ground structures. The primary equipment typically used to accomplish the phases of OnCS–DC construction has been identified and alternative equipment that produces less noise may be used to accomplish the phases of OnCS-DC construction. It has been assumed that work on construction phases may occur concurrently and all construction noise sources were assumed to be operating simultaneously. The primary noise generating equipment anticipated for construction of the OnCS–DC is summarized in Table 4.

Table 4. OnCS–DC construction equipment and noise emissions.

Equipment	Utilization Factor, %	L_{Amax} at 50 ft, dBA	Time
Backhoe	40	77.6	Day
Crane	16	80.6	Day
Front End Loader	40	79.1	Day
Generator	50	80.6	Day
Excavator	40	80.7	Day
Dump Truck	40	76.5	Day
Dozer	40	81.7	Day
Grader	40	85.0	Day
Chipper	74	89.7	Day

Construction of the OnCS-DC is expected to take approximately 2 years. Construction activities are expected to occur primarily during the daytime. Limited construction activity utilizing a small subset of equipment may occur at night, and nighttime construction activities have not been separately evaluated.

3.3.2 Onshore Cable Route Construction

Construction activities associated with installation of the Onshore Transmission Cable and Onshore Interconnection Cable will generate temporary sources of noise. The Onshore Transmission Cable route extends from the Landfall and ICW HDDs at Smith Point County Park and Smith Point Marina to the OnCS–DC and is up to 17.5 mi (28 km) long as shown in Figure 1. Two potential routes for the Onshore Interconnection Cable are currently under consideration from the OnCS–DC to the existing Holbrook Substation. Similar construction activities would be used regardless of the final route selected. The majority of the Onshore

Transmission Cable and Onshore Interconnection Cable will be installed within the ROW of public roads and thus no overhead transmission infrastructure was evaluated.

Construction of an underground transmission cable generally involves removing pavement, trenching, and laying pipe, constructing the duct bank and vaults, installing and testing cable, and site restoration. Representative noise-generating construction equipment anticipated for the various phases of construction along the onshore route is summarized in Table 5. Work on construction phases may occur simultaneously to minimize interference with traffic, and all sources were assumed to be operating simultaneously.

Table 5. Onshore cable route construction equipment and noise emissions.

Equipment	Utilization Factor, %	L_{Amax} at 50 ft, dBA	Time
Generator	50	80.6	Day
Concrete Saw	20	89.6	Day
Backhoe	40	77.6	Day
Dump Truck	40	76.5	Day
Welder / Torch	40	74.0	Day
Crane	16	80.6	Day
Concrete Truck	20	81.4	Day
Roller	20	80.0	Day
Paver	50	77.2	Day

Construction of the onshore cables is expected to take approximately 2 years. Installation will progress along the cable route during this time such that exposure to construction noise at any particular location along the route will be of relatively short duration. Excluding construction activities at TCs, construction activities are expected to occur primarily during the daytime along the route. Night work may be required in some locations to alleviate disruptions to traffic and has not been separately evaluated.

3.3.3 Construction at HDD and HAB sites

Several construction sites that involve drilling operations are anticipated along the Onshore Transmission Cable and Onshore Interconnection Cable routes. Construction at the Landfall HDD is expected to occur over 5 months and construction at the ICW HDD is expected to occur over 7 months, and construction is planned to occur outside of the summer season. The construction phases at HDD and HAB sites include site preparation, drilling operations including cable installation, and restoration.

Construction activities for site preparation are anticipated at all HAB and HDD sites prior to drilling operations. Site preparation will include offloading equipment, excavating pits on either side of a crossing, and shoring. Shoring involves the installation of a temporary sheet pile anchor wall adjacent to the drilling rig to provide stability while conducting drilling activities. In addition to the anchor wall, the workspace may also require the installation of other temporary sheet piles to aid in anchoring the rig and to provide soil stabilization of the excavated area.

The phase of construction with the greatest potential for noise impacts will be the drilling operations. HDD operations are anticipated at Landfall, at the ICW, at the TC of Sunrise Highway at Revilo Avenue, and at the TC of Carmans River at Victory Avenue. At the Landfall HDD and ICW HDD, the preferred entry area has been considered and noise from proposed fallback areas will be similar. HAB technology will be used for shorter crossings of the LIRR at Church Road and Manor Road and at the LIE along the Onshore Interconnection Cable route as indicated in Table 1. Microtunneling may be used at TC2 instead of HDD. Microtunneling is a trenchless construction method that uses equipment similar to HAB.

Construction sites for drilling operations consist of an entry side and exit side, and varying construction equipment and activities are at each location. The majority of equipment, including the drilling rig, is typically located at the entry side of the construction site. The noise associated with the exit side operations is generally lower than the noise generated at the entry side. Potential entry and exit locations for the TC locations along the onshore route have been selected assuming one circuit will be installed that will require a 48-inch casing. HAB sites assume that the casing will be at least 10 ft (3 m) below grade to clear other utilities. HDD sites assume that the casing will be 40 ft (12 m) below grade to provide no less than 20 ft (6 m) of cover while crossing the waterway. The exit side of the Landfall HDD is located approximately 0.9 mi (1.5 km) offshore. Noise from the exit side of the Landfall HDD is unlikely to significantly influence the acoustic environment onshore and is not included in this Onshore Acoustic Assessment.

Noise levels from drilling operations are dependent on the equipment used. The length of crossing, bore diameter, and ground conditions influence the type and power of the equipment required. HAB sites will require a machine that can accommodate a 48-inch casing and has sufficient power. At HDD sites, installation of a 48-inch casing will likely require a large, modular HDD rig with a trailer-mounted carriage, engine-driven hydraulic power unit, control skid, and anchorage components. The modular HDD rig is also operated in conjunction with a mud mixing/cleaning system, high volume pump, fluid and mud tanks, equipment for managing pipe, and other ancillary equipment to facilitate operations. It was assumed that a large HDD rig will be required at the Landfall HDD and the ICW HDD, whereas a typical HDD rig will be required at the TC of Sunrise Highway at Revilo Avenue and at the TC of Carmans River at Victory Avenue. Expected sound power levels for suitable diesel powered HAB rigs were obtained from manufacturer data. Octave-band power levels for HDD operations were obtained from analyses of empirical data from construction sites around the United States (Burge 2009).

Drilling operations proceed through multiple stages, some of which require uninterrupted operation until complete. Since the overall operation can span multiple days, nighttime operation for this activity is expected. Construction involving the HAB and HDD equipment is assumed to occur 24 hours a day, whereas typical construction activities such as pipe assembly are expected to be limited to daytime hours. Specifically, the noise sources that operate during both day and night include the HAB or HDD rig, mud pump, and generator. The equipment that operates during the daytime varies between the entry side and exit side. The noise sources associated with the HDD entry side are the drilling rig, pumps, electric generators, crane, loaders, dump trucks, trailer trucks, and welders. The noise sources associated with the exit side include pumps, electric generators, crane, and backhoe. Representative noise-generating construction equipment anticipated at HDD and HAB sites is summarized in Table 6. Excluding the drilling rigs, sound levels and usage factors of construction equipment were acquired from RCNM.

Table 6. HDD and HAB construction equipment noise sources and operations.

Activity	Equipment	Utilization Factor, %	L_{Amax} at 50 ft, dBA	Time
Site Preparation	Generator	50	80.6	Day
	Crane	16	80.6	Day
	Impact Pile Driver	20	101.3	Day
	Excavator	40	80.7	Day
	Dump truck	40	76.5	Day
	Flat Bed Truck	40	74.3	Day
	Jackhammer	20	88.9	Day
Drilling Operations (entry side)	HAB Rig	100	75.0	Day and Night
	HDD Rig, large	100	86.3	Day and Night

Table 6. HDD and HAB construction equipment noise sources and operations.

Activity	Equipment	Utilization Factor, %	L_{Amax} at 50 ft, dBA	Time
	HDD Rig, typical	100	74.3	Day and Night
	Pumps	50	80.9	Day and Night
	Generator	50	80.6	Day and Night
	Crane	16	80.6	Day
	Dump Truck	40	76.5	Day
	Flat Bed Truck	40	74.3	Day
	Front End Loader	40	79.1	Day
Drilling Operations (exit side)	Pumps	50	80.9	Day and Night
	Generator	50	80.6	Day and Night
	Crane	16	80.6	Day
	Backhoe	40	77.6	Day
	Welder / Torch	40	74.0	Day

After drilling operations are completed, all work areas and temporary laydown yards will be graded, backfilled, and returned to pre-construction conditions in accordance with landowner requests and permit requirements. Noise from this phase will be limited to typical construction activities associated with equipment such as tracked graders, backhoes, and trucks, and is not separately addressed in this Onshore Acoustic Assessment.

3.4 Operational Noise

The OnCS–DC is the only evaluated onshore Project component that will generate noise during operation. There is no long-term operational noise associated with the Onshore Transmission Cable or the Onshore Interconnection Cable. Operational noise from the OnCS–DC at the Union Avenue Site was considered. A preliminary design describing the components and layout of an OnCS–DC has been completed. The final layout will depend on local environmental conditions and may vary based on subsequent engineering design. Design drawings describing the layout of equipment and buildings were directly imported into the geographic information system and SoundPLAN modeling software.

The most prominent noise sources of an OnCS–DC are the converter transformers, DC equipment, reactors, filters, and outdoor heating, ventilation, and air conditioning (HVAC) equipment. The significant noise producing equipment inside the converter hall are the DC converter modules and auxiliary systems for cooling, piping, and HVAC. The primary noise generating components of the OnCS–DC and corresponding quantity, and unweighted and A-weighted overall sound power levels are summarized in Table 7. The octave band sound power levels of the OnCS–DC components are shown in Table 8. The information in Table 7 and Table 8 are based upon preliminary data supplied by the manufacturer. Quantity indicates the number of units active during maximum operation at the corresponding sound power level. All other components not in these tables were assumed to be negligible for the onshore acoustic assessment. Noise sources such as corona sources, switching devices, and generators are transient, insulated within buildings, reserved for use during rare emergency situations only, or otherwise do not typically make significant contributions to the overall equivalent continuous sound level.

Table 7. OnCS–DC components, quantity, and overall sound power levels.

Component	Quantity	Overall L_W	
		A-weighted, dBA	Unweighted, dB
Main Transformers	3	98	111
Transformer Coolers	3	86	93
Converter Reactor	6	82	98
Converter Water Cooling	1	92	100
Converter Hall, Structure	1	91	112
Converter Hall, Ventilation	4	78	86
Converter Hall, AHU	2	85	102
Control Building, HVAC	2	80	93
Control Building, Fan	8	78	84
Control Building, Gate	1	75	79
Spare Building, Fan	2	77	84
Auxiliary Transformers	2	75	95
Power Line Carrier Filter Bank	1	80	82
Radio Interference Filter Bank	1	80	89
Alternating Current Filter Bank	1	91	90

Table 8. Octave band sound power levels of the OnCS–DC components.

Component	Octave Band L_W, dB								
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Main Transformer	81	76	111	95	97	83	62	52	41
Transformer Cooler	84	81	87	87	86	81	70	63	62
Converter Reactor	80	96	93	81	81	72	61	55	48
Converter Water Cooling	94	87	94	93	89	86	84	79	75
Converter Hall, Structure	108	109	99	95	89	74	62	54	48
Converter Hall, Ventilation	77	82	76	77	79	70	62	54	49
Converter Hall, AHU	101	90	94	89	83	76	66	63	60
Control Building, HVAC	91	84	80	81	77	76	71	65	54
Control Building, Fan	81	69	67	77	72	74	70	65	60
Control Building, Gate	71	67	72	72	72	71	64	60	55
Spare Building, Fan	77	77	77	74	73	70	70	68	63
Auxiliary Transformers	82	93	90	71	58	53	51	50	50
Power Line Carrier Filter Bank	73	73	73	72	73	73	73	73	73
Radio Interference Filter Bank	72	71	88	75	76	71	71	71	71
Alternating Current Filter Bank	30	40	40	50	70	82	87	85	60

Predictive models assumed simultaneous operation of the transformers and other prominent OnCS–DC components under maximum operating conditions and operational noise was assumed to be constant over 24 hours of the day. Sound power levels have been estimated for the main transformers at maximum operating and site conditions with forced external cooling (ONAF2) based on the currently available data and design.

Transformer specifications corresponding to reduced power operating conditions with cooling by natural convection or forced circulation (ONAN and ONAF1) are not available at this time. The general dimensions of a main transformer, including the tank, are: 31 ft (9.4 m) high, 13 ft (4 m) wide, and 16 ft (4.8 m) long. An octave band spectrum was assumed for the Alternating Current Filter Bank that agrees with the overall weighted and unweighted sound levels provided by the manufacturer. The data in Table 7 and Table 8 for the converter reactors, converter water cooling, converter hall air handling unit (AHU), power line carrier filter bank, and the radio interference filter bank are indicative of adjustments for quieter equipment by design. The noise reductions associated with mitigation of these components are summarized in Table 9.

Table 9. Noise reductions associated with mitigation of OnCS–DC components.

Component	Overall L_W, dBA
Converter Reactor	3
Converter Water Cooling	3
Converter Hall, AHU	5
Power Line Carrier Filter Bank	5
Radio Interference Filter Bank	5

National Electrical Manufacturers Association (NEMA) standards establish ratings to designate the maximum noise level radiated from electrical components, and it is anticipated that components installed as part of the Project will conform to relevant Institute of Electrical and Electronics Engineers (IEEE) and NEMA standards. At this time, elements of the OnCS–DC design including specific equipment models have not been specified and the corresponding NEMA ratings are not available.

As the OnCS–DC design advances, it is expected that specific electrical components will be identified that have specifications meeting the assumptions used in this Onshore Acoustic Assessment such that operational noise from the OnCS–DC will be consistent with the results presented herein. Alternatively, this noise study may be refined based on additional data describing the proposed Project; potential refinement of this study could include a reevaluation of operational OnCS–DC noise and whether additional mitigative measures may be necessary.

4.0 Existing Conditions

This section presents the results of the field survey of existing ambient conditions, locations of NSRs, and the existing conditions at NSRs used to assess potential noise impacts.

4.1 Field Survey Results

A field survey of ambient existing conditions was conducted at 11 locations according to the methods described in Section 3.1.2. Unattended long-term monitoring was conducted at two survey locations (SL-1 and SL-2) and short-term attended monitoring was conducted at nine survey locations (SS-3 to SS-11) from September 23 to September 26, 2020. Given the potential for 24-hour activity (operation and/or construction) at Project sites, both day (7:00 AM to 6:00 PM) and night (10:00 PM to 7:00 AM) conditions were assessed at short-term survey locations. The locations of the field survey measurements appear in Figure 4, Figure 5, and Figure 6 through Figure 10.

Pertinent observations and details of the equipment, measurements, survey sites, and conditions prevailing during the survey were recorded. The survey was conducted with Larson Davis Model 831 sound level meters and PCB 377C20 random incidence microphones. Laboratory calibration certificates are provided in Appendix A. Instruments were field calibrated before and after each measurement with a Larson Davis CAL200 Acoustic Calibrator. Per ANSI standards, the microphone was mounted on a tripod at a height of approximately 5 ft (1.5 m) and positioned to minimize the influence of large reflecting surfaces and nearby noise sources such as roadways.

The local wind velocity, air temperature, relative humidity, and precipitation was measured on site with a Vaisala WXT-536 Weather Sensor. The weather during the survey provided conditions suitable for environmental sound measurements. In general, atmospheric conditions were calm with partly cloudy skies during the day and overcast skies at night. There was no precipitation during the survey period. The average wind speed was 1 mi per hour (MPH) (0.4 m per second [m/s]) with a maximum of 5 MPH (2 m/s) during the daytime measurements. The air temperature ranged from 54 degrees Fahrenheit (12 degrees Celsius) at night to 78 degrees Fahrenheit (26 degrees Celsius) during the day, and the average relative humidity was 73 percent.

The existing sound levels (L_{ANS}) at survey locations ranged between 45 to 65 dBA during the day and 35 to 64 dBA at night. L_{ANS} was used to characterize existing conditions at NSRs due to the significant influence of insects, birds, leaf rustle, and other natural sources of sound on the A-weighted sound level measurements during the field survey. Use of L_{ANS} circumvents the distortion of measurement data by high frequency natural sounds on L_A while having a minimal effect when these sounds are not present (ANSI 2014a). Table 10 presents a summary of the existing ambient conditions during day and night periods at survey locations described by A-weighted and ANS-weighted equivalent continuous levels as well as A-weighted percentile levels. Additional field survey data including one-third octave band spectra and hourly history of the measurements from unattended long-term survey locations are presented in Figure 2 and Figure 3.

Table 10. Field survey measurements of existing ambient conditions.

Survey Site	Survey Location	Time period	L_A, dBA	L_{ANS}, dBA	L_{A10}, dBA	L_{A50}, dBA	L_{A90}, dBA	L_{ANS90}, dBA
SL-1	Smith Point County Park	Day	52	50	51	47	46	40
		Night	50	44	50	48	45	41
SL-2	607 Union Avenue	Day	57	56	59	55	52	52
		Night	58	52	58	57	55	47
SS-3	36 Peters Drive	Day	55	45	57	54	53	38
		Night	59	35	60	59	58	33
SS-4	87 Northern Boulevard	Day	56	56	58	52	50	49
		Night	56	50	56	55	54	43
SS-5	North of Smith Road and Montauk Highway	Day	63	61	64	61	58	57
		Night	52	50	55	48	45	40
SS-6	39 Yaphank Avenue	Day	68	65	69	67	66	63
		Night	65	63	67	64	61	60
SS-7	55 Yaphank Avenue	Day	60	59	63	58	55	54
		Night	49	48	52	46	43	38
SS-8	748 Long Island Avenue	Day	56	55	57	55	53	53
		Night	58	58	61	57	54	52
SS-9	78 Avenue C	Day	59	57	58	56	54	53
		Night	61	61	63	61	60	60
SS-10	199 Morris Avenue	Day	54	52	55	50	48	47

Table 10. Field survey measurements of existing ambient conditions.

Survey Site	Survey Location	Time period	L_A, dBA	L_{ANS}, dBA	L_{A10}, dBA	L_{A50}, dBA	L_{A90}, dBA	L_{ANS90}, dBA
		Night	65	64	67	64	60	60
SS-11	152 Fairfield Drive East	Day	61	60	66	57	53	49
		Night	57	54	56	53	52	46

4.2 Union Avenue Site

The OnCS–DC is proposed to be located near the existing Holbrook Substation on the south side of Union Avenue in the Town of Brookhaven. This 7-acre site is bound to the north by Union Avenue directly across from the Long Island Power Authority Power Generation Facility; to the east by commercial development; to the south by the LIRR; and to the west by commercial and industrial development. The Union Avenue Site is currently used as a base of operations for a large paving and industrial site work company. Land zoned as utilities or transportation was categorized as industrial in regard to the applicable regulations. Figure 4 shows the locations of field survey measurements, NSRs, and other features in the vicinity of the proposed OnCS–DC site at the Union Avenue Site.

The NSR locations in the vicinity of the Union Avenue Site and the existing sound levels at these locations are summarized in Table 11. The most critically impacted portion of each external property line (PL) of the facility site (e.g., non-participating boundary lines) also were evaluated as NSRs and included in the table. The closest residential NSRs to the Union Avenue Site are properties located to the south on Fairfield Drive East. The closest residential property line is approximately 1,300 ft (396 m) distant from the center of the Union Avenue Site. The closest distance between a Union Avenue Site property line and a residential property line is approximately 886 ft (270 m) and corresponds to UA-10.

Table 11. NSRs in the vicinity of the Union Avenue Site and existing conditions.

NSR	NSR Location	Category	Survey Location	Day L_{ANS}, dBA	Night L_{ANS}, dBA
UA-1	140 Morris Avenue	Residential	SS-9	57	61
UA-2	191 Morris Avenue	Residential	SL-2	56	52
UA-3	193 Morris Avenue	Residential	SL-2	56	52
UA-4	195 Morris Avenue	Residential	SL-2	56	52
UA-5	197 Morris Avenue	Residential	SL-2	56	52
UA-6	199 Morris Avenue	Residential	SL-2	56	52
UA-7	647 Union Avenue	Residential	SL-2	56	52
UA-8	2 Lindsey Place	Residential	SS-11	60	54
UA-9	201 Fairfield Drive East	Residential	SS-11	60	54
UA-10	202 Fairfield Drive East	Residential	SS-11	60	54
UA-11	152 Fairfield Drive East	Residential	SS-11	60	54
UA-12	23 Trail Blazer Court	Residential	SL-2	56	52
UA-13	35 Jenna Court	Residential	SL-2	56	52
UA-14	568 Union Avenue	Residential	SL-2	56	52
UA-15	586 Union Avenue (PL West)	Industrial	SL-2	56	52
UA-16	614 Union Avenue (PL East)	Industrial	SL-2	56	52
UA-17	607 Union Avenue	Industrial	SL-2	56	52

Table 11. NSRs in the vicinity of the Union Avenue Site and existing conditions.

NSR	NSR Location	Category	Survey Location	Day L_{ANS}, dBA	Night L_{ANS}, dBA
UA-18	555 Furrows Road	Industrial	SL-2	56	52
UA-19	PL North	NA	SL-2	56	52
UA-20	PL South	NA	SL-2	56	52
UA-21	11 Claremont Avenue	Commercial	SL-2	56	52

Field measurements of existing ambient conditions were conducted at four survey locations near the Union Avenue Site. Existing ambient conditions at survey locations were influenced by typical community noise sources such as road traffic. Other prominent sources of sound at survey locations were insects, birds, leaf rustle, and noise from nearby industrial facilities. Existing ambient conditions at NSRs were associated with representative survey measurements as shown in Table 11. Existing conditions exceeded the nighttime permissible sound level limits for operational noise per the Town of Brookhaven noise code and the day-night average sound level as specified by the EPA at NSRs in residential areas.

4.3 Suffolk County Parks

Landfall HDD construction is anticipated to occur within the paved parking lot at Smith Point County Park on Fire Island. The ICW HDD will route the Onshore Transmission Cable across the ICW from the entry site located at the paved parking lot within Smith Point Marina to the exit site located at the west end of Smith Point County Park. Both SCPs are managed by Suffolk County and are zoned as Preserved Recreation and Open Space. Note that the entry side of TC3 (HDD construction at Carmans River and Victory Avenue) is located in South Haven County Park and this construction is addressed in the section describing the TC locations below.

Figure 5 shows the locations of field survey measurements and seven NSRs in the vicinity of the Landfall HDD and ICW HDD construction sites. The Smith Point County Park campground is approximately 890 ft (271 m) east of the center of the Landfall HDD construction site. The western boundary of Smith Point County Park is shared with Fire Island National Seashore, which is managed by the National Park Service (NPS). This adjacent section of Fire Island is federally designated wilderness (Otis Pike Fire Island High Dune Wilderness). Several NSRs were identified in proximity to the entry site of the ICW HDD at the closest property line of nearby residences; the closest NSR was approximately 900 ft (274 m) away.

The NSR locations in the vicinity of SCPs and the existing sound levels at these locations are summarized in Table 12. Field measurements of existing ambient conditions were conducted at two survey locations near the Landfall HDD and ICW HDD construction sites. Existing ambient conditions at survey locations were influenced by typical community noise sources such as road traffic. Other prominent sources of sound at survey locations were insects, birds, ocean surf, watercraft, and general aviation. Existing ambient conditions at NSRs were associated with representative survey measurements as shown in Table 12.

Table 12. NSRs in the vicinity of SCPs and existing conditions.

NSR	NSR Location	Category	Survey Location	Day L_{ANS}, dBA	Night L_{ANS}, dBA
SCP-1	Smith Point County Park, campground	Natural	SL-1	50	44
SCP-2	Smith Point County Park, at NPS boundary	Natural	SL-1	50	44
SCP-3	36 Peters Drive	Residential	SS-3	45	35
SCP-4	100 Lombardy Drive	Residential	SL-1	50	44

Table 12. NSRs in the vicinity of SCPs and existing conditions.

NSR	NSR Location	Category	Survey Location	Day L_{ANS}, dBA	Night L_{ANS}, dBA
SCP-5	55 William Floyd Parkway	Residential	SL-1	50	44
SCP-6	8 Bay Fair Drive	Residential	SL-1	50	44
SCP-7	14 Huntington Drive	Residential	SS-3	45	35

4.4 Onshore Cable Routes

The Onshore Transmission Cable route extends from the TJB at the Landfall HDD to the OnCS–DC through the Town of Brookhaven. The most critical NSRs are the residential properties that directly abut the Onshore Transmission Cable route. The existing sound level at most NSRs was estimated to be 50 dBA during the day and 44 dBA during the night per methods for predicting community noise described in Section 3.1.1.

There are two major roadways within close proximity to the Onshore Transmission Cable route, and existing conditions at nearby NSRs are expected to vary with proximity to the roadway. The LIE was categorized as an 'interstate highway' by the FTA method. The closest NSRs are approximately 135 ft (41 m) from the property line to the geometric mean of the LIE and existing sound levels were estimated to be 65 dBA during the day. NYS Route 27 (Sunrise Highway) was categorized as an 'other roadway' according to the FTA method. The closest NSR is approximately 220 ft (67 m) from the property line to the geometric mean of this roadway and existing ambient sound levels were estimated to be 55 dBA during the day.

The NYSDEC policy specifies a sound level limit of 65 dBA for construction noise in residential areas. If existing ambient sound levels exceed this limit, the policy is to not exceed existing conditions. Excluding activity at TC locations, the same noise sources will be involved in installing the Onshore Transmission Cable along the route. Therefore, while the existing noise level varies with location along the Onshore Transmission Cable route, the construction activities must satisfy the same noise limits along the entire route. Because existing ambient sound levels at residential areas along the Onshore Transmission Cable route were estimated to not exceed 65 dB, the daytime construction noise limit is 65 dBA per NYSDEC policy.

The Onshore Interconnection Cable route is expected to proceed along Union Avenue, traverse land zoned as utilities, and cross the LIE. Union Avenue is a neighborhood street that is not classified as a major roadway. Existing conditions at NSRs are expected to vary with proximity to the LIE. The closest NSRs are approximately 200 ft (61 m) from the property line to the geometric mean of the LIE and existing sound levels were estimated to be 65 dBA during the day by the FTA method. Therefore, the permissible sound limit for construction along the Onshore Interconnection Cable route is identical to the Onshore Transmission Cable route. The expectation is that existing sound levels do not exceed 65 dBA during the daytime at residential NSRs and the daytime construction noise limit is 65 dBA per NYSDEC policy.

4.5 Trenchless Crossings

Construction using TC technologies (HAB and HDD) is anticipated along the Onshore Transmission Cable and Onshore Interconnection Cable routes at locations where the routes cross the LIRR, Carmans River, and specific roads as identified in Table 1. In total, 78 NSRs were identified at the five TC locations. At each TC, the most critical NSRs were identified based on land use and the expected locations of the drilling operation entry and exit pits. Most nearby properties are zoned as residential, although commercial, industrial, open space, and federally-managed natural areas are also in close proximity to construction sites at some TCs. Land zoned as institutional was categorized as commercial in regard to the applicable regulations. The entry side of TC3

(HDD construction at Carmans River and Victory Avenue) is located in South Haven County Park. The locations of most NSRs were conservatively identified at the property line nearest to the construction site as appropriate.

The NSR locations in proximity to TCs and estimated existing ambient levels at these locations are summarized in Table 13. Field measurements were conducted at one or more survey locations representative of conditions near each TC. The locations of NSRs and field survey measurements in the vicinity of TC1 through TC5 are shown in Figure 6 through Figure 10, respectively. Existing ambient conditions at survey locations were strongly influenced by typical community noise sources such as road traffic. Other prominent sources of sound at survey locations were insects, birds, and landscaping equipment. Noise from the LIRR was not present during the short-term measurements. Existing ambient conditions at most NSRs were associated with representative survey measurements as shown in Table 13. The distance from Sunrise Highway was used to identify the corresponding survey locations for NSRs associated with TC2 and TC3. Several NSRs associated with TC5 along the Onshore Interconnection Cable route are in close proximity to the LIE and the existing conditions at these NSRs were estimated by the FTA method as indicated in Table 13.

Existing conditions exceeded the nighttime permissible sound level limits for construction noise per the Suffolk County noise code at many NSRs associated with TC2 and TC3. In addition, the daytime permissible sound level limits for construction noise per NYSDEC policy were also exceeded at NSRs associated with TC2 and TC3 that are in close proximity to Sunrise Highway.

Table 13. NSRs in the vicinity of TCs and existing conditions.

NSR	NSR Location	Category	Survey Location	Day L_{ANS}, dBA	Night L_{ANS}, dBA
TC1-1	83 Northern Boulevard	Residential	SS-4	56	50
TC1-2	87 Northern Boulevard	Residential	SS-4	56	50
TC1-3	130 Mastic Boulevard West	Residential	SS-4	56	50
TC1-4	134 Mastic Boulevard West	Commercial	SS-4	56	50
TC1-5	534 William Floyd Parkway	Commercial	SS-4	56	50
TC1-6	532 William Floyd Parkway	Commercial	SS-4	56	50
TC1-7	60 Northern Boulevard	Commercial	SS-4	56	50
TC1-8	61 Merrick Road	Residential	SS-4	56	50
TC1-9	10 Ostend Circle	Residential	SS-4	56	50
TC1-10	89 Northern Boulevard	Residential	SS-4	56	50
TC1-11	124 Mastic Boulevard West	Residential	SS-4	56	50
TC1-12	800 Montauk Highway	Commercial	SS-4	56	50
TC2-1	40 Forest Avenue	Residential	SS-5	61	50
TC2-2	1044 William Floyd Parkway	Commercial	SS-5	61	50
TC2-3	1029 William Floyd Parkway	Commercial	SS-5	61	50
TC2-4	1031 William Floyd Parkway	Commercial	SS-7	59	48
TC2-5	29 Revilo Avenue	Residential	SS-7	59	48
TC2-6	10 Victory Avenue	Residential	SS-5	61	50
TC2-7	12 Victory Avenue	Residential	SS-5	61	50
TC2-8	14 Victory Avenue	Residential	SS-5	61	50
TC2-9	25 Revilo Avenue	Residential	SS-6	65	63
TC2-10	11 Victory Avenue	Residential	SS-6	65	63

Table 13. NSRs in the vicinity of TCs and existing conditions.

NSR	NSR Location	Category	Survey Location	Day L_{ANS}, dBA	Night L_{ANS}, dBA
TC2-11	13 Victory Avenue	Residential	SS-6	65	63
TC2-12	21 Revilo Avenue	Residential	SS-6	65	63
TC2-13	18 Auborn Avenue	Residential	SS-6	65	63
TC2-14	12 Auborn Avenue	Residential	SS-6	65	63
TC2-15	8 Auborn Avenue	Residential	SS-5	61	50
TC2-16	11 Revilo Avenue	Residential	SS-5	61	50
TC2-17	7 Revilo Avenue	Residential	SS-5	61	50
TC2-18	5 Revilo Avenue	Residential	SS-5	61	50
TC2-19	3 Revilo Avenue	Residential	SS-5	61	50
TC2-20	1 Revilo Avenue	Residential	SS-7	59	48
TC2-21	691 Montauk Highway	Commercial	SS-7	59	48
TC2-22	737 Montauk Highway	Commercial	SS-7	59	48
TC2-23	10 Camp Upton Road	Commercial	SS-7	59	48
TC2-24	739 Montauk Highway	Commercial	SS-7	59	48
TC2-25	803 McGraw Street	Commercial	SS-7	59	48
TC3-1	Southaven County Park, office	Residential	SS-7	59	48
TC3-2	2 Stacy Court	Residential	SS-5	61	50
TC3-3	35 River Road	Residential	SS-5	61	50
TC3-4	52 Victory Avenue	Residential	SS-6	65	63
TC3-5	36 River Road	Residential	SS-5	61	50
TC3-6	32 River Road	Residential	SS-5	61	50
TC3-7	28 River Road	Residential	SS-6	65	63
TC3-8	48 Victory Avenue	Residential	SS-6	65	63
TC3-9	46 Victory Avenue	Residential	SS-6	65	63
TC3-10	3 Dorsett Place	Residential	SS-7	59	48
TC3-11	393 Smith Road	Residential	SS-7	59	48
TC3-12	2976 Montauk Highway	Residential	SS-5	61	50
TC3-13	2979 Montauk Highway	Residential	SS-6	65	63
TC3-14	2964 Montauk Highway	Residential	SS-6	65	63
TC3-15	2958 Montauk Highway	Residential	SS-6	65	63
TC3-16	2956 Montauk Highway	Residential	SS-6	65	63
TC3-17	2903 Montauk Highway	Residential	SS-6	65	63
TC3-18	2901 Montauk Highway	Residential	SS-6	65	63
TC3-19	2897 Montauk Highway	Residential	SS-6	65	63
TC3-20	2891 Montauk Highway	Residential	SS-6	65	63
TC3-21	2881 Montauk Highway	Residential	SS-6	65	63
TC3-22	224 Gerard Road	Residential	SS-6	65	63
TC3-23	222 Gerard Road	Residential	SS-5	61	50
TC3-24	220 Gerard Road	Residential	SS-5	61	50
TC3-25	218 Gerard Road	Residential	SS-5	61	50

Table 13. NSRs in the vicinity of TCs and existing conditions.

NSR	NSR Location	Category	Survey Location	Day L_{ANS}, dBA	Night L_{ANS}, dBA
TC4-1	748 Long Island Avenue	Commercial	SS-8	55	58
TC4-2	766 Long Island Avenue	Residential	SS-8	55	58
TC4-3	745 Long Island Avenue	Residential	SS-8	55	58
TC4-4	749 Long Island Avenue	Residential	SS-8	55	58
TC4-5	21 Manor Road	Commercial	SS-8	55	58
TC4-6	3601 Horseblock Road	Commercial	SS-8	55	58
TC5-1	41 Avenue C	Residential	FTA	55	50
TC5-2	49 Avenue C	Residential	FTA	60	55
TC5-3	53 Avenue C	Residential	FTA	60	55
TC5-4	63 Avenue C	Residential	FTA	60	55
TC5-5	67 Avenue C	Residential	FTA	60	55
TC5-6	71 Avenue C	Residential	SS-9	57	61
TC5-7	30 Lakeside Drive	Residential	SS-9	57	61
TC5-8	38 Lakeside Drive	Residential	SS-9	57	61
TC5-9	1 Zebra Plaza	Commercial	FTA	60	55
TC5-10	607 Union Avenue	Industrial	SL-2	56	52

5.0 Impact Assessment

5.1 Construction Noise at the Union Avenue Site

OnCS–DC construction at the Union Avenue Site will generate a sound level of approximately 86 dBA at a distance of 50 ft (15 m) from the center of construction activities. During the day, construction noise is exempt from both the Town of Brookhaven and Suffolk County noise ordinances as described in the Regulatory Framework section above. Existing conditions have been estimated at NSRs in the vicinity of the Union Avenue Site, and construction noise should be limited to 65 dBA at residential properties and 79 dBA at industrial properties per NYSDEC policy. Assuming conditions favorable to noise propagation (no consideration of attenuation besides spreading loss), construction would exceed 65 dBA at distances less than 550 ft (168 m) and 79 dB at distances less than 110 ft (34 m). Table 14 summarizes the expected OnCS–DC construction noise at distances from construction at the Union Avenue Site.

Table 14. OnCS–DC construction noise at the Union Avenue Site.

Distance, ft (m)	L_A, dBA
50 (15)	86
110 (34)	79
550 (168)	65

The closest residential NSR is approximately 1,300 ft (396 m) away from the center of construction activities at the Union Avenue Site. Construction would generate noise of approximately 58 dBA at the closest residential NSR and lower levels at all other NSRs in residential areas. This indicates that the sound level of construction noise at residential NSRs would be similar to existing conditions. The closest industrial property is approximately 220 ft (67 m) away from the center of construction activities at the Union Avenue Site.

Construction will generate a sound level of approximately 73 dBA at the closest industrial NSR. This evaluation indicates that construction noise at the Union Avenue Site would not exceed permissible sound level limits at NSRs. Construction noise is expected to exceed 65 dBA at nearby industrial NSRs and BMPs will be implemented to minimize noise per NYSDEC policy.

5.2 Construction Noise at HDD and HAB Sites

Seven scenarios involving drilling operations have been evaluated per Table 1, including HDD construction at SCPs and HDD or HAB construction at five TC locations along the Onshore Transmission Cable and Onshore Interconnection Cable routes. During the day, construction noise is exempt from both the Town of Brookhaven and Suffolk County noise criteria. Daytime construction noise limits per NYSDEC policy are 65 dBA in residential areas and 79 dBA in commercial and industrial areas as described above. Some HDD construction equipment will require continuous (24-hour) operation including the drilling rig, pumps, and generators. Construction is prohibited by the Town of Brookhaven's policy at night. Nighttime construction activities will impose noise limits from Suffolk County regulations when the noise source is located in SCPs and within the limits of the ROW of a County highway. Therefore, Suffolk County regulations apply to construction at the Landfall HDD, ICW HDD, TC2, and TC3.

5.2.1 Site Preparation

Noise from site preparation was estimated to produce a sound level of 94 dBA at a distance of 50 ft (15 m) from the center of HDD and HAB construction activities. Given the proximity of NSRs at many TCs, noise from site preparation will exceed the NYSDEC criterion of 65 dBA in nearby residential areas if unmitigated. At some TCs, the NYSDEC criterion of 79 dBA in commercial areas will also be exceeded. Site preparation activities associated with the installation of sheet piling is expected to take approximately two days. While these construction activities are short term, the mitigative measures described herein are warranted to attenuate construction noise at NSRs.

The pile driver used for installation of shoring is likely to be the dominant noise source during site preparation. Impact pile-driving should be avoided whenever possible in favor of vibratory or other driving methods where the geological conditions permit their use. An impact or vibratory pile driver should be completely shielded within an acoustically-treated enclosure. Typically, the acoustically-treated enclosure is a long steel box lined with sound absorptive material that may include a mass-loaded vinyl curtain attached at the bottom to completely enclose the pile driving equipment. Further noise reduction may be achieved by applying suitable absorptive materials (i.e., an impact cushion) to piles and equipping the diesel-engine-driven hydraulic pump with a more effective muffler. Alternatively, use of a bore piling rig and augured holes for cast-in-place piles is another approach that can produce noise levels significantly lower than vibratory pile driving, and an enclosure may not be necessary. These are potential options for mitigation and the approach to mitigate construction noise will be formalized in the EM&CP.

After implementing noise control strategies for pile driving, site preparation is expected to produce a total sound level of approximately 84 dBA at 50 ft (15 m). Assuming conditions favorable to noise propagation, construction would exceed 65 dBA at distances less than 460 ft (140 m). Permissible noise limits are not expected to be exceeded at NSRs associated with the Landfall HDD, the ICW HDD, or TC5. Construction noise from site preparation would exceed NYSDEC criteria at nearby NSRs associated with all TC locations along the Onshore Transmission Cable route (TC1, TC2, TC3, and TC4). Therefore, BMPs for construction as outlined in Section 6 will be implemented to further reduce noise levels at these sites. Construction noise from site preparation is not expected to exceed NYSDEC criteria at nearby NSRs associated with TC5 along the Onshore Interconnection Cable route, however, BMPs will also be implemented at TC5 because the sound level at a commercial NSR will exceed 65 dBA. At sites where noise barriers or other mitigative measures are planned for subsequent drilling operations (as described below in Section 5.2.2 Drilling Operations), the barriers should be erected prior to construction and quiet technology utilized to also reduce noise impacts from site preparation. As the activities associated with site preparation are anticipated to be of relatively short duration and limited to the daytime hours, this construction is not expected to cause an adverse impact after implementing mitigative measures.

5.2.2 Drilling Operations

Unmitigated, construction activities will result in significant increases in the sound level at many nearby NSRs. At the Landfall HDD, ICW HDD, and all TC locations along the Onshore Transmission Cable route involving unmitigated HDD or HAB construction, noise limits would be exceeded at one or more NSRs per NYSDEC policy, Suffolk County policy, or both criteria. Therefore, the following mitigative measures are warranted at HAB and HDD sites to attenuate construction noise from drilling operations at NSRs. Construction noise from TC5 along the Onshore Interconnection Cable route is not expected to exceed permissible sound level limits at NSRs, however, the sound level at NSRs in non-residential areas is expected to exceed 65 dBA and BMPs should be implemented per NYSDEC policy.

The noise mitigation plan for drilling operations at HDD and HAB sites should include acoustically-treated construction equipment. Quiet technology pumps and generators that are designed with a complete sound attenuating enclosure and include exhaust mufflers will provide a noise reduction of 15 to 20 dB over standard models. A quieter HDD rig should be used that incorporates engine exhaust silencers and partial noise barriers around the hydraulic power unit, engine jacket-water coolers, and mud mixing/cleaning system. Employing full enclosures for HDD equipment is typically not feasible due to cooling requirements and costs. At HAB sites, a newer model HAB rig should be used which is up to 15 dB quieter than typical older rigs.

At specified HDD and HAB sites, a temporary noise barrier system should also be installed around the perimeter of the construction site to reduce the noise of drilling operations. There are several potential approaches to configure an adequate noise barrier. Acoustical insulation that consists of a sound absorptive material bonded to a mass-loaded vinyl curtain may be attached to a chain link fence in overlapping sections. A cost-effective barrier system could be constructed of 1-inch-thick plywood panels up to 16 ft (5 m) high. The inside surface of the barrier should be covered with sound absorptive material (such as 2-inch-thick fiberglass duct board) over at least 50 percent of the area. Other materials may be used for temporary barriers such as hay bales or the strategic placement of mobile storage tanks and site storage containers, as practical. Alternatively, a large acoustically-lined tent may be used to enclose the workspace, although this must accommodate access by mobile equipment and typically requires a large area. The mitigation required for each scenario involving drilling operations is summarized in Table 15. BMPs for construction activities as outlined in Section 6 will also be implemented for the scenarios designated in Revised Table 13 to further minimize the total sound level. These potential options for mitigation and the approach for construction noise mitigation will be formalized in the EM&CP.

Table 15. Mitigation specified for drilling operations at HBB and HDD sites.

Scenario	Mitigation
Landfall HDD construction at Smith Point County Park	• Acoustically treated HDD rig • Quiet technology pumps and generators
ICW HDD construction at Smith Point Marina	• Acoustically treated HDD rig • Quiet technology pumps and generators • BMPs for exit side operations

Table 15. Mitigation specified for drilling operations at HBB and HDD sites.

Scenario	Mitigation
HAB construction at the LIRR and Church Road (TC1)	• Newer HAB rig • Quiet technology pumps and generators • Noise barriers surrounding both entry and exit side operations, at least 12 ft (4 m) tall
HDD construction at Sunrise Highway and Revilo Avenue (TC2)	• Acoustically treated HDD rig • Quiet technology pumps and generators • Partial noise barriers at both entry and exit side operations, at least 12 ft (4 m) tall • BMPs
HDD construction at Carmans River and Victory Avenue (TC3)	• Newer HAB rig • Quiet technology pumps and generators • Partial barrier for exit side operations, at least 12 ft (4 m) tall • BMPs
HAB construction at the LIRR and Manor Road (TC4)	• Newer HAB rig • Quiet technology pumps and generators • Partial noise barriers at both entry and exit side operations, at least 9 ft (3 m) tall • BMPs
HAB construction at the LIE (TC5)	• Standard equipment may be used for drilling operations • BMPs

Table 16, Table 17, and Table 18 summarize the estimated day and night sound levels due to existing conditions, Project activities, and contributions from both (i.e., the predicted total ambient sound level) at the NSRs for scenarios involving drilling operations. Figure 11, Figure 12, and Figure 13 through Figure 17 present the predicted daytime sound levels due to construction activities. These results provide an indication of the level of noise that can be expected with application of the proposed mitigative measures described in Table 15. If drilling operations at two sites were to occur simultaneously, the total sound level at some NSRs would increase, but the increase would not require any changes to the mitigative measures specified.

Table 16. Landfall HDD construction noise.

	Existing		Project		Total	
NSR	Day L_A, dBA	Night L_A, dBA	Day L_A, dBA	Night L_A, dBA	Day L_A, dBA	Night L_A dBA
SCP-1	50	44	49	44	52	47
SCP-2	50	44	37	33	50	44
SCP-3	45	35	27	23	45	35
SCP-4	50	44	28	24	50	44
SCP-5	50	44	34	29	50	44
SCP-6	50	44	34	30	50	44
SCP-7	45	35	38	34	46	38

Table 17. ICW HDD construction noise.

NSR	Existing		Project		Total	
	Day L_A, dBA	Night L_A, dBA	Day L_A, dBA	Night L_A, dBA	Day L_A, dBA	Night L_A, dBA
SCP-1	50	44	31	24	50	44
SCP-2	50	44	57	44	58	47
SCP-3	45	35	38	34	46	37
SCP-4	50	44	40	36	50	44
SCP-5	50	44	49	45	52	47
SCP-6	50	44	50	46	53	48
SCP-7	45	35	29	24	45	35

Table 18. HAB and HDD construction noise at TCs along onshore cable routes.

NSR	Existing		Project		Total	
	Day L_A, dBA	Night L_A, dBA	Day L_A, dBA	Night L_A, dBA	Day L_A, dBA	Night L_A, dBA
TC1-1	56	50	62	48	63	52
TC1-2	56	50	60	46	61	51
TC1-3	56	50	60	46	61	51
TC1-4	56	50	60	47	62	52
TC1-5	56	50	54	40	58	50
TC1-6	56	50	53	39	58	50
TC1-7	56	50	63	48	64	52
TC1-8	56	50	57	42	59	51
TC1-9	56	50	57	42	59	51
TC1-10	56	50	55	41	59	51
TC1-11	56	50	54	41	58	50
TC1-12	56	50	60	47	61	52
TC2-1	61	50	46	33	61	50
TC2-2	61	50	50	37	61	50
TC2-3	61	50	59	46	63	51
TC2-4	59	48	51	38	60	48
TC2-5	59	48	53	40	60	49
TC2-6	61	50	44	32	61	50
TC2-7	61	50	46	33	61	50
TC2-8	61	50	42	30	61	50
TC2-9	65	63	59	46	66	63
TC2-10	65	63	53	40	65	63
TC2-11	65	63	46	33	65	63
TC2-12	65	63	56	43	66	63
TC2-13	65	63	46	33	65	63
TC2-14	65	63	42	30	65	63

Table 18. HAB and HDD construction noise at TCs along onshore cable routes.

NSR	Existing		Project		Total	
	Day L_A, dBA	Night L_A, dBA	Day L_A, dBA	Night L_A, dBA	Day L_A, dBA	Night L_A, dBA
TC2-15	61	50	43	31	61	50
TC2-16	61	50	54	42	62	51
TC2-17	61	50	55	43	62	51
TC2-18	61	50	56	44	62	51
TC2-19	61	50	55	43	62	51
TC2-20	59	48	53	41	60	49
TC2-21	59	48	51	39	60	48
TC2-22	59	48	50	38	60	48
TC2-23	59	48	52	40	60	49
TC2-24	59	48	55	43	61	49
TC2-25	59	48	56	44	61	49
TC3-1	59	48	50	38	60	48
TC3-2	61	50	39	26	61	50
TC3-3	61	50	42	29	61	50
TC3-4	65	63	58	45	66	63
TC3-5	61	50	42	29	61	50
TC3-6	61	50	46	33	61	50
TC3-7	65	63	54	40	65	63
TC3-8	65	63	51	38	65	63
TC3-9	65	63	49	36	65	63
TC3-10	59	48	44	31	59	48
TC3-11	59	48	44	31	59	48
TC3-12	61	50	44	31	61	50
TC3-13	65	63	43	30	65	63
TC3-14	65	63	46	33	65	63
TC3-15	65	63	47	35	65	63
TC3-16	65	63	48	36	65	63
TC3-17	65	63	55	43	65	63
TC3-18	65	63	52	40	65	63
TC3-19	65	63	51	39	65	63
TC3-20	65	63	46	34	65	63
TC3-21	65	63	45	33	65	63
TC3-22	65	63	42	30	65	63
TC3-23	61	50	41	28	61	50
TC3-24	61	50	40	28	61	50
TC3-25	61	50	41	29	61	50
TC4-1	55	58	67	53	67	59
TC4-2	55	58	49	36	56	58
TC4-3	55	58	49	35	56	58
TC4-4	55	58	60	47	61	58

Table 18. HAB and HDD construction noise at TCs along onshore cable routes.

NSR	Existing		Project		Total	
	Day L_A, dBA	Night L_A, dBA	Day L_A, dBA	Night L_A, dBA	Day L_A, dBA	Night L_A, dBA
TC4-5	55	58	69	55	69	60
TC4-6	55	58	63	49	63	58
TC5-1	55	50	52	50	57	53
TC5-2	60	55	52	51	61	56
TC5-3	60	55	55	54	61	57
TC5-4	60	55	55	53	61	57
TC5-5	60	55	54	52	61	57
TC5-6	57	61	53	51	58	61
TC5-7	57	61	48	46	57	61
TC5-8	57	61	46	44	57	61
TC5-9	60	55	64	63	66	63
TC5-10	56	52	62	60	63	61

At NSRs associated with TC2 and TC3, existing conditions exceed the nighttime permissible sound level limit for construction noise per the Suffolk County noise code and are equivalent to the daytime permissible sound level limit for construction noise per NYSDEC policy. Feasible noise controls have been specified to limit the increase in the total sound level at these NSRs. After implementing noise controls to limit construction noise, construction activity at TC2 and TC3 is expected to exceed the permissible sound level limits specified by NYSDEC during the day or Suffolk County at night at one or more NSRs by 1 dB or less. BMPs have been recommended to further attenuate noise levels at NSRs associated with TC2 and TC3. Construction noise from drilling operations at TC1, TC4, and TC5 will not exceed permissible limits and is in compliance with all applicable regulations. BMPs were specified for TC4 and TC5 to further reduce noise in non-residential areas per NYSDEC policy. BMPs were also recommended for exit side operations of the ICW HDD in consideration of the sensitive nature of designated wilderness areas adjacent to Project activities.

Microtunneling may be used at TC2 instead of HDD. Microtunneling is a trenchless construction method that uses equipment similar to HAB. If microtunneling is used at TC2, the onshore noise impacts are expected to be less than estimated herein, however mitigation including quieter equipment, noise barriers, and BMPs would still be required as specified for HAB scenarios.

5.3 Construction Noise along the Onshore Cable Routes

The noise levels associated with construction along the Onshore Transmission Cable and Onshore Interconnection Cable routes were analyzed with RCNM, which provides the received noise level at specified distances from the construction activity. During the day, construction noise is exempt from both the Town of Brookhaven and Suffolk County noise ordinances. Existing conditions have been estimated at NSRs along the routes, and construction noise should be limited to 65 dBA during the day per NYSDEC policy as described in Section 4.

The most critical NSRs are the abutting residential properties along the Onshore Transmission Cable route. Although distance varies along the route, the property line of many residential areas is set back approximately 40 ft (12 m) from the road centerline along which the route proceeds. Construction of the Onshore Transmission Cable will generate noise of approximately 88 dBA at a distance of 40 ft (12 m) from the center of construction activities. Construction noise from the Onshore Transmission Cable route will exceed 65 dBA at distances of up to 550 ft (168 m). Figure 18 shows the Onshore Transmission Cable route and the distance at which the NYSDEC limit is reached.

Construction of the Onshore Interconnection Cable is also expected to exceed the NYSDEC noise limits at NSRs adjacent to the proposed routes. No significant difference in noise impact is anticipated between construction of the two Onshore Interconnection Cable routes. Therefore, the BMPs outlined in Section 6 should be implemented to diminish noise impacts from construction of the Onshore Transmission Cable and Onshore Interconnection Cable routes. Because construction will continuously progress along the route, exposure to noise at any particular location will be temporary. If issues are identified and further attenuation is required, temporary barriers or curtains may be erected around the noisiest equipment or the entire work area, as practical. Acoustical insulation that consists of a sound absorptive material bonded to a mass-loaded vinyl curtain may be attached to a chain link fence in overlapping sections. Alternatively, barriers can be constructed on the work site from common construction building materials (plywood, block, stacks, or spoils) if necessary. To be effective, these should be lined with sound absorbing material and strategically placed as close to the noise source or NSR as possible. These are potential options for mitigation and the approach for construction noise mitigation will be formalized in the EM&CP.

In some areas, construction along the Onshore Transmission Cable and Onshore Interconnection Cable routes may be requested to occur at night to mitigate traffic impacts. As described in Section 2, nighttime construction activities may impose noise limits from Suffolk County in certain areas and these limits would be exceeded. In addition, nighttime construction activities are prohibited by the Town of Brookhaven’s policy.

5.4 Operational Noise at the Union Avenue Site

Several noise producing components of the OnCS–DC require noise controls. The converter reactors, converter water cooling, power line carrier filter bank, and the radio interference filter bank to be installed will be selected for lower sound ratings as detailed in Section 3.4. Reduced sound equipment incorporates various forms of acoustical treatments by design, such as reduced speed fans.

The sound levels due to operation of the OnCS–DC at the Union Avenue Site is presented in Figure 19. Table 19 summarizes the estimated A-weighted continuous equivalent sound levels due to existing conditions (day and night), Project operation, the total sound level (day and night) including contributions from both existing conditions and the Project, and the increase of the ambient sound level over existing conditions (day and night) at NSRs for operation at this location. These results provide an indication of the noise that can be expected with application of the proposed mitigative measures. The predicted total sound level of the OnCS–DC at the Union Avenue Site with mitigative measures applied complies with all applicable criteria as specified by the EPA, NYSDEC, and the Town of Brookhaven regulations.

Table 19. Operational noise of the OnCS–DC at the Union Avenue Site.

NSR	Existing		Project	Total		Increase	
	Day L_A, dBA	Night L_A, dBA	L_A, dBA	Day L_A, dBA	Night L_A dBA	Day L_A, dBA	Night L_A dBA
UA-1 (R)	57	61	28	57	61	0	0
UA-2 (R)	56	52	31	56	52	0	0
UA-3 (R)	56	52	32	56	52	0	0
UA-4 (R)	56	52	29	56	52	0	0
UA-5 (R)	56	52	32	56	52	0	0
UA-6 (R)	56	52	33	56	52	0	0

Table 19. Operational noise of the OnCS–DC at the Union Avenue Site.

NSR	Existing		Project	Total		Increase	
	Day L_A, dBA	Night L_A, dBA	L_A, dBA	Day L_A, dBA	Night L_A dBA	Day L_A, dBA	Night L_A dBA
UA-7 (R)	56	52	34	56	52	0	0
UA-8 (R)	60	54	33	60	54	0	0
UA-9 (R)	60	54	38	60	54	0	0
UA-10 (R)	60	54	41	60	54	0	0
UA-11 (R)	60	54	40	60	54	0	0
UA-12 (R)	56	52	38	56	52	0	0
UA-13 (R)	56	52	32	56	52	0	0
UA-14 (R)	56	52	33	56	52	0	0
UA-15 (I)	56	52	67	68	68	12	16
UA-16 (I)	56	52	57	60	58	4	6
UA-17 (I)	56	52	52	57	55	1	3
UA-18 (I)	56	52	57	59	58	3	6
UA-19 (NA)	56	52	53	58	55	2	3
UA-20 (NA)	56	52	58	60	59	4	7
UA-21 (C)	56	52	36	56	52	0	0

The NSR column in Table 19 indicates in parentheses whether the use of the associated parcel is industrial (I), commercial (C), residential (R), or not applicable (NA). UA-15, UA-16, UA-19, and UA-20 are on the West, East, North and South property line respectively and further detail on the NSRs is in Table 11. The highest Project sound levels from OnCS–DC operation at the Union Avenue Site will be at nearby industrial properties, whereas the permissible noise limits at residential NSRs are lower. At NSRs in residential areas, existing conditions exceed the nighttime permissible sound level limits for operational noise per the Town of Brookhaven noise code and the day-night average sound level as specified by the EPA. As limits are already exceeded due to existing conditions, noise controls have been specified to avoid an increase in the total sound level at these NSRs per NYSDEC policy. Considering residences only, the highest Project sound level from the OnCS–DC at the Union Avenue Site will be at NSR UA-10. The Project sound level at UA-10 will be approximately 41 dBA at night, which will result in an increase of 0 dBA in the total level relative to existing conditions. The OnCS–DC operational noise is constant and although daytime levels were also considered, the sound level at night is the limiting case because the threshold for increased noise is lower during this time period.

6.0 Best Management Practices

This section presents BMPs that can be implemented to minimize noise impacts to the community. In addition to the potential specific mitigative measures for noise abatement described above, BMPs will be implemented to reduce noise from specified Project construction activities. The BMPs should be implemented when reasonable and effective while maintaining public safety and adhering to other Project requirements as applicable. The BMPs proposed to be implemented will be included in the EM&CP. The following BMPs include guidance for both equipment and administrative controls:

- Construction equipment should be appropriately specified for the task. Overpowered or underpowered equipment may unnecessarily generate excessive noise.

- The quietest equipment feasible should be used for construction activities. Newer equipment is generally quieter than old equipment. Using quiet machinery is one of the most effective methods for diminishing noise impacts.
- Construction equipment should be equipped with noise-reducing devices including mufflers, silencers, covers, guards, and vibration isolators, as applicable. Mobile equipment, such as jackhammers and welders, should be shielded with portable enclosures or shrouds, as applicable. Noise producing equipment using internal combustion engines should be equipped with effective inlet silencers and exhaust mufflers to control engine noise.
- Ensure that construction equipment is well maintained. Loose or worn parts can result in increased noise levels.
- To the extent feasible, restrict the noisiest operations to normal work hours during the day.
- Relocate the noisiest equipment far from NSRs whenever possible. During the planning stages of the Project, it may be possible to designate storage areas far from NSRs. When this is not possible, the storage of waste materials, earth, and other supplies may be able to be positioned such that it also functions as a noise barrier.
- Erect additional sound barriers around the noisiest equipment or near the noise sensitive receptor, as practical.
- Route truck traffic away from residential streets and select streets with the fewest homes if other alternatives are not available.
- Do not allow engine-driven equipment to idle unnecessarily near NSRs.
- Back-up alarms should be used when required for safety only and replaced with strobe lights when possible.
- Inform the public about the time and nature of construction activities. Open communication and providing neighbors with information is a critical step towards minimizing noise impacts to the community.

7.0 Figures

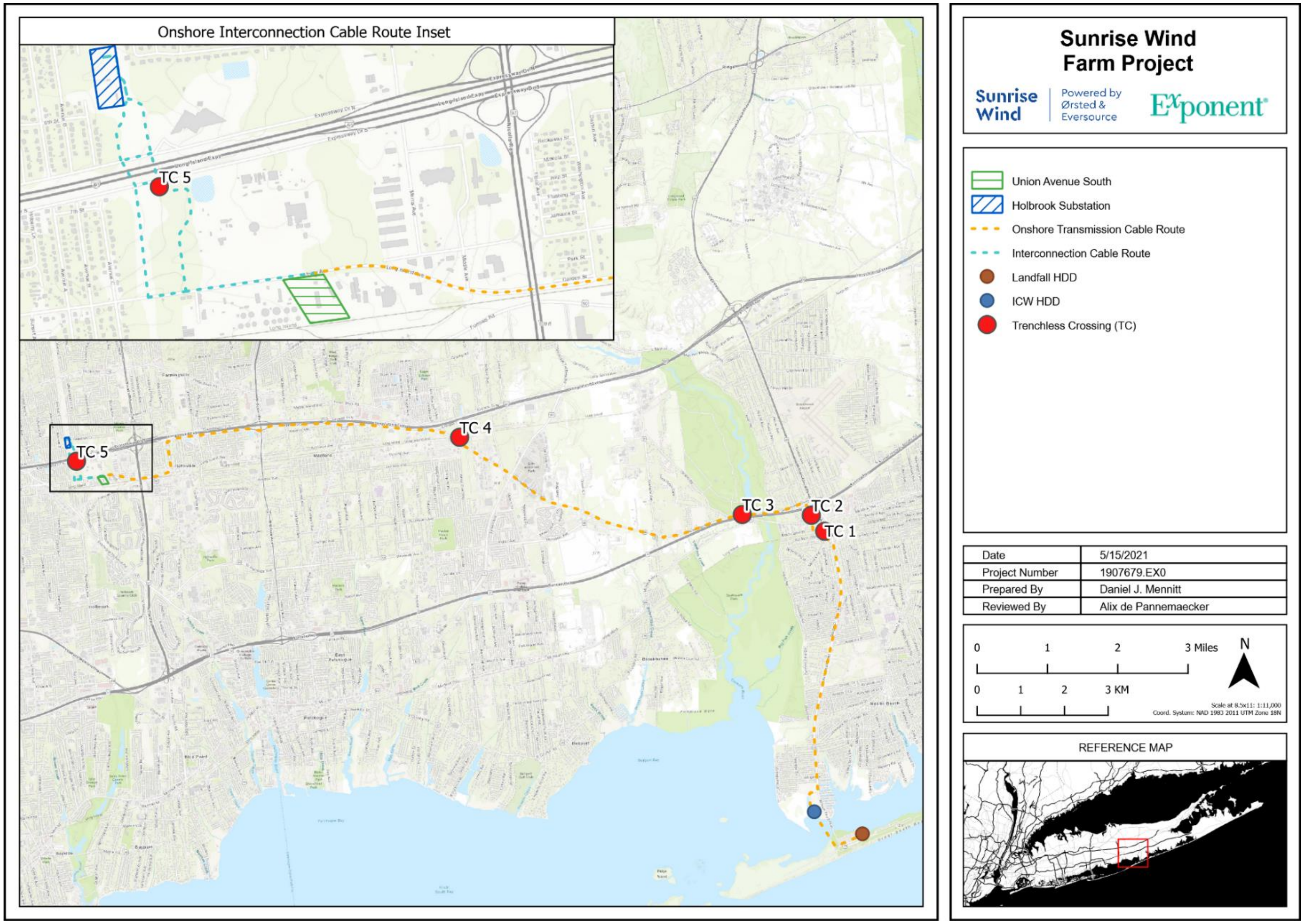

Figure 1. Onshore components of the Project.

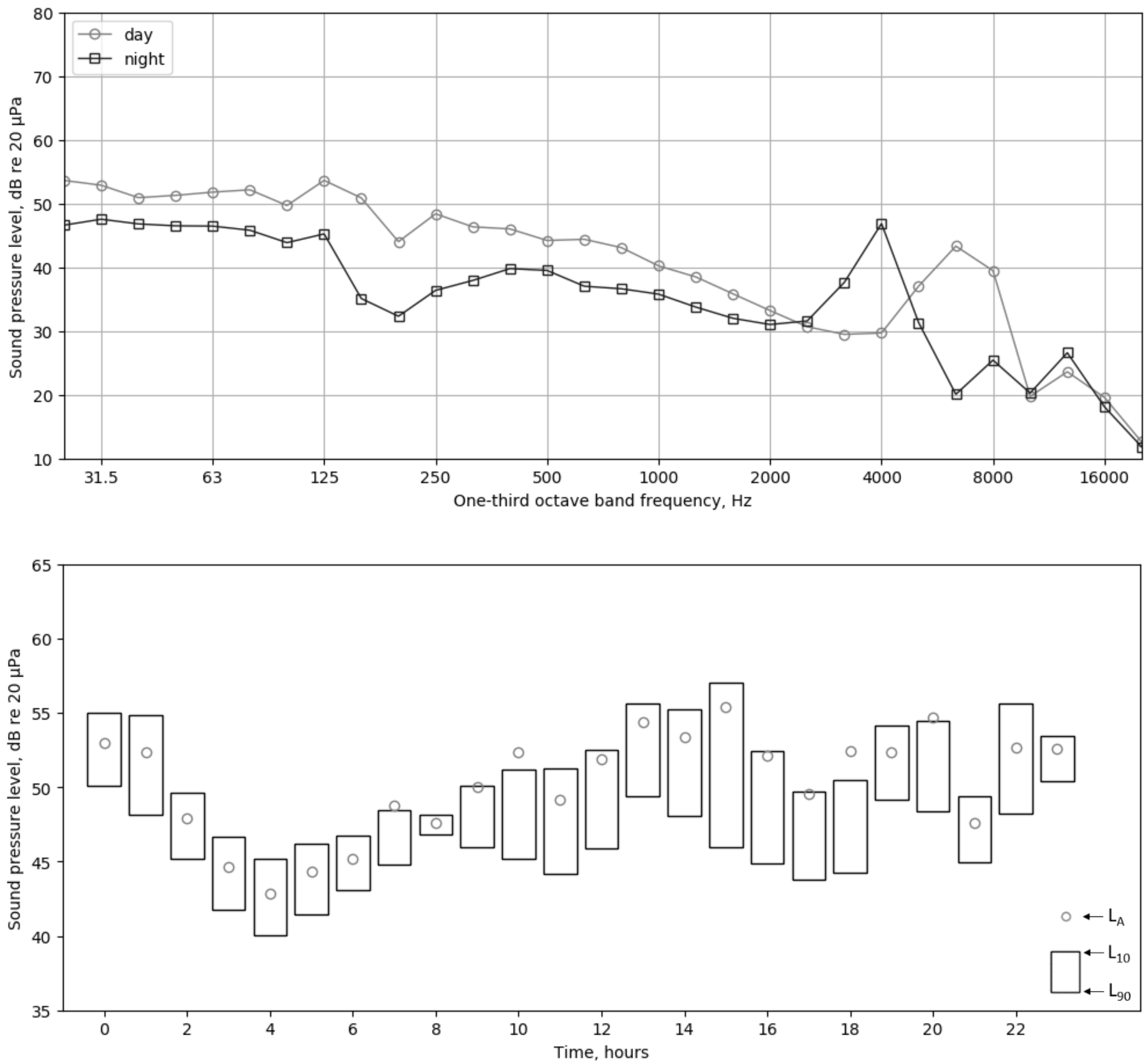

Figure 2. Field survey measurement data from SL-1 including the average one-third octave band spectra over day and night hours (top panel) and hourly history of the L_{10}, L_{90}, and L_A (bottom panel).

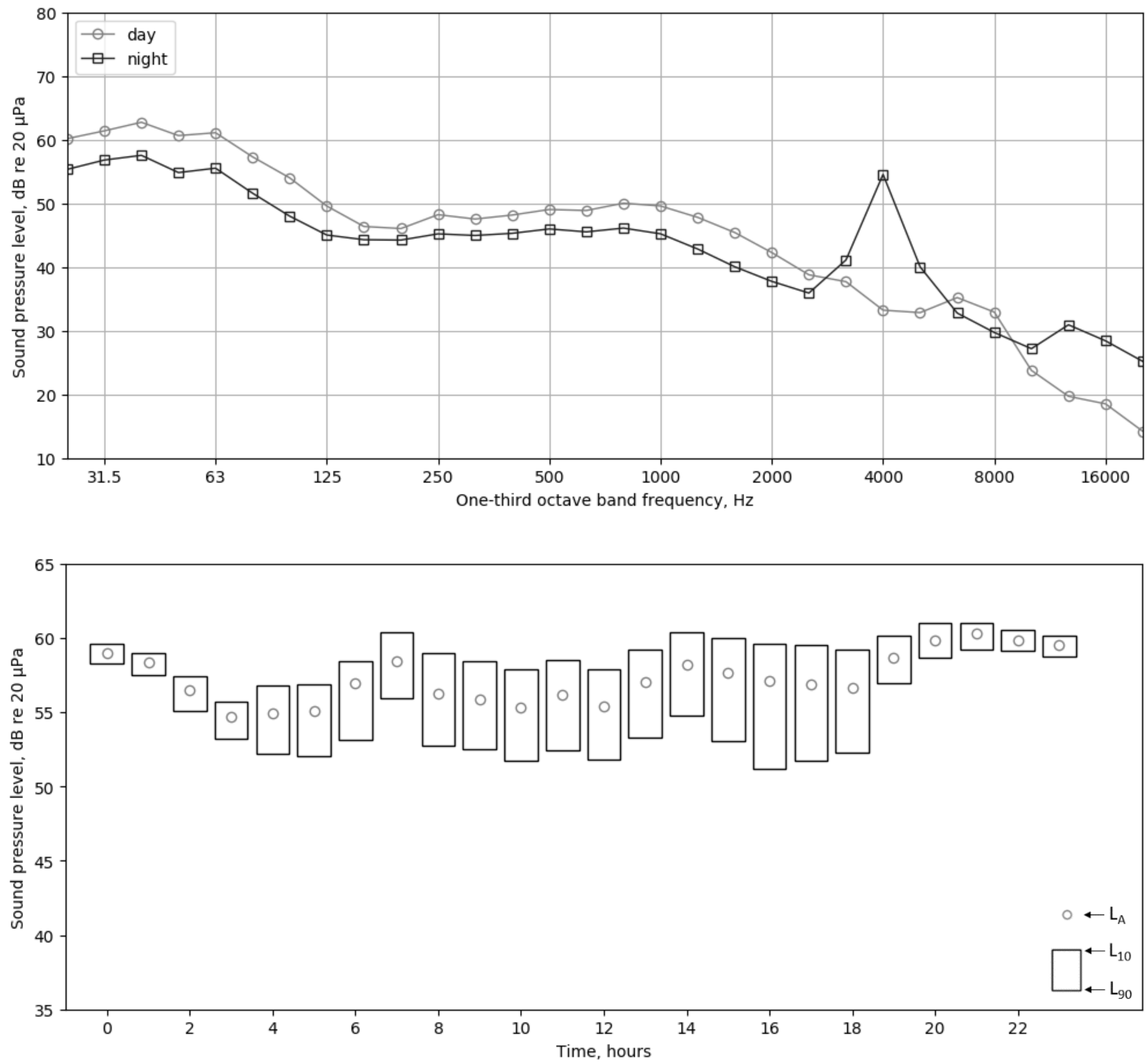

Figure 3. Field survey measurement data from SL-2 including the average one-third octave band spectra over day and night hours (top panel) and hourly history of the L_{10}, L_{90}, and L_A (bottom panel).

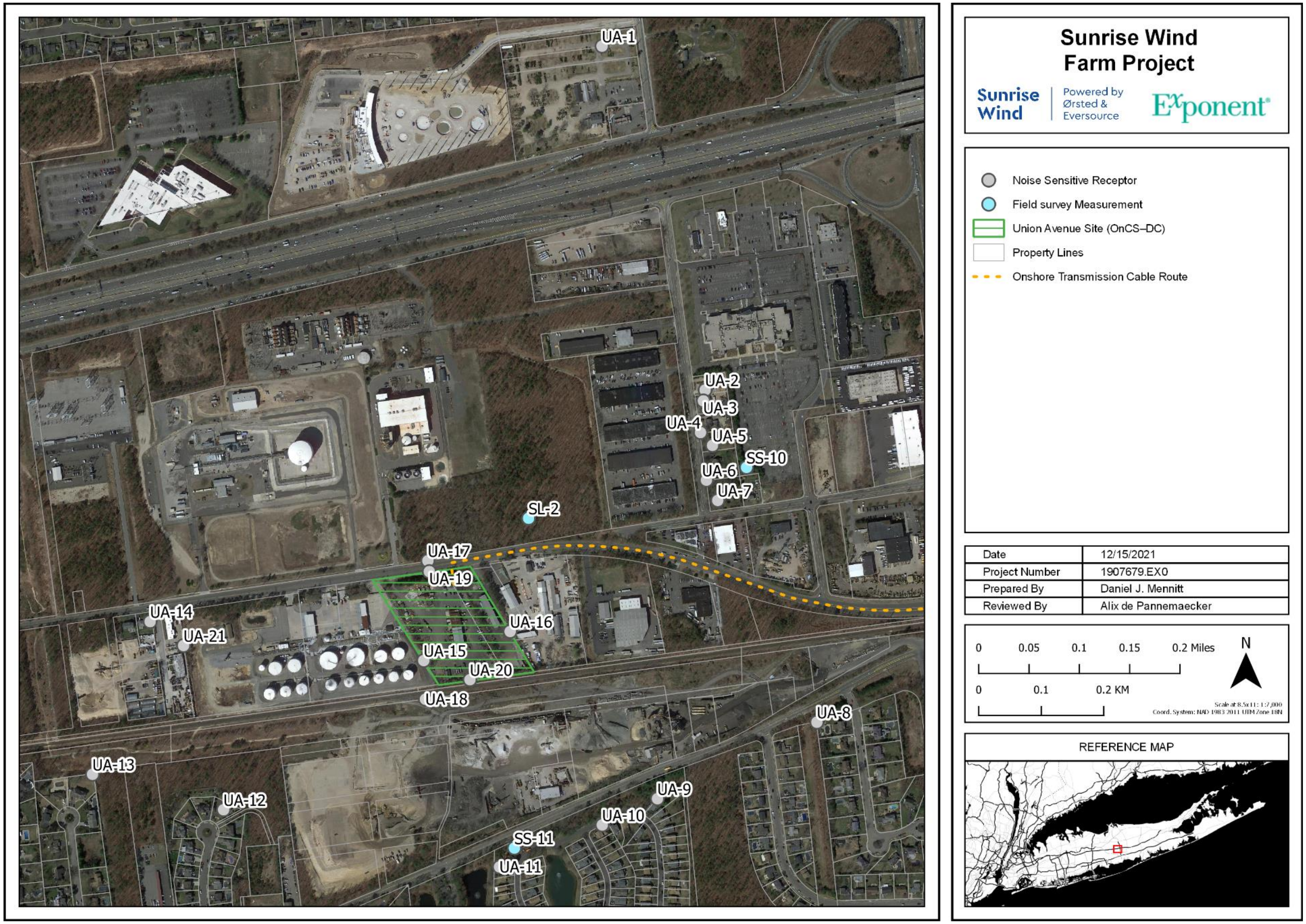

Figure 4. **Field survey measurement and NSR locations in the vicinity of the Union Avenue Site.**

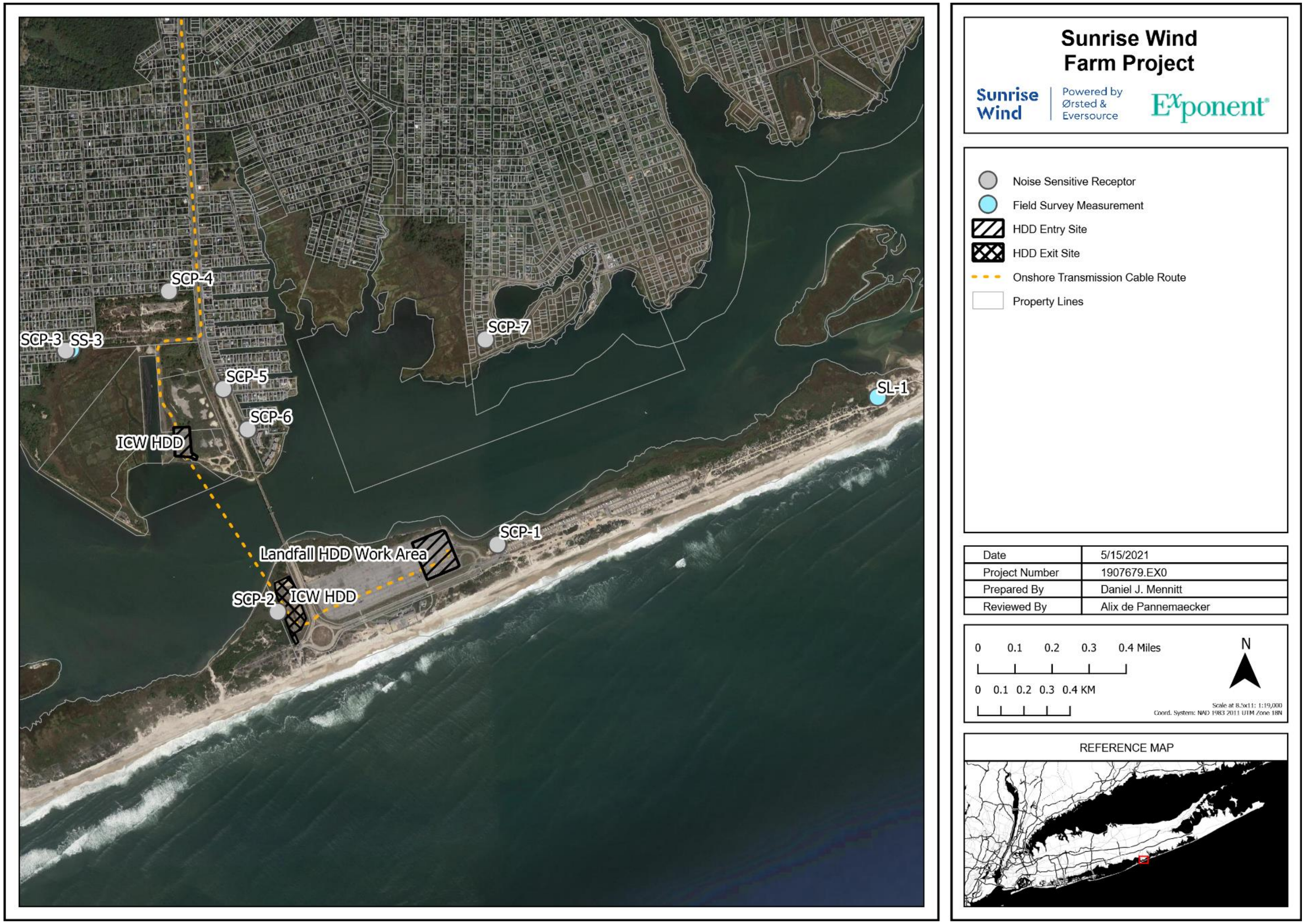

Figure 5. Field survey measurement and NSR locations in the vicinity of the Landfall HDD and ICW HDD.

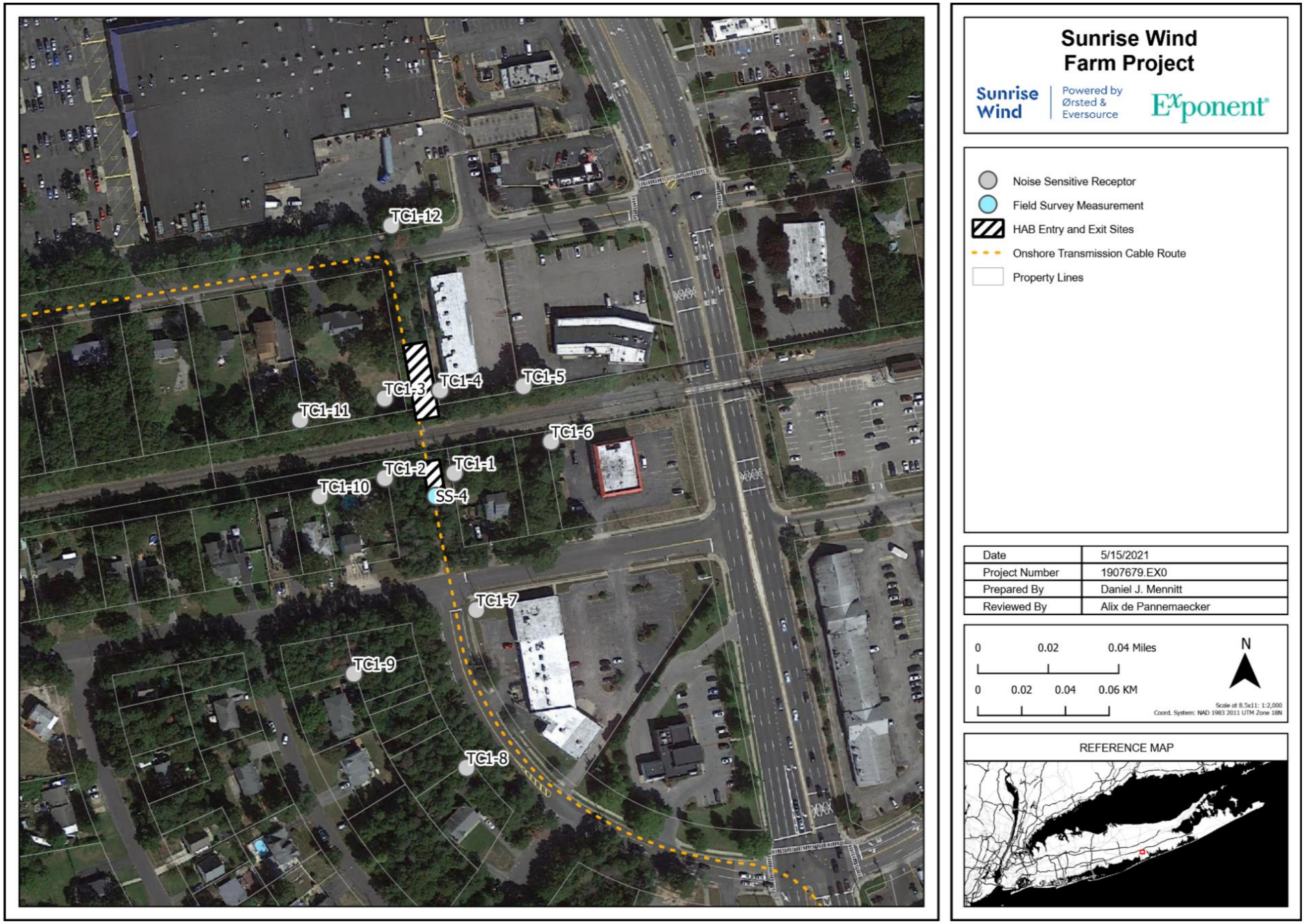

Figure 6. **Field survey measurement and NSR locations in the vicinity of TC1.**

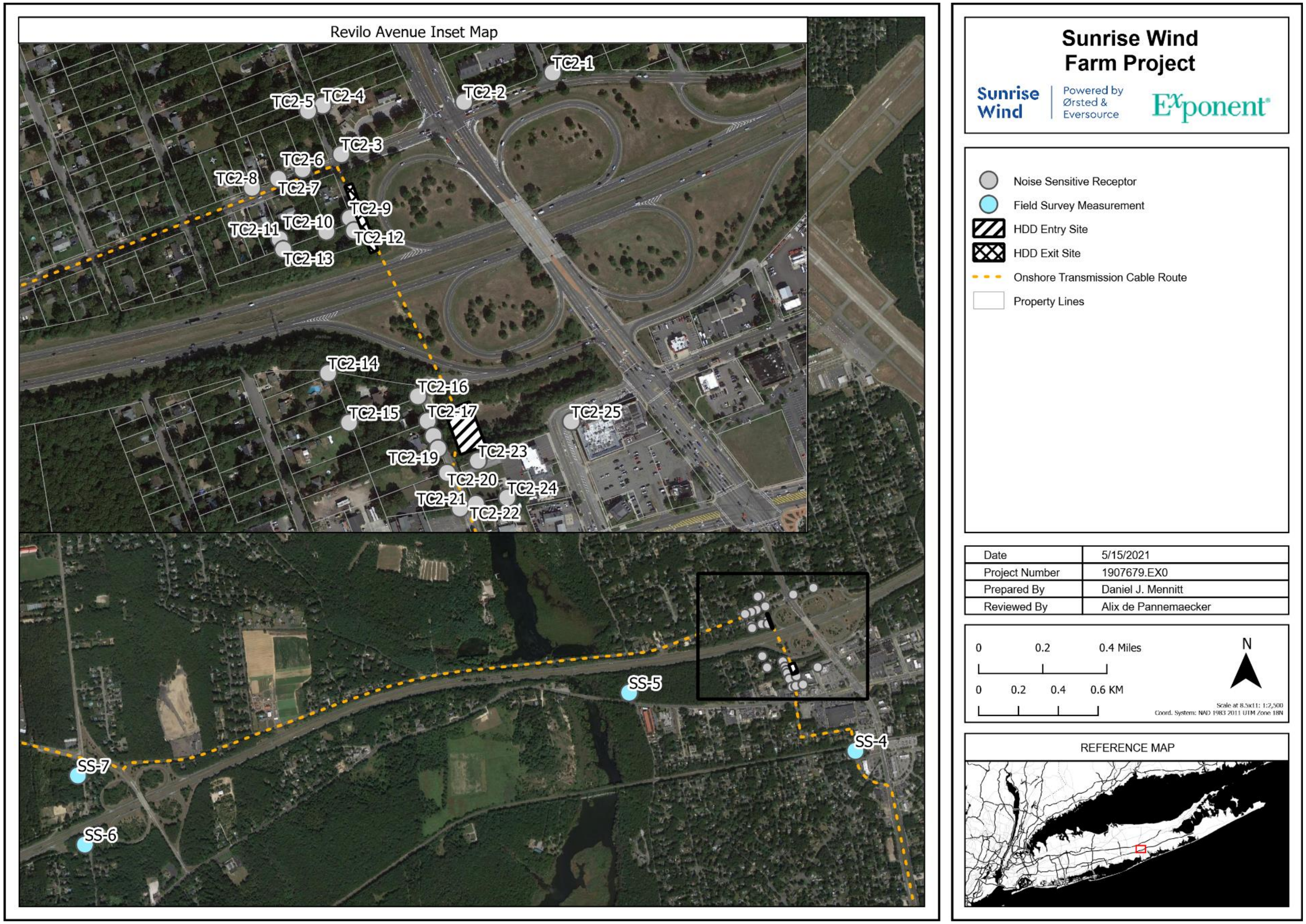

Figure 7. **Field survey measurement and NSR locations in the vicinity of TC2.**

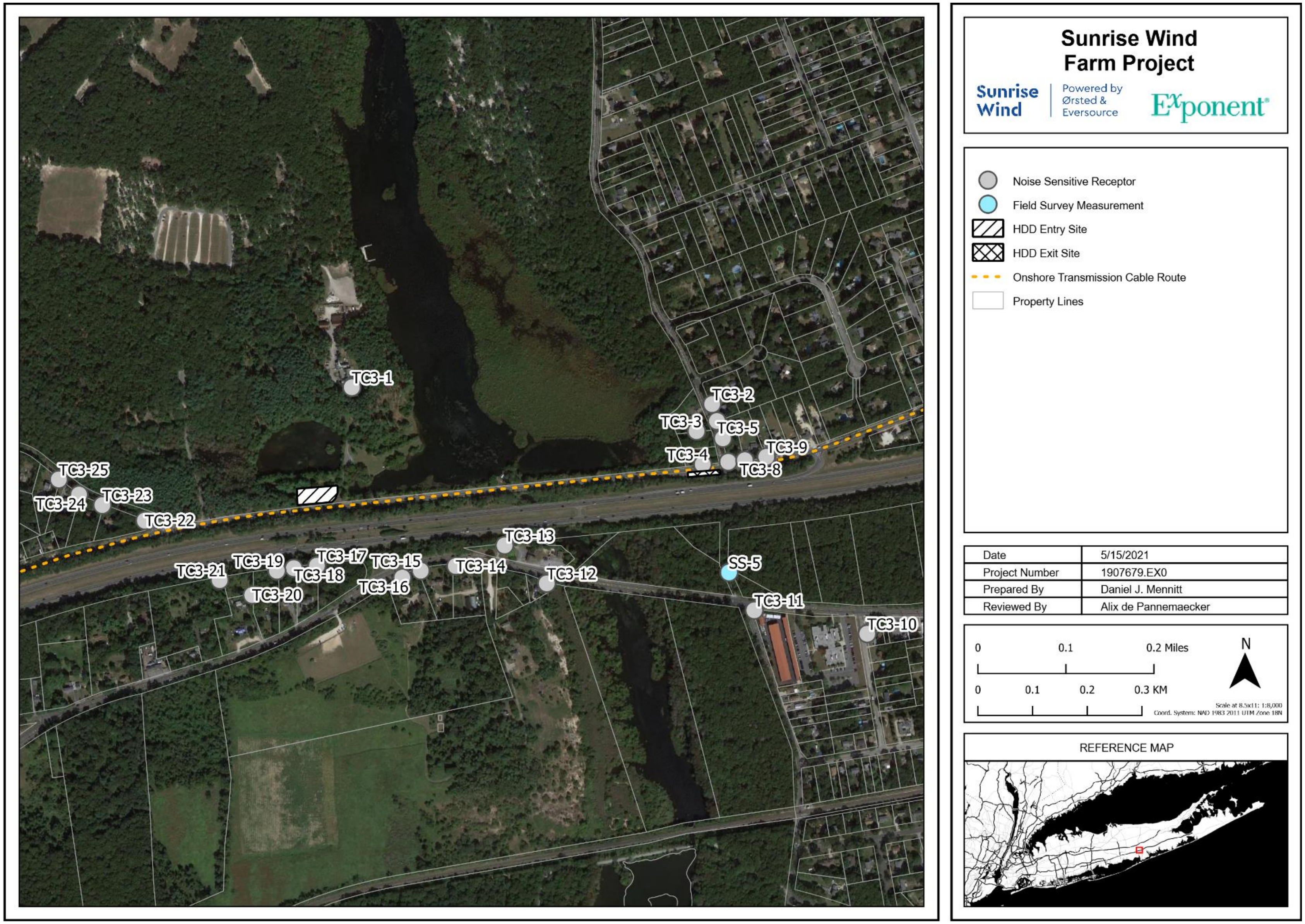

Figure 8. **Field survey measurement and NSR locations in the vicinity of TC3.**

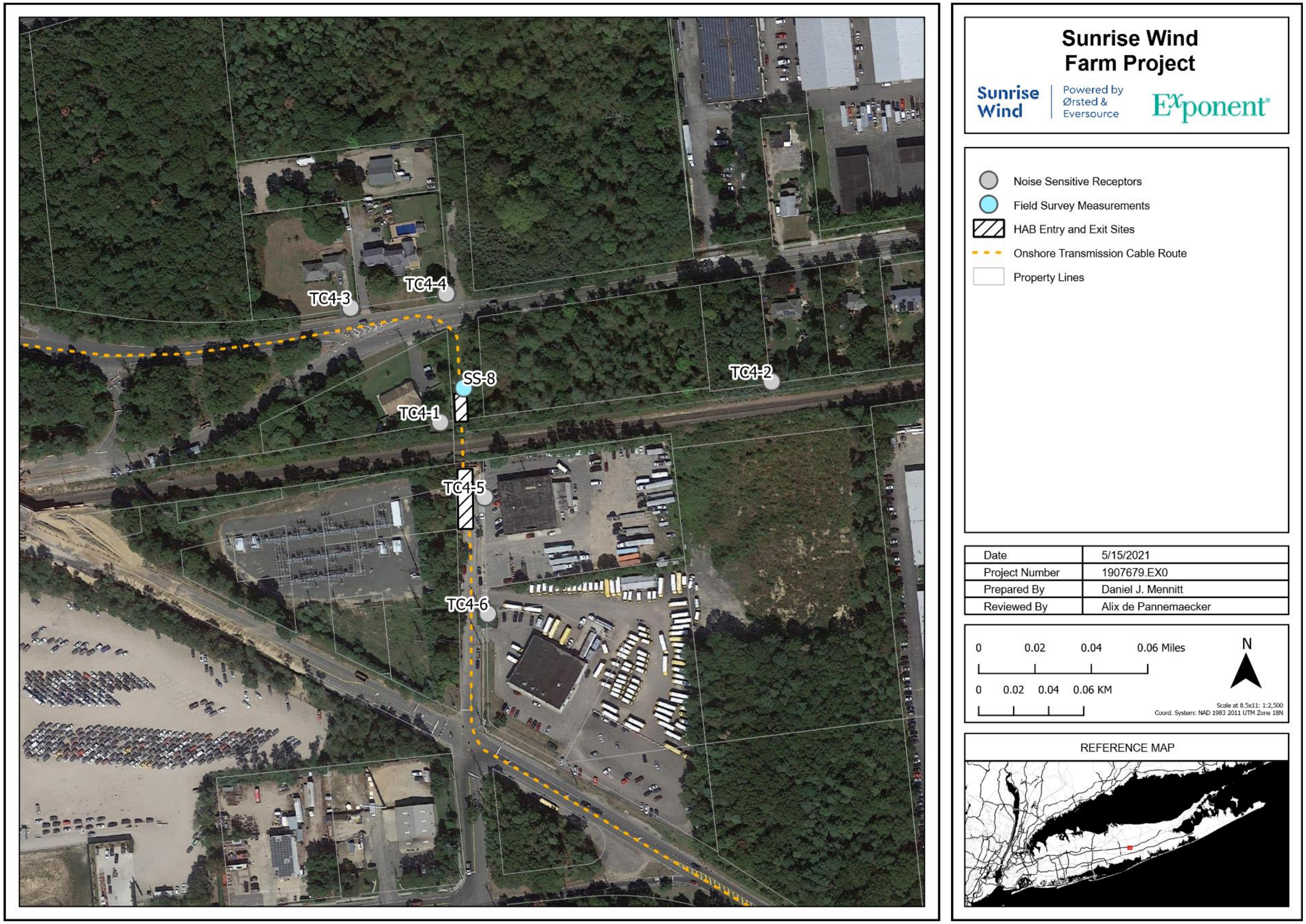

Figure 9. **Field survey measurement and NSR locations in the vicinity of TC4.**

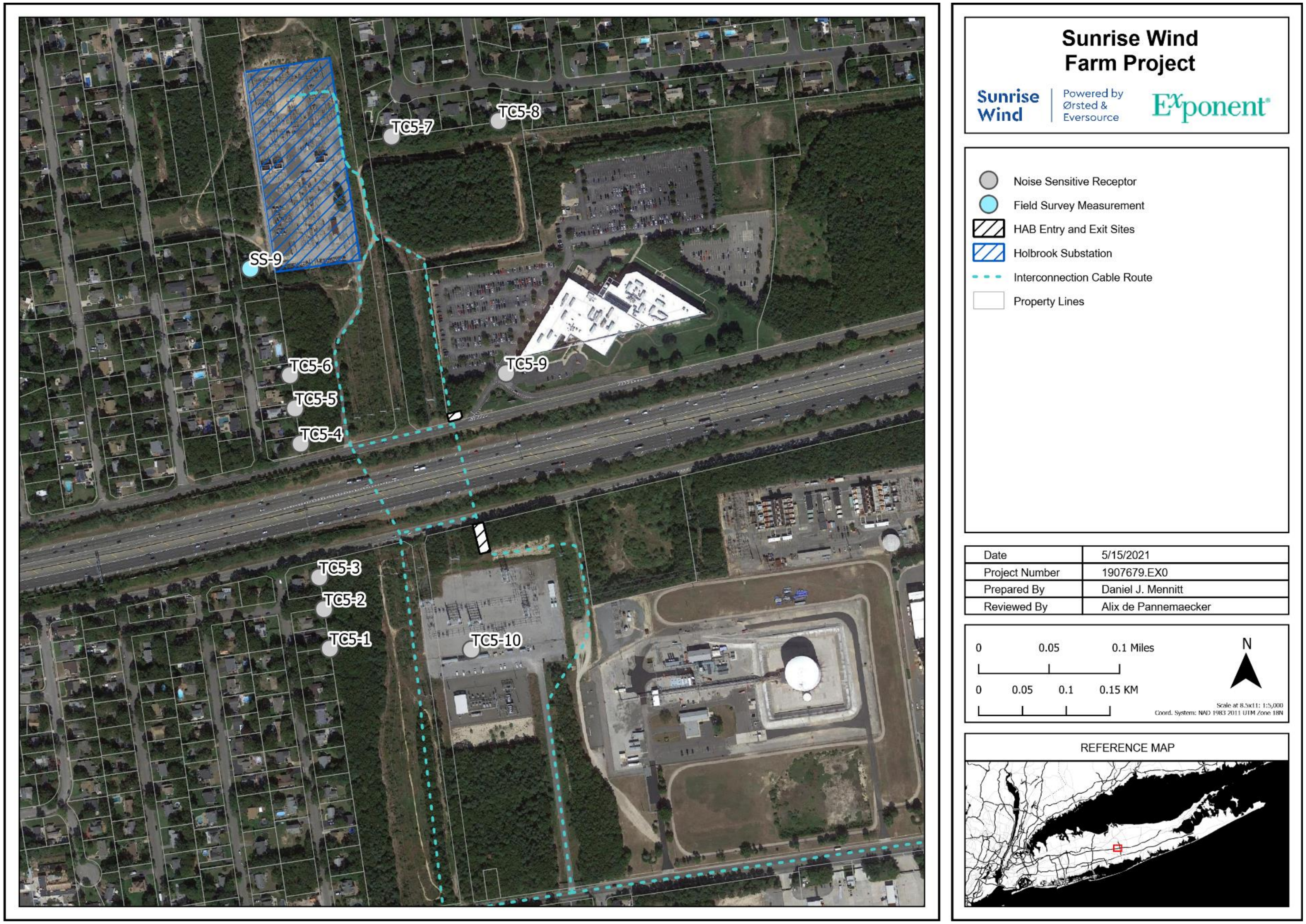

Figure 10. **Field survey measurement and NSR locations in the vicinity of TC5.**

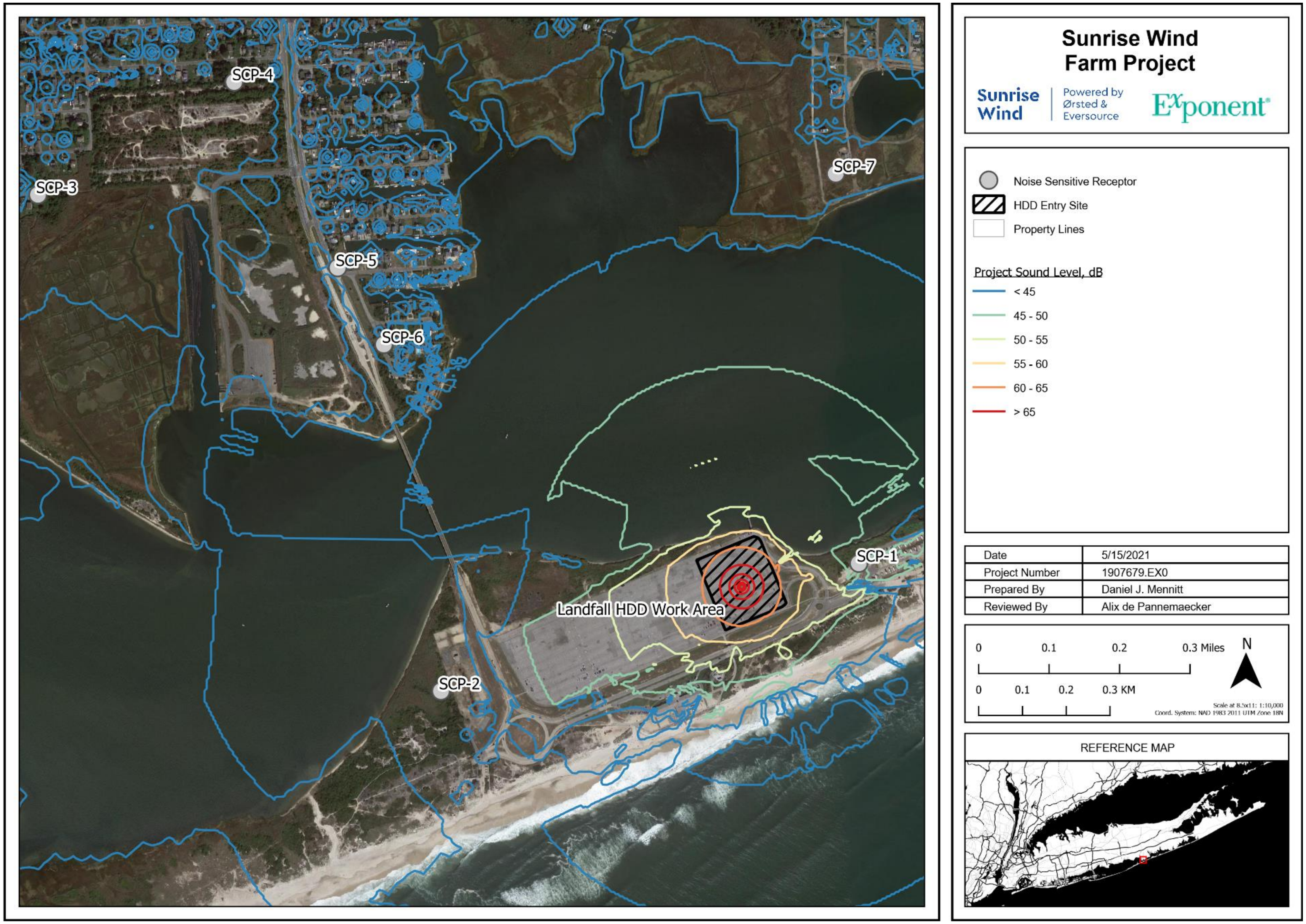

Figure 11. Landfall HDD daytime construction noise contours.

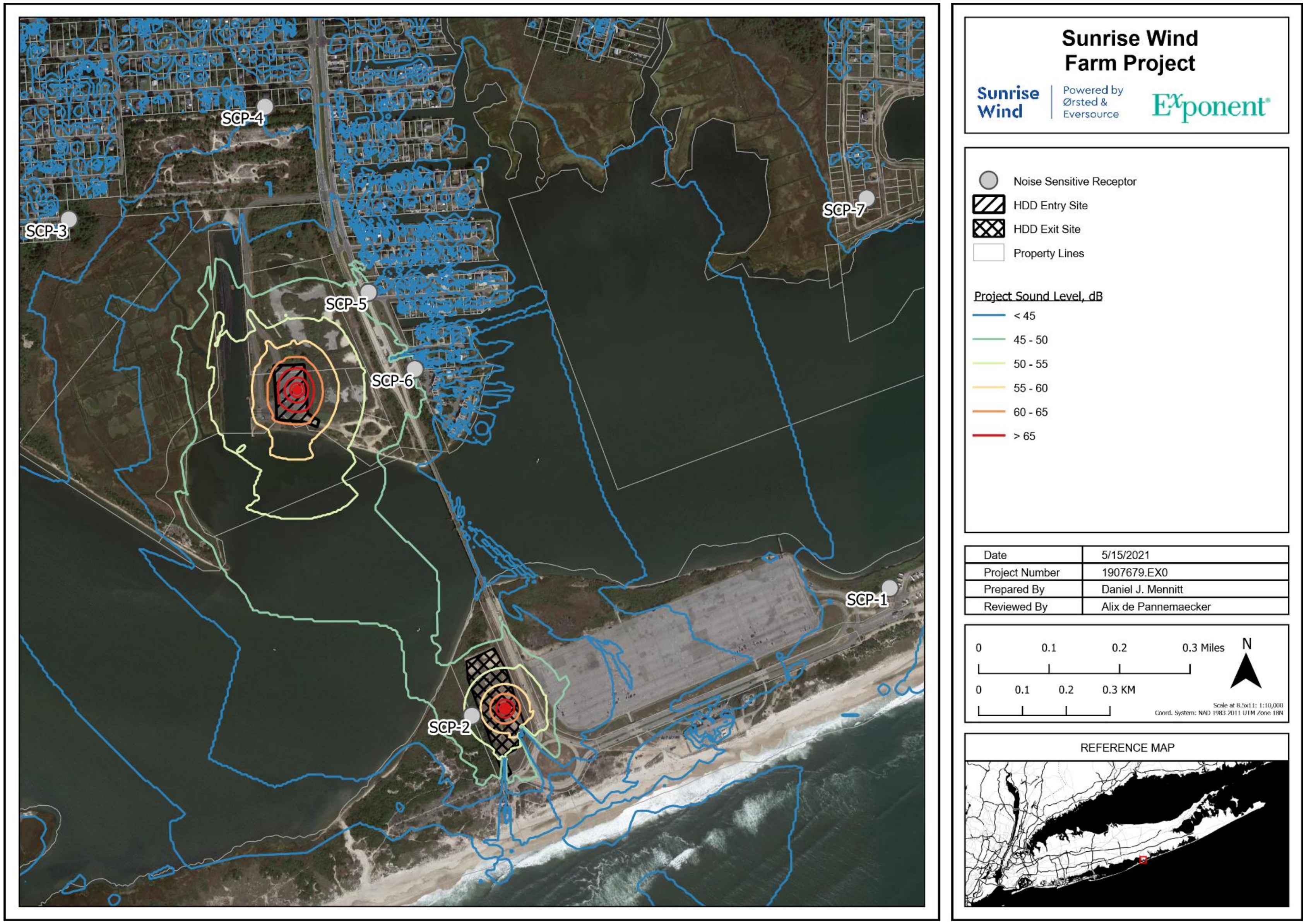

Figure 12. ICW HDD daytime construction noise contours.

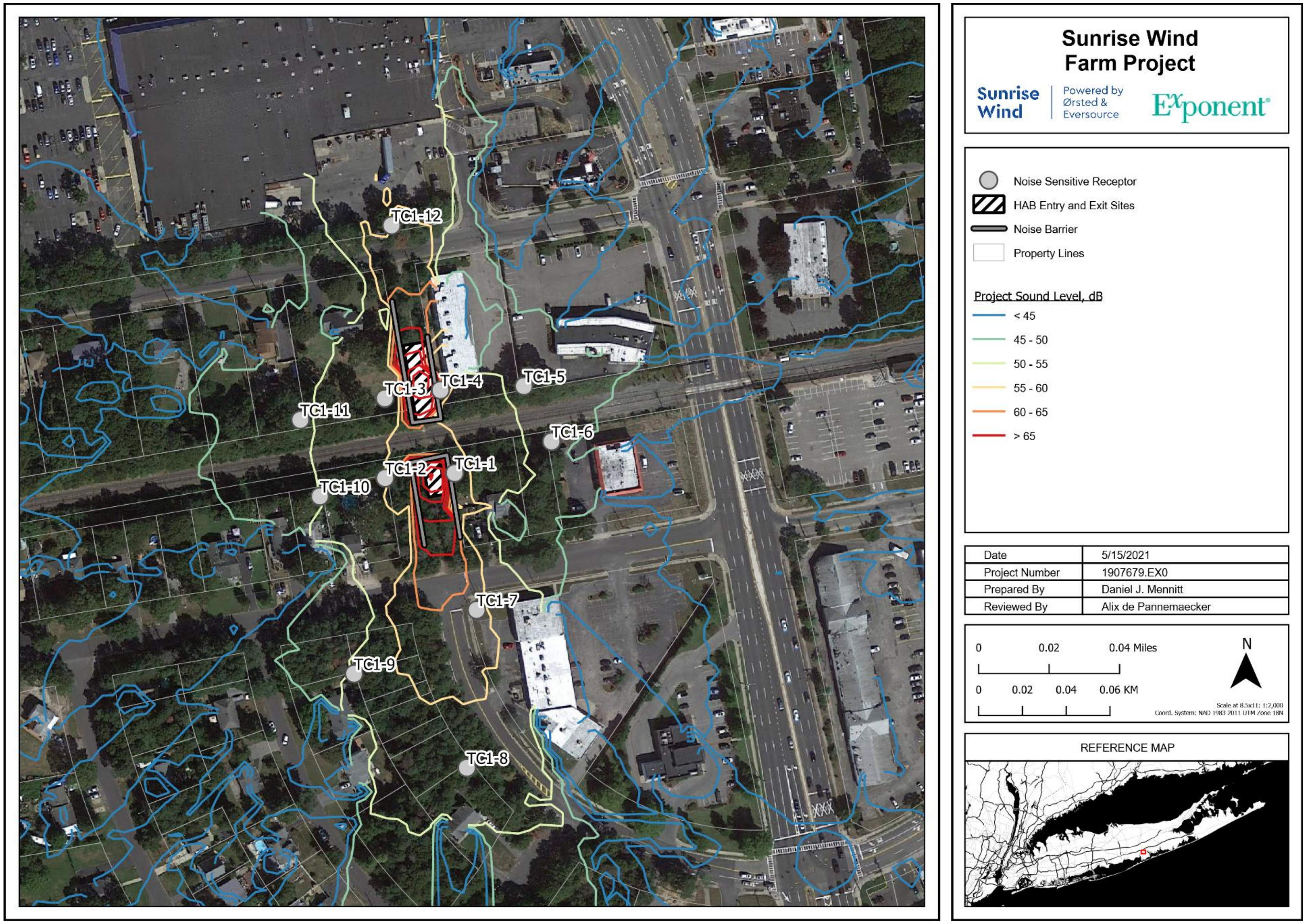

Figure 13. **TC1 HAB daytime construction noise contours.**

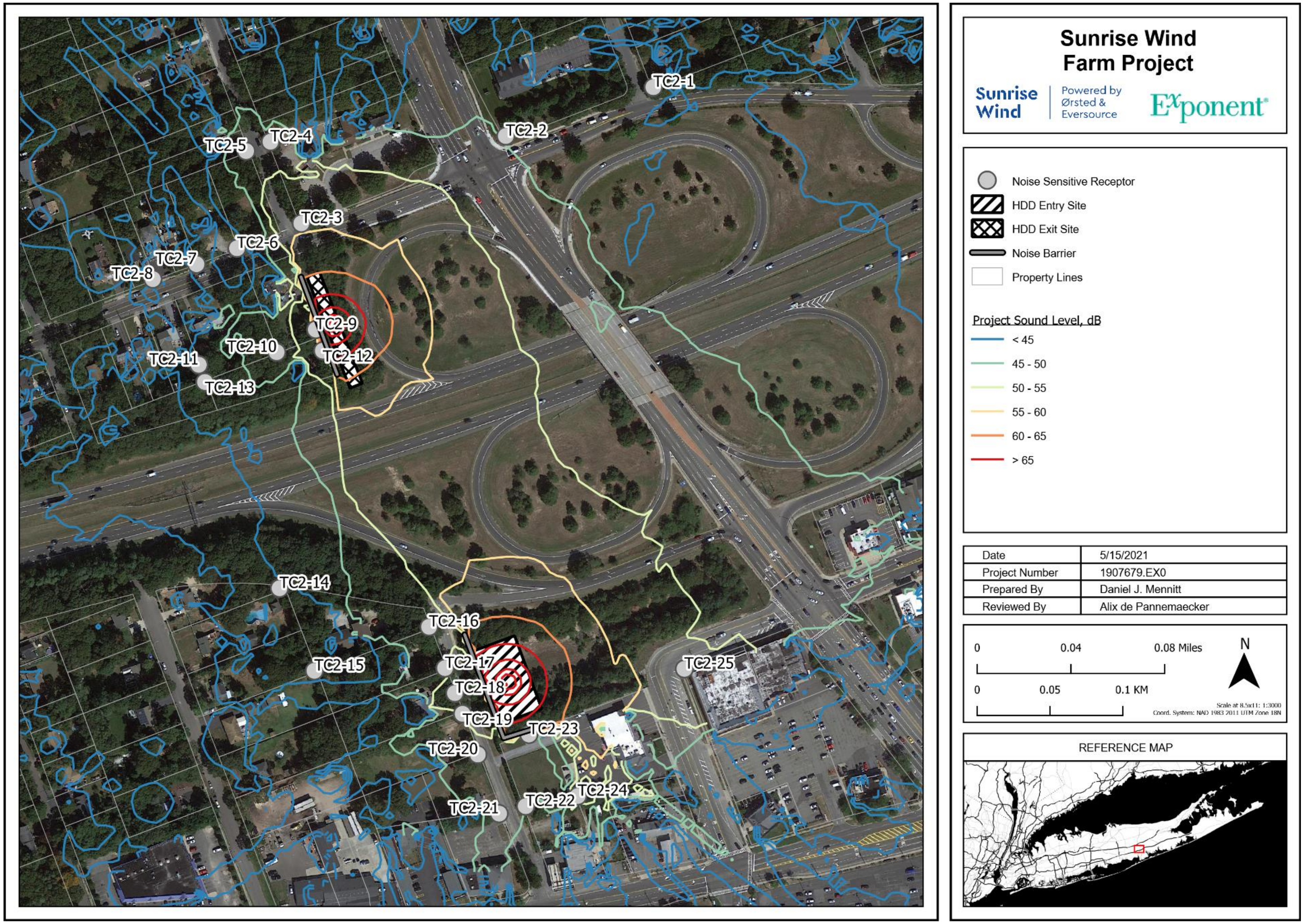

Figure 14. **TC2 HDD daytime construction noise contours.**

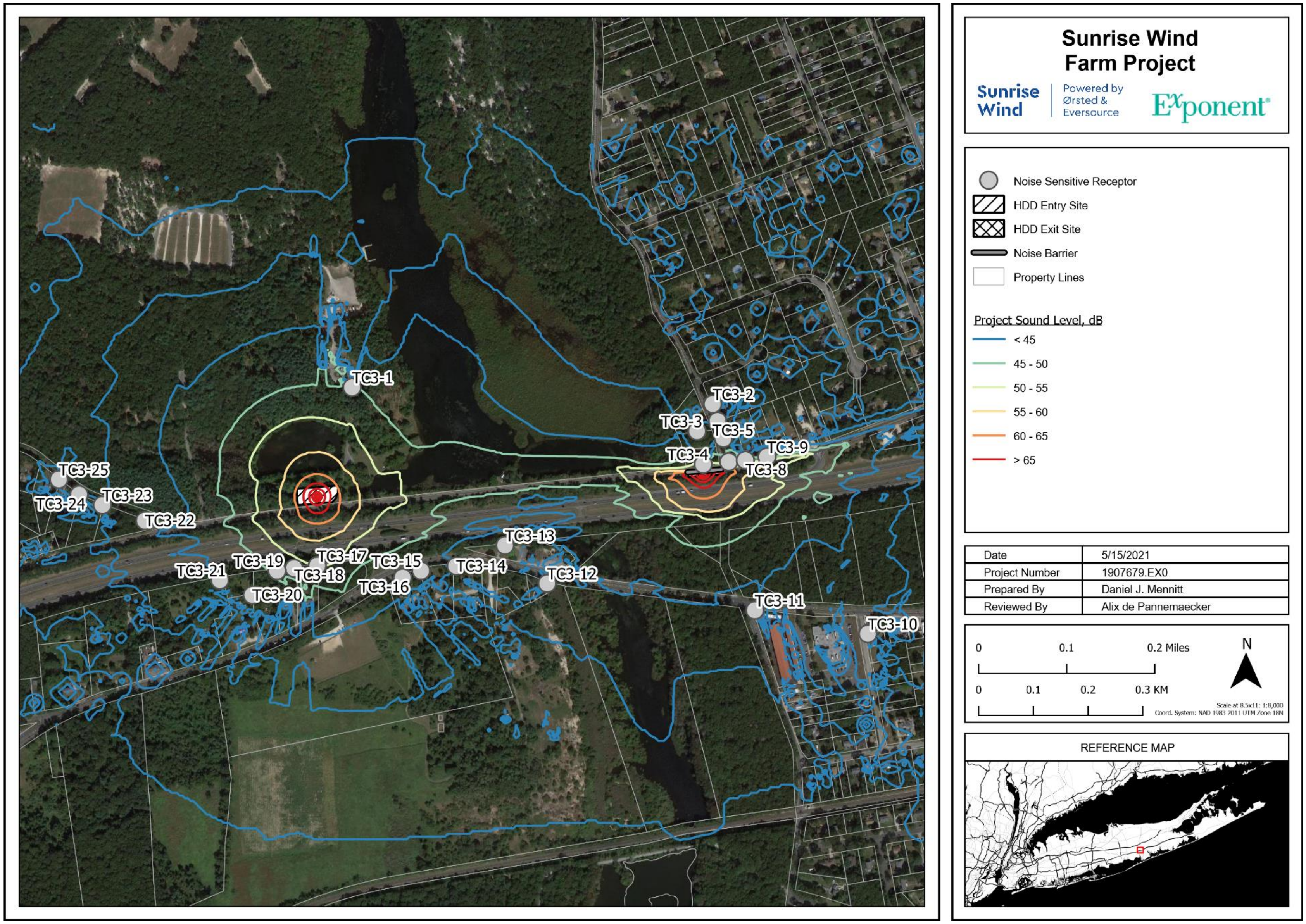

Figure 15. **TC3 HDD daytime construction noise contours.**

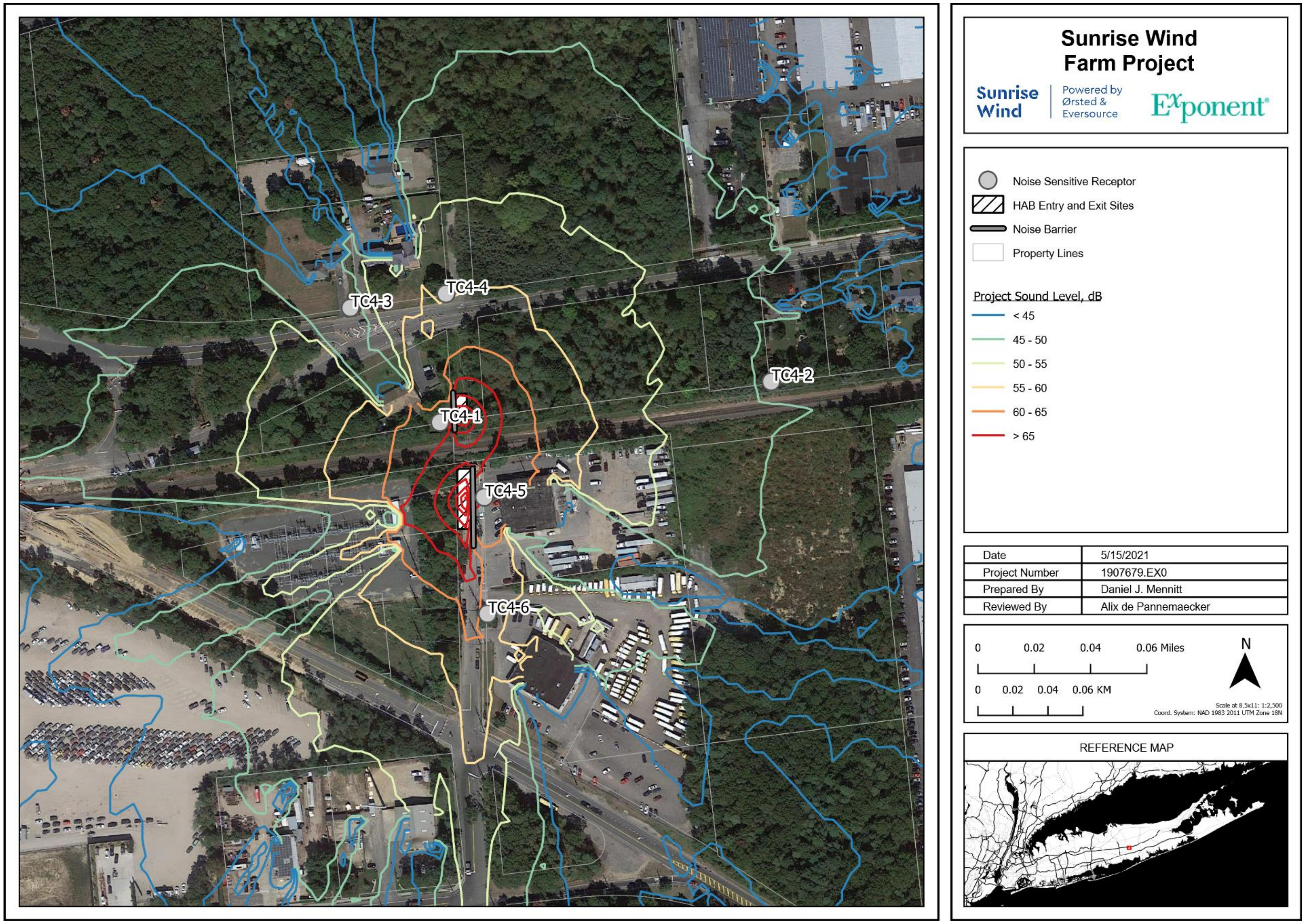

Figure 16. **TC4 HAB daytime construction noise contours.**

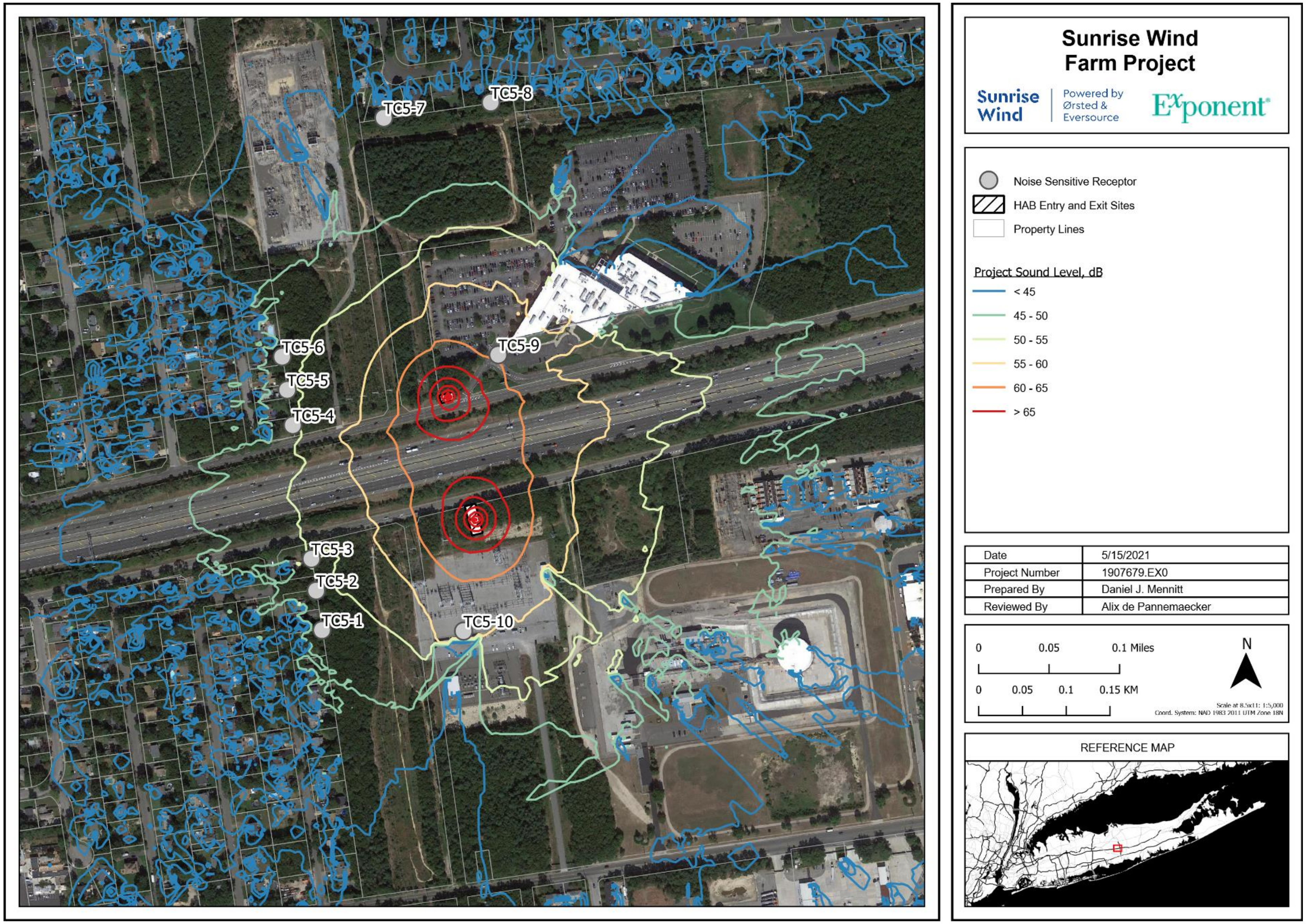

Figure 17. **TC5 HAB daytime construction noise contours.**

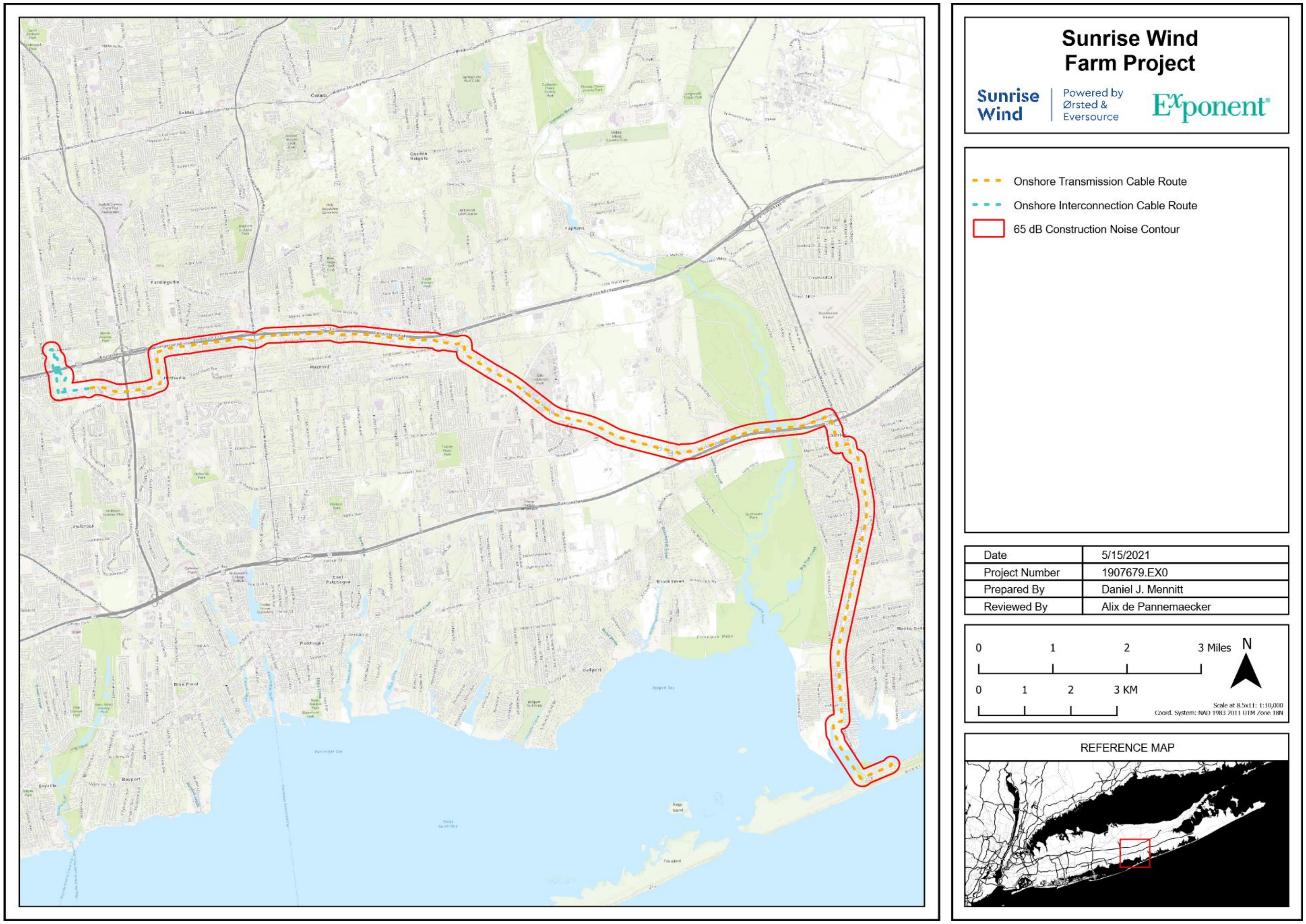

Figure 18. **Onshore cable routes and 65 dBA construction noise contours.**

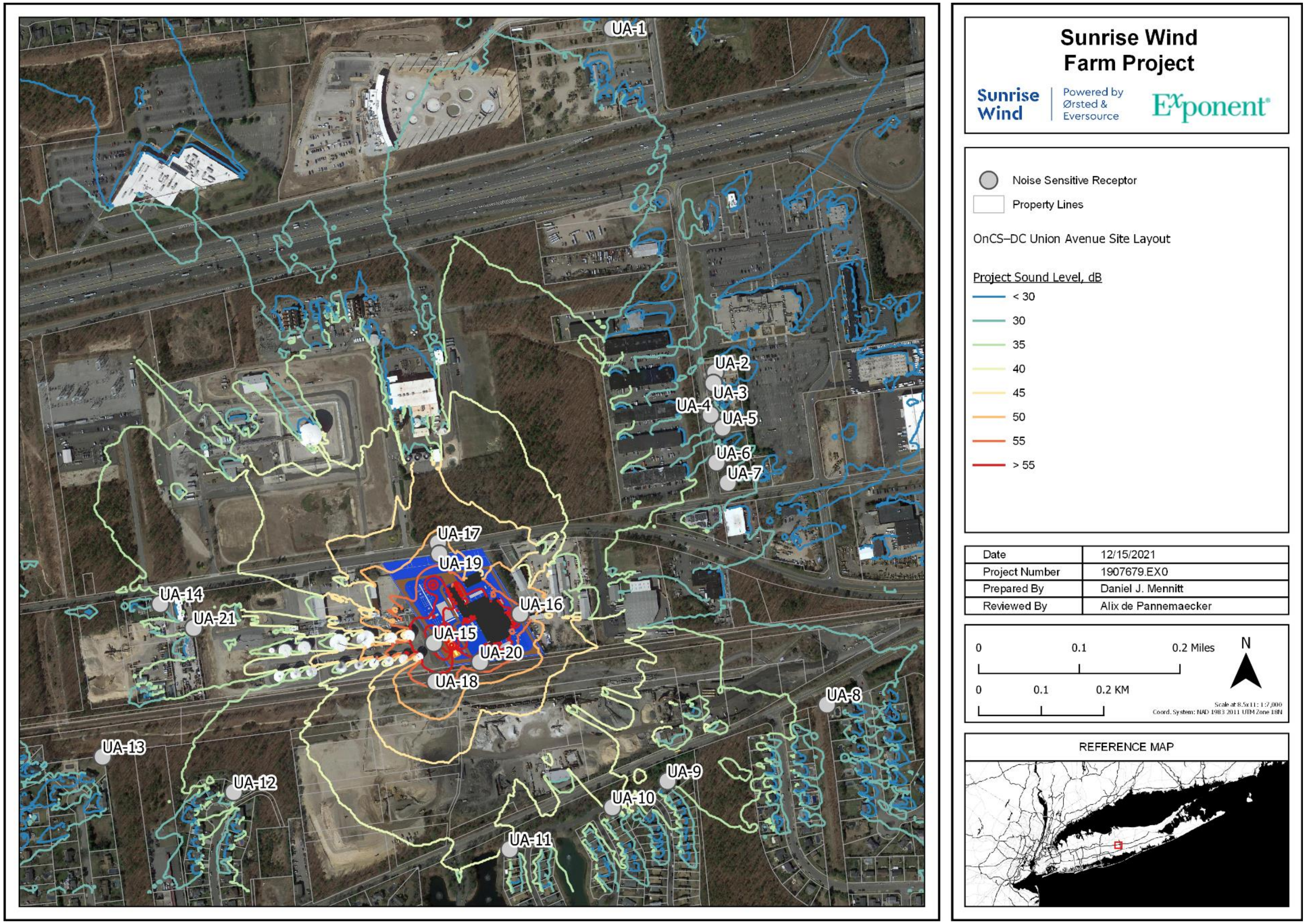

Figure 19. **OnCS–DC at the Union Avenue Site operational noise contours.**

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9.0 Limitations

At the request of TRC Environmental Corporation (TRC) and Sunrise Wind, Exponent Engineering P.C. (Exponent) conducted an environmental sound survey of ambient conditions, modeled anticipated noise levels from the proposed Project, and assessed potential noise impacts from the Project. The scope of services performed during this investigation may not adequately address the needs of other users of this report, and any re-use of this report or its findings, conclusions, or recommendations presented herein for purposes other than intended for Project permitting are at the sole risk of the user.

This report summarizes the analysis performed to date and presents the findings resulting from that work. In the analysis, we have relied on geospatial data, specifications, usage, and various other types of information describing the anticipated construction and operation activities of the Project provided by TRC and Sunrise Wind. Although Exponent has exercised usual and customary care in the conduct of this analysis, the responsibility for the design and operation of the Project remains fully with Sunrise Wind. Sunrise Wind has confirmed to Exponent that the data contained herein are not subject to Critical Energy Infrastructure Information restrictions.

The findings presented herein are made to a reasonable degree of engineering and scientific certainty. Exponent reserves the right to supplement this report and to expand or modify opinions based on review of additional material if it becomes available.

10.0 Appendix A

Certificate of Calibration and Conformance

This document certifies that the instrument referenced below meets published specifications per Procedure PRD-P263; ANSI S1.4-1983 (R 2006) Type 1; S1.4A-1985; S1.43-1997 Type 1; S1.11-2004 Octave Band Class 0; S1.25-1991; IEC 61672-2002 Class 1; 60651-2001 Type 1; 60804-2000 Type 1; 61260-2001 Class 0; 61252-2002.

Manufacturer:	Larson Davis	Temperature:	72.4	°F
Model Number:	831		22.44	°C
Serial Number:	3005	Rel. Humidity:	38.8	%
Customer:	TMS Rental	Pressure:	992.4	mbars
Description:	Sound Level Meter		992.4	hPa

Note: As Found/As Left: In Tolerance

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 18-Mar-20 Calibration Due:

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	5/6/2020

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of The Modal Shop.

Technician: Bradly Haarmeyer Signature: [signature]

THE MODAL SHOP
A PCB GROUP CO.

3149 East Kemper Road
Cincinnati, OH. 45241
Phone: (513) 351-9919
(800) 860-4867
www.modalshop.com

PRD-F242 revB July 25, 2016 Page 1 of 1

Certificate of Calibration and Conformance

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Manufacturer:	Larson Davis	Temperature:	68.5	°F
Model Number:	831		20.28	°C
Serial Number:	3327	Rel. Humidity:	21.2	%
Customer:	TMS Rental	Pressure:	990.5	mbars
Description:	Sound Level Meter		990.5	hPa

Note: As Found/As Left: In Tolerance

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 3-Feb-20 Calibration Due:

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	5/6/2020

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

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Technician: William Kellner Signature: William Kellner

THE MODAL SHOP
A PCB GROUP CO.

3149 East Kemper Road
Cincinnati, OH. 45241
Phone: (513) 351-9919
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www.modalshop.com

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Manufacturer:	Larson Davis	Temperature:	69.2	°F
Model Number:	831		20.67	°C
Serial Number:	3556	Rel. Humidity:	16.2	%
Customer:	TMS Rental	Pressure:	990.5	mbars
Description:	Sound Level Meter		990.5	hPa

Note: As Found/As Left: In Tolerance

Upon receipt for testing, this instrument was found to be:

Within the stated tolerance of the manufacturer's specification.

Calibration Date: 5-Feb-20 Calibration Due:

Calibration Standards Used:

Manufacturer	Model	Serial Number	Cal Due
Stanford Research Systems	DS360	123270	5/6/2020

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at The Modal Shop and/or Larson Davis Corporate Headquarters. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. Calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of The Modal Shop.

Technician: William Kellner Signature: William Kellner

THE MODAL SHOP
A PCB GROUP CO.

3149 East Kemper Road
Cincinnati, OH. 45241
Phone: (513) 351-9919
(800) 860-4867
www.modalshop.com

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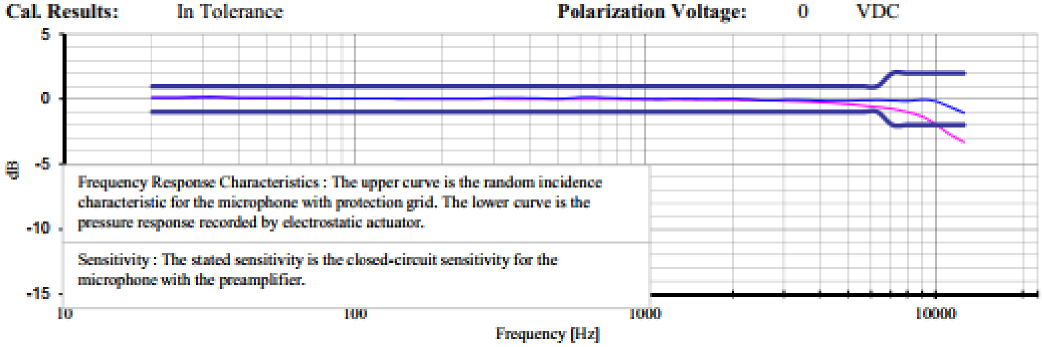
THE MODAL SHOP INC.
A PCB GROUP CO.

3149 East Kemper Rd.
Cincinnati, OH 45241
Ph : 513-351-9919
Fax: 513-458-2172
www.modalshop.com

~Certificate of Calibration~

Manufacturer:	PCB	PCB	**Customer:**	TMS Rental
Model Number:	377C20	426E01	**Address:**	
Serial Number:	172574	41101		
Asset ID:			**Calibration Date:**	Dec 11, 2019 12:52:33
Description:	Random Microphone with Preamplifier		**Due Date:**	

Sensitivity:	**250 Hz**	**1 kHz**		**Temperature:**	70 (21)	°F (°C)
	-26.74	-26.77	dB re. 1V/Pa	**Humidity:**	28	%
	46.04	45.86	mV/Pa	**Ambient Pressure:**	1009.8	mbar
Cal. Results:	In Tolerance			**Polarization Voltage:**	0	VDC



Traceability: The calibration is traceable through NIST Project A1801.

Notes: Calibration results relate only to the items calibrated.
This certificate may not be reproduced, except in full, without written permission.
This calibration is performed in compliance with ISO 9001, ISO 17025 and ANSI Z540.
Measurement uncertainty (250 Hz sensitivity calibration) at 95% confidence level: 0.30 dB
Calibrated per procedure PRD-P204.

User Note: As Found / As Left: In Tolerance.

Frequency Response with reference to level at 250 Hz

Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)
20	0.08	630	0.12	4500	-0.15		
25	0.08	800	0.04	5000	-0.16		
31.5	0.13	1000	-0.01	5600	-0.12		
40	0.07	1120	-0.02	6300	-0.10		
50	0.07	1250	0.00	7100	-0.13		
63	0.06	1400	0.01	8000	-0.16		
80	0.03	1600	-0.01	9000	-0.07		
100	0.03	1800	0.00	10000	-0.18		
125	0.02	2000	0.01	11200	-0.61		
160	0.01	2240	-0.04	12500	-1.07		
200	0.00	2500	-0.11				
250	0.00	2800	-0.11				
315	0.06	3150	-0.07				
400	0.05	3550	-0.09				
500	0.01	4000	-0.14				

Technician: Ed Devlin

Approval:

Reference Equipment Used:

Manuf.	*Model*	*Serial*	*Cal. Date*	*Due Date*
GRAS	40AG	58094	2/11/2019	2/11/2020

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THE MODAL SHOP INC
A PCB GROUP CO.

3149 East Kemper Rd.
Cincinnati, OH 45241
Ph : 513-351-9919
Fax: 513-458-2172
www.modalshop.com

~Certificate of Calibration~

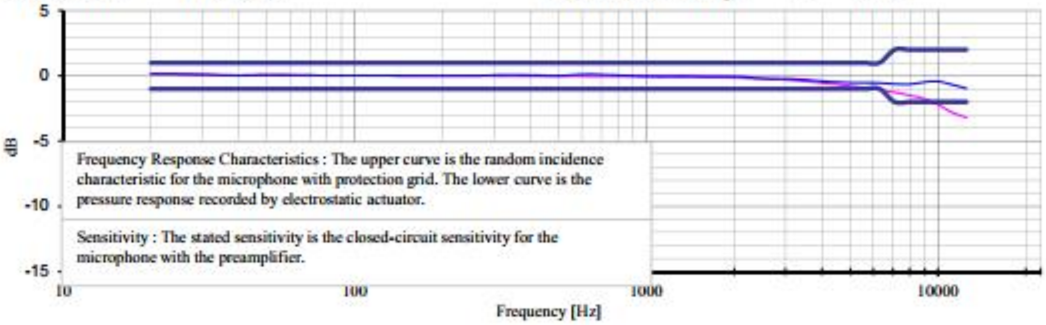
Manufacturer: PCB PCB
Model Number: 377C20 426E01
Serial Number: 164999 41114
Asset ID:
Description: Random Microphone with Preamplifier

Customer: TMS Rental
Address:
Calibration Date: Dec 11, 2019 12:59:00
Due Date:

Sensitivity:	**250 Hz**	**1 kHz**	
	-26.44	-26.49	dB re. 1V/Pa
	47.63	47.39	mV/Pa

Temperature:	70 (21)	°F (°C)
Humidity:	28	%
Ambient Pressure:	1009.8	mbar
Polarization Voltage:	0	VDC

Cal. Results: In Tolerance



Traceability: The calibration is traceable through NIST Project A1801.

Notes: Calibration results relate only to the items calibrated.
This certificate may not be reproduced, except in full, without written permission.
This calibration is performed in compliance with ISO 9001, ISO 17025 and ANSI Z540.
Measurement uncertainty (250 Hz sensitivity calibration) at 95% confidence level: 0.30 dB
Calibrated per procedure PRD-P204.

User Note: As Found / As Left: In Tolerance.

Frequency Response with reference to level at 250 Hz

Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)
20	0.14	630	0.12	4500	-0.48		
25	0.13	800	0.04	5000	-0.52		
31.5	0.08	1000	-0.03	5600	-0.53		
40	0.03	1120	-0.04	6300	-0.55		
50	0.06	1250	-0.03	7100	-0.62		
63	0.04	1400	-0.03	8000	-0.64		
80	0.03	1600	-0.06	9000	-0.48		
100	0.02	1800	-0.06	10000	-0.44		
125	0.02	2000	-0.05	11200	-0.68		
160	0.01	2240	-0.12	12500	-0.97		
200	0.01	2500	-0.21				
250	0.00	2800	-0.23				
315	0.06	3150	-0.24				
400	0.05	3550	-0.30				
500	0.00	4000	-0.42				

Technician: Ed Devlin

Approval: [signature]

Reference Equipment Used:

Manuf.	*Model*	*Serial*	*Cal. Date*	*Due Date*
GRAS	40AG	58094	2/11/2019	2/11/2020

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Cincinnati, OH 45241
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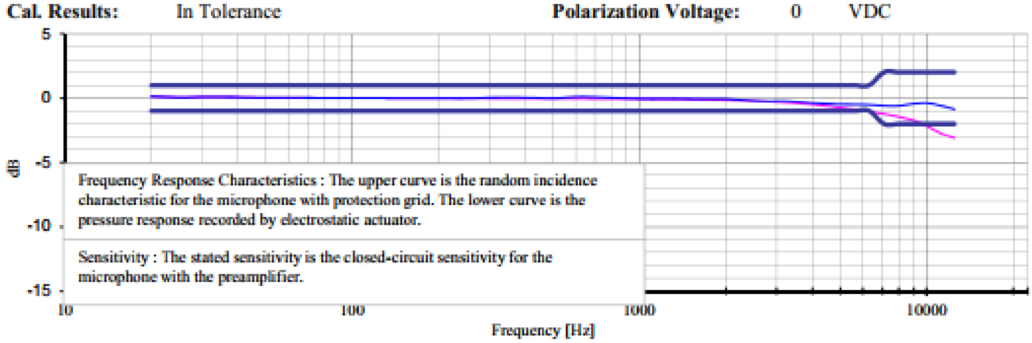
Fax: 513-458-2172
www.modalshop.com

~Certificate of Calibration~

Manufacturer:	PCB	PCB	**Customer:**	TMS Rental
Model Number:	377C20	426E01	**Address:**	
Serial Number:	300440	41116		
Asset ID:			**Calibration Date:**	Dec 11, 2019 13:26:13
Description:	Random Microphone with Preamplifier		**Due Date:**	

Sensitivity:	**250 Hz**	**1 kHz**		**Temperature:**	70 (21)	°F (°C)
	-26.42	-26.47	dB re. 1V/Pa	**Humidity:**	28	%
	47.78	47.50	mV/Pa	**Ambient Pressure:**	1009.8	mbar
Cal. Results:	In Tolerance			**Polarization Voltage:**	0	VDC



Traceability: The calibration is traceable through NIST Project A1801.

Notes: Calibration results relate only to the items calibrated.
This certificate may not be reproduced, except in full, without written permission.
This calibration is performed in compliance with ISO 9001, ISO 17025 and ANSI Z540.
Measurement uncertainty (250 Hz sensitivity calibration) at 95% confidence level: 0.30 dB
Calibrated per procedure PRD-P204.

User Note: As Found / As Left: In Tolerance.

Frequency Response with reference to level at 250 Hz

Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)	Frequency (Hz)	Upper (dB)
20	0.15	630	0.12	4500	-0.45		
25	0.07	800	0.04	5000	-0.49		
31.5	0.11	1000	-0.03	5600	-0.50		
40	0.08	1120	-0.04	6300	-0.53		
50	0.04	1250	-0.03	7100	-0.60		
63	0.04	1400	-0.03	8000	-0.61		
80	0.03	1600	-0.06	9000	-0.45		
100	0.02	1800	-0.06	10000	-0.40		
125	0.02	2000	-0.06	11200	-0.60		
160	0.01	2240	-0.13	12500	-0.88		
200	0.00	2500	-0.22				
250	0.00	2800	-0.25				
315	0.06	3150	-0.24				
400	0.05	3550	-0.29				
500	0.00	4000	-0.38				

Technician: Ed Devlin

Approval: [signature]

Reference Equipment Used:

Manuf.	*Model*	*Serial*	*Cal. Date*	*Due Date*
GRAS	40AG	58094	2/11/2019	2/11/2020

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Calibration Certificate

Certificate Number 2020009399

Customer:
The Modal Shop
10310 AeroHub Boulevard
Cincinnati, OH 45215, United States

Model Number	CAL200	***Procedure Number***	D0001.8386		
Serial Number	18149	***Technician***	Scott Montgomery		
Test Results	**Pass**	***Calibration Date***	26 Aug 2020		
Initial Condition	As Manufactured	***Calibration Due***			
Description	Larson Davis CAL200 Acoustic Calibrator	***Temperature***	24	°C	± 0.3 °C
		Humidity	41	%RH	± 3 %RH
		Static Pressure	101.3	kPa	± 1 kPa

Evaluation Method The data is aquired by the insert voltage calibration method using the reference microphone's open circuit sensitivity. Data reported in dB re 20 μPa.

Compliance Standards Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
IEC 60942:2017 ANSI S1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017. **Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.**

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Standards Used

Description	Cal Date	Cal Due	Cal Standard
Agilent 34401A DMM	08/04/2020	08/04/2021	001021
Larson Davis Model 2900 Real Time Analyzer	04/02/2020	04/02/2021	001051
Microphone Calibration System	03/03/2020	03/03/2021	005446
1/2" Preamplifier	09/17/2019	09/17/2020	006506
Larson Davis 1/2" Preamplifier 7-pin LEMO	08/06/2020	08/06/2021	006507
1/2 inch Microphone - RI - 200V	12/06/2019	12/06/2020	006511
Pressure Transducer	10/18/2019	10/18/2020	007204

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Provo, UT 84601, United States
716-684-0001

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D0001.8410 Rev C

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Output Level

Nominal Level [dB]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
114	101.3	114.01	113.80	114.20	0.14	Pass
94	101.3	94.02	93.80	94.20	0.14	Pass

-- End of measurement results--

Frequency

Nominal Level [dB]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
114	101.3	1,000.28	990.00	1,010.00	0.20	Pass
94	101.3	1,000.25	990.00	1,010.00	0.20	Pass

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N)

Nominal Level [dB]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
114	101.3	0.46	0.00	2.00	0.25 ‡	Pass
94	101.3	0.46	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Level Change Over Pressure

Tested at: 114 dB, 24 °C, 36 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
108.0	108.0	-0.03	-0.30	0.30	0.04 ‡	Pass
101.3	101.4	0.00	-0.30	0.30	0.04 ‡	Pass
92.0	91.9	0.03	-0.30	0.30	0.04 ‡	Pass
83.0	82.9	0.03	-0.30	0.30	0.04 ‡	Pass
74.0	74.0	0.00	-0.30	0.30	0.04 ‡	Pass
65.0	65.0	-0.07	-0.30	0.30	0.04 ‡	Pass

-- End of measurement results--

Frequency Change Over Pressure

Tested at: 114 dB, 24 °C, 36 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
108.0	108.0	0.00	-10.00	10.00	0.20 ‡	Pass
101.3	101.4	0.00	-10.00	10.00	0.20 ‡	Pass
92.0	91.9	0.00	-10.00	10.00	0.20 ‡	Pass
83.0	82.9	0.00	-10.00	10.00	0.20 ‡	Pass
74.0	74.0	0.00	-10.00	10.00	0.20 ‡	Pass
65.0	65.0	-0.01	-10.00	10.00	0.20 ‡	Pass

-- End of measurement results--

Certificate Number 2020009399

Total Harmonic Distortion + Noise (THD+N) Over Pressure

Tested at: 114 dB, 24 °C, 36 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
108.0	108.0	0.44	0.00	2.00	0.25 ‡	Pass
101.3	101.4	0.45	0.00	2.00	0.25 ‡	Pass
92.0	91.9	0.46	0.00	2.00	0.25 ‡	Pass
83.0	82.9	0.48	0.00	2.00	0.25 ‡	Pass
74.0	74.0	0.50	0.00	2.00	0.25 ‡	Pass
65.0	65.0	0.53	0.00	2.00	0.25 ‡	Pass

-- End of measurement results--

Signatory: *Scott Montgomery*

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