ENCLOSURE

TURKEY POINT UNITS 6 & 7 COMBINED LICENSE APPLICATION ENVIRONMENTAL REPORT SUPPLEMENT

ASSESSMENT OF CERTAIN POTENTIAL CONSTRUCTION NOISE AND VIBRATION IMPACTS ON THREATENED AND ENDANGERED AQUATIC SPECIES

Golder Associates Inc.
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ASSESSMENT OF CERTAIN POTENTIAL CONSTRUCTION NOISE AND VIBRATION IMPACTS ON THREATENED AND ENDANGERED AQUATIC SPECIES

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Proposed Turkey Point Units 6 & 7

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Table of Contents

List of Tables

List of Figures

1.0 INTRODUCTION

This report provides an assessment of aquatic noise and vibration associated with certain potential sources of underwater sound during construction of the proposed Turkey Point Units 6 & 7 Project (Project), including the species (receptors) of concern and the methodology for assessing potential impacts. Where possible, the 2014 Biological Opinion (BO) by the National Marine Fisheries Service (NMFS) for the U.S. Army Corps of Engineers (USACE) Regional General Permit (RGP) SAJ-82 (specifically Appendices B and C) was used as a reference for predicted noise levels by activity and impact thresholds by type of receptor. This approach should facilitate review by NMFS staff by using previously accepted noise data and values applied to marine environments similar to those adjacent to the Project. In addition to underwater noise, this report addresses potential airborne noise as it applies to the American crocodile, which nests on the berms within the Industrial Waste Water Treatment Facility (IWWTF).

2.0 POTENTIAL SOURCES AND RECEPTORS OF NOISE FROM PROJECT

2.1 Certain Potential Noise Sources

Golder identified certain potential noise sources that may impact threatened and endangered (listed) marine species during construction of specific portions of Turkey Point Units 6 & 7. Predicted sound levels were evaluated for the following sources of potential noise:

- Construction of the barge unloading area (sheet piling and dredging);
- Construction of the radial collector wells using trenchless technology (microtunneling) for well radials;
- Construction of perimeter sheet pile associated with Unit 6 & 7 Plant Area adjacent to the IWWTF; and
- Airborne noise associated with site preparation and construction

These sound sources can be categorized generally as pulsed (pile driving) or continuous (microtunneling). The standard sound measurement for determining potential effects on marine organisms is root mean square (RMS) pressure, though peak pressure is often used to determine threshold values. The anticipated duration of construction for each area/activity is also included in the analysis. Vibrations caused by ground-based construction activities that can potentially be transmitted from soil into water as well as microtunneling 25 to 40 feet underneath Biscayne Bay are insignificant sources relative to direct water contact activities such as installation of sheet pile in water, which would have significantly more potential noise effects on biota.

NMFS has developed impact criteria based upon RMS sound pressure and cumulative sound exposure (SEL) levels for fish, sea turtles and marine mammals. While the criteria are based on sound levels, the effects are based on studies that indicate sound vibrations and low frequency noise (100 to less than 2000 hertz) result in potential impacts, including effects upon behavior. This assessment is limited to waterborne and, in the case of the crocodiles, airborne sound levels. Land vibrations that do not result in additional waterborne or airborne sound above background levels will not have an effect on any of the receptors of concern and are not included in this assessment.

The existing barge canal at the Turkey Point Plant includes a turning basin that is approximately 300 feet wide and 1,200 feet long with a depth of approximately 18 feet. The canal is approximately 100 feet wide and extends northeast from the basin. The depth in the center of the canal ranges between 11-15 feet while the depth of the adjacent areas of Biscayne Bay ranges from 2-4 feet near the plant and 4-6 feet near the end of the marked canal.

Radial collector wells will consist of central cassions constructed upon uplands located on Turkey Point that are connected to laterals. The laterals will project horizontally from the caissons a distance of up to 900 feet at a depth of approximately 25 to 40 feet beneath Biscayne Bay.

2.2 Potential Receptors

The potential receptors identified for noise are marine mammals, sea turtles, crocodiles, and fish. The NMFS will be most concerned with protected species in the waters of Biscayne Bay in the vicinity of the Project. Based on the 2014 BO in support of the USACE RGP SAJ-82 for marine facilities in the Florida Keys, the species of concern are the smalltooth sawfish (*Pristis pectinata*) and the five sea turtle species that may inhabit the adjacent waters in the vicinity of the Project: loggerhead (*Caretta caretta*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), and Kemp's ridley (*Lepidochelys kempii*). In addition, the NMFS identified the Nassau grouper (*Epinephelus striatus*) as an additional species of concern based on its candidacy as a listed species. The U.S. Fish and Wildlife Service will address potential impacts from construction to the American crocodile (*Crocodylus acutus*) and West Indian manatee (*Trichechus manatus*), and the NMFS will include the bottlenose dolphin (*Tursiops truncatus*) in its assessment.

This underwater noise assessment includes noise thresholds and distances for the smalltooth sawfish, Nassau grouper, sea turtles, West Indian manatee, and bottlenose dolphin under the assumption that these species may be present in the vicinity of the barge canal turning basin during construction. The depth of the water in the turning basin, the shallow nature of the surrounding waters of Biscayne Bay, and the lack of submerged aquatic vegetation (SAV) in the canal and turning basin all result in a very small likelihood that these species will be present in close proximity to the proposed barge unloading area.

In the portion of Biscayne Bay where the proposed radial collector wells will be located, the shallow depth is appropriate for the smalltooth sawfish, but the project area is not within NMFS-designated critical habitat for smalltooth sawfish. The depth and bottom cover are also appropriate for juvenile Nassau grouper in the areas of the collector wells. The adult Nassau grouper, sea turtles, manatee, and dolphin are much less likely to inhabit the shallow waters adjacent to Turkey Point.

3.0 IMPACT ASSESSMENT

The following section includes a separate evaluation of potential noise impacts for four sets of project activities: sheet pile installation and dredging of the barge unloading area; horizontal directional drilling for the radial collector wells; sheet pile driving around the plant area for dredging and backfilling; and site preparation and plant construction. Each activity will be assessed separately due to the different noise sources and available data on noise levels and potential impacts.

3.1 Sheet Pile Installation at the Barge Unloading Area

The underwater noise generated by sheet pile driving is in the form of pulsed sounds that occur at various intervals depending upon the equipment used. The repetitive nature of the pile driving sounds does not allow the receptors to fully recover from one pulse before the next pulse is produced. In order to assess this type of sound source, NMFS has developed a model and criteria based upon the sound pressure levels (RMS and peak) and the sound exposure level (SEL) that takes into account the number of pulses per day. The NMFS model can be used to assess the potential noise levels generated from pile driving if used for the construction of marine facilities.

The modeling approach included the following data and assumptions as also described in Appendices B and C in the above referenced BO for SAJ-82 (NMFS, 2014):

3.1.1 Source Noise Levels

Predicted underwater noise levels for the sheet pile driving are as follows:

- Driving a 24-inch AZ steel sheet pile with an impact hammer has been measured to produce noise at a peak pressure of 220 dB, RMS of 204 dB, and SEL of 194 dB (CALTRANS, 2012; NMFS, 2014)
  - All sound pressure levels are referenced to 1 micro Pascal (μPa) at 1 m
- This noise source is expected to be present during daytime hours for no more than two weeks during construction of a sheet pile wall approximately 90 ft in total length

3.1.2 Noise Impact Thresholds

Based on a literature review and the NMFS BO (2014), noise levels were identified that cause potential effects to marine species that could be present in the vicinity of the Project. The results are summarized below:

- The underwater noise peak sound pressure threshold for potential injury to fish and sea turtles is 206 dB, and the cumulative sound pressure threshold (SEL) for potential injury to fish ≥ 2 g and sea turtles is 187 dB (NMFS, 2014; Stadler and Woodbury, 2009)
- The underwater noise pressure threshold (RMS) for behavioral disturbance to fish is 150 dB, and the underwater noise pressure threshold (RMS) for behavioral disturbance to sea turtles is 160 dB (NMFS, 2014; Stadler and Woodbury, 2009)
- The underwater noise pressure threshold (RMS) for potential injury to cetaceans is 180 dB, while the underwater noise pressure threshold (RMS) for behavioral disturbance to cetaceans is 160 dB for pulsed sounds (Southall et al., 2007)
- West Indian manatees are conservatively assumed to have the same thresholds as cetaceans
- All sound pressure levels are referenced to 1 micro Pascal (μPa) at 1 m

3.1.3 Noise Level Prediction from NMFS Model

The radial distance from the sound source to the injury or behavior thresholds are listed in Table 1, and the areas exposed to sound levels above these thresholds are shown in Figure 1. The results using the NMFS underwater noise model indicate that the areas where noise levels are predicted to be high enough to cause potential physical or auditory injury are limited, for the most part, to the barge turning basin itself. The threshold for potential behavioral effects and cumulative auditory effects on fishes does theoretically extend approximately 2800 feet into the adjacent Biscayne Bay. However, the sheet pile driving will occur in water that is up to approximately 18 feet deep, and the sound waves associated with the predicted noise will likely travel along the deeper center of the canal and reflect off the shallow sides. This local topographic feature makes the 150 dB threshold contour line shown in Figure 1 a conservative estimate. The noise from dredging the barge unloading area was not included in the assessment because the extent of dredging to connect the upland-excavated area to the existing turning basin is only 0.1 acre and sheet pile wall will be in place during the dredging that will act to prevent turbidity and reduce noise from entering the adjacent waters.

3.1.4 Potential for Exposure and Species Response to Noise

Based on the habitats and depths within the barge turning basin and adjacent portion of Biscayne Bay, there is a low likelihood that any of the potential receptors of concern will be exposed to noise generated by the sheet pile driving (Table 1). Sea turtles have a low probability of be present in the vicinity of the sheet pile wall due to the lack of nesting beaches and the shallow water depth in the adjacent portion of Biscayne Bay. There is also a low probability of larger Nassau grouper in the vicinity of the Project, but juvenile grouper may occupy the seagrass beds and mangrove habitats near Turkey Point. The construction area is not in the designated critical habitat for the smalltooth sawfish, and there are no documented occurrences of this species at Turkey Point. The West Indian manatee is not likely to occupy the barge turning basin due to a lack of seagrass, and the Project's manatee protection plan will require

that in-water work be stopped (eliminating noise sources) if manatees approach the sheet pile area during construction in accordance with the Florida Fish and Wildlife Conservation Commission requirements. Finally, the bottlenose dolphin does not commonly occur in the very shallow waters around Turkey Point.

As described above, the likelihood of occurrence is low for the species of concern, and if any individuals are present during construction they are most likely to be in the adjacent bay. The most common response at this distance from the potential noise source by the species of concern is avoidance of the area during the period when noise is generated (up to 2 weeks). This avoidance could result in disrupted feeding, though the turning basin is not a likely foraging area for any of the species of concern and there is suitable foraging habitat available throughout Biscayne Bay outside of the area of sheet pile installation (Figure 2). Based on all of the above factors, the construction of the barge unloading area through sheet pile installation and subsequent dredging is not likely to adversely affect any of the species of concern (Table 1).

3.2 Microtunneling for Radial Collector Wells

The proposed radial collector wells will extend outward from caissons located within uplands along the Turkey Point peninsula at a depth between 20 and 45 feet below the bottom of Biscayne Bay. The radial wells will be located in the Key Largo formation which is well indurated coralline limestone material (ER Figure 2.3-19; FPL, 2013). The layer above the Key Largo formation is Miami Limestone which is a sandy, oolitic limestone that formed as a precipitate and is approximately 25 feet in thickness at Turkey Point. The upper 3 feet of substrate below the waters of Biscayne Bay is organic muck made up of organic soil and silt. Both the oolitic precipitate and organic muck are materials that will dampen mechanical vibration and sound unlike the harder limestone in the Key Largo formation.

The radial collector well laterals will be installed using microtunneling technology. The predicted underwater noise generated via microtunneling is continuous sound of a level analogous to auger drilling and water jetting. As indicated in the BO for SAJ-82 (NMFS, 2014), both of these methods produce noise levels below the injury or behavioral thresholds for the receptors of concern at Turkey Point. Furthermore, the maximum predicted noise level of 120 dB re 1μPa at 1 m from the drill head will be further reduced by the combined minimum 25 feet of oolitic limestone and organic muck below the waters of Biscayne Bay. Finally, the microtunneling will be performed within a cased tunnel that will further insulate the mechanical vibration and noise. As a result, the potential noise is not expected to exceed ambient levels at the sediment/water interface above the microtunneling site.

The duration of microtunneling for the radial wells is approximately 2-4 years, within which drilling will be conducted during daytime hours and will extend along radials one at a time. The location of the microtunneling will move slowly along the radial route, thus an area above the drilling head will be

exposed to potential noise for relatively short durations within the overall construction timeframe. In addition, as previously indicated, there is a low probability that the species of concern will be present in the waters above the radial collector wells with the possible exception of juvenile grouper. Based on the above factors, this activity is not likely to adversely affect any of the species of concern.

3.3 Sheet Pile Installation at the Units 6 & 7 Plant Area

Stabilization of the Plant Area perimeter will be required to protect the IWWTF during excavation and removal of unsuitable material and placement of fill. To minimize potential impact on the cooling canals, the Units 6 & 7 Plant Area will first be isolated from IWWTF by installation of temporary sheet piling. The sheet piling will be installed to the Miami Limestone Formation around the perimeter of the plant area with the top of the sheet piling extending somewhat above the adjacent existing grade elevation. After the area behind the sheet piling is backfilled, the sheet piling will be removed and re-used as this process moves around the perimeter of the plant area. Eventually additional erosion protection such as riprap will be installed along the perimeter of the plant area adjacent to the canals. The sheet pile will not be installed within the canals; therefore, no significant aquatic noise impacts are anticipated. The potential for airborne noise generated by the installation of sheet pile along the perimeter of the Plant Area to enter the surrounding canals is addressed in the following Section.

3.4 Site Preparation and Construction of Plant and Radial Collector Caissons

Construction of the Project will require site preparation using heavy equipment and installation of foundations and erection of major components of each unit. The use of construction equipment, such as dump trucks, sheet-pile drivers, cranes, bulldozers, graders, front-end loaders, and air compressors will be required. These activities will result in airborne noise that can potentially impact threatened and endangered species as well as potentially enter the surrounding water bodies. This section presents the potential impacts due to airborne noise.

The construction period noise predictions for the Project were developed using the CadnaA (Computer Aided Noise Abatement) computer model, a computerized software program for calculation, presentation, assessment and prediction of environmental noise (DataKustik, 2006 et seq.).

CadnaA is an environmental noise propagation and attenuation computer program that was developed to assist with complex noise propagation calculations for major noise sources and projects. Potential noise sources are entered as octave band sound power levels, L_ws. Locations of the noise sources, buildings, and receptors are input directly on the base map and can be edited throughout the modeling process. All potential noise sources are assumed to be a point, line, area, or vertical area source, and can be specified by the user. Sound propagation is calculated by accounting for hemispherical spreading and three other user-identified attenuation options: atmospheric attenuation, path-specific attenuation, and

barrier attenuation. Atmospheric attenuation is calculated using International Organization for Standards, ISO 9613-1: "*Acoustics – Attenuation of sound during propagation outdoors – Part 1: Calculation of the absorption of sound by the atmosphere.*" CadnaA path-specific attenuation can be specified to account for the effects of soil, vegetation, foliage, and wind shadow. Directional source characteristics and reflection can be simulated using path-specific attenuation. Barrier attenuation is calculated by assuming an infinitely long barrier perpendicular to the source-receptor path. Total and A-weighted sound pressure levels (SPLs) are calculated.

The noise levels from the construction of the Project were evaluated using the L_ws for the various types of equipment associated with site preparation and construction of permanent features, such as foundations, buildings, cooling towers and other components of each unit. The modeling was performed to account for these phases of construction, which involve distinctly different activities. The construction phases evaluated were site preparation and permanent facilities construction/installation. Site preparation activities included potential noise sources associated with earthwork such as excavation, filling, and compaction that will be performed using heavy ground-based equipment (bulldozers, pan scrappers, and trucks). Permanent facility construction/installation includes the operation of the concrete batch plant, trucks, cranes, welders, compressors, and hammers.

Construction equipment has maximum noise levels ranging from approximately 70 to 90 dBA (measured at a distance of 50 ft). Tables 2 and 3 list the major types of equipment expected to be used during the construction of the Project and the associated noise characteristics during site preparation and construction of permanent features, respectively. Potential noise sources were located on the Plant Area and the radial collector wells area. Since the operations of construction noise sources are variable, sufficient noise sources were added in each simulation to represent a conservative estimate of maximum noise levels during each phase and location. In addition, all of the equipment was conservatively assumed to be operating continuously and simultaneously at peak power to produce peak sound power levels.

The potential noise levels resulting from these combinations of equipment were input as multiple sources to the model. Octave bands were estimated from *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances* (EPA, 1971). It is unlikely that all the equipment would be operating simultaneously and continuously; therefore, this impact assessment is conservative. Background SPL values were incorporated into the model to calculate impacts at the Plant Area boundary and the residential community closest to the Plant Area. The atmospheric and ground attenuation options were enabled during the noise modeling runs.

The location of each potential noise source was based on its location in the computerized site plan and imported into the CadnaA model for the noise analysis. Sources were distributed consistent with the activities associated with each phase and all sources were input as point sources. The atmospheric attenuation was set at the CadnaA default value, which is 10 degrees Celsius (50° F) and 70 percent relative humidity. For southern Florida, the default value would produce conservative results. The ground attenuation for the area was set to be equivalent to porous soil. No vegetation or other buildings that can act as barriers were considered in the model.

The predicted noise levels in the vicinity of the Plant Area due to site preparation and construction activities are estimated to range from about 80 dB at 500 feet to about 65 dBA at 3,000 feet from construction activities. The predicted noise levels were the un-weighted noise levels from the Turkey Point Unit 6 & 7 Site Certification Application (FPL, 2009).

The maximum predicted noise levels do not include background, which can be variable depending upon the activities in the area. The background noise levels used in this evaluation is the un-weighted sound pressure levels from the Turkey Point Unit 6 & 7 Site Certification Application (FPL, 2009). The background noise levels, represented the average sound energy of the two daytime and nighttime measurements, were higher in the vicinity of the existing Turkey Point units and decreased substantially with distance. At approximately 2,000 feet from the existing Turkey Point units, the noise levels were 77 dB. At about 1 mile from the existing facility the measured noise levels were 68 dB. Construction activities conducted near the existing Turkey Point units would have a maximum overall noise level of about 82 dB and for areas greater than 2,000 from the existing plant the maximum overall noise level is estimated to be about 78 dB. Sound levels in the cooling canal system and Biscayne Bay would be 70 dB or less.

Crocodilian hearing is most sensitive at lower frequencies with lowest thresholds around 36 to 38 dB re 20 μPa and poor sensitivity above 2 kHz (Higgs et al. 2002). The maximum predicted noise levels will be above the threshold of hearing of the crocodiles in the vicinity of the construction activities but will be less than airborne levels that would cause physical injury or significant behavioral response. Indeed, crocodiles have been observed in areas near the existing Turkey Point units that have airborne noise levels of 75 dB or more.

NMFS concluded in the BO for SAJ-82 that airborne noise sources from construction do not result in underwater noise levels of concern to biota. The transmission of airborne noise to water can occur. However, the acoustic impedance of water is much greater than in air with much of the airborne noise reflected from the water surface. As a result, only a small fraction of acoustic energy is transmitted from air to water as a function of the ratio of acoustic impedances of air to water (e.g., 0.003; from Urick, R.J., 1967 for air and seawater; Godin, O.A., 2008). In addition, since the sound speed in water is much

greater than air, sound is only transmitted into water within a narrow area near the noise source. Sound energy must be at angles toward water less than 13 degrees from vertical to have airborne refracted into water (U.S. Navy, 2008). Since the maximum noise levels of construction activities will result from noise generated at locations on the ground surface at heights generally less than a few meters high, most of the sound energy will be reflected back into the air as the angles toward the water will be much greater than 13 degrees. Indeed, airborne noise must almost be overhead a water body before noise energy can penetrate (U.S. Army, 2004). Thus, airborne noise generated by construction activities associated with Turkey Point Units 6 & 7 result in noise levels in water that would be much lower than those that would cause physical injury or behavioral response to aquatic receptors.

4.0 CONCLUSION

On behalf of FPL, Golder performed an assessment of potential impacts to aquatic threatened and endangered species from potential noise generated during construction of the Turkey Point Units 6 & 7 Project. The noise generated from sheet pile driving for the barge unloading area is temporary (two weeks) and will be generally restricted to the existing barge canal and turning basin. The noise and vibration generated by the excavation of the radial collector well laterals via microtunneling should not cause disturbance at the sediment surface or noise above background levels. Airborne noise from site preparation and construction along the perimeter of the plant site and radial collector well areas will not result in adverse impacts to the American crocodile or result in airborne transmission of noise that would significantly impact threatened and endangered species. Based on all of the above factors, the potential noise associated with construction of Turkey Point Units 6 & 7 is not likely to adversely affect any of species of concern.

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Table 1. Predicted Noise Levels, Receptors, and Impact Radii for Sheet Pile Driving at the Barge Unloading Area for Turkey Point Units 6 & 7

Potential Receptors of Concern	Route of Effect	Predicted Noise Source Level (NMFS 2014)	Noise Effect Thresholds (NMFS 2014)	Potential Impact Radius	Potential Effects and Responses to Noise	Likelihood of Exposure to Noise	Predicted Effects Determination
Sea Turtles (loggerhead, leatherback, Kemp's ridley, hawksbill, and green)	Physical/ auditory Injury	220 dB peak; 194 SEL	206 dB peak; 187 SEL	30 ft	Physical or auditory injury	Low due to shallow depth and lack of nesting beaches near project	NLAA due to small potential impact radii, low chance of occurrence and relatively short construction duration
	Auditory Injury	220 dB peak; 194 SEL	206 dB peak; 187 SEL	2,815 ft (assuming 10 piles/day)	Onset of auditory injury		
	Behavioral Response	204 RMS	160 dB (RMS)	607 ft	Disrupted feeding or sheltering; avoidance of area		
Fish (Smalltooth Sawfish, Nassau Grouper)	Physical/ auditory Injury	220 dB peak; 194 SEL	206 dB peak; 187 SEL	30 ft	Physical or auditory injury	Low for adult and moderate for juvenile grouper due to shallow depth; low for sawfish due to no documented occurrences and project not in designated critical habitat	NLAA due to small potential impact radii, low chance of occurrence and relatively short construction duration
	Auditory Injury	220 dB peak; 194 SEL	206 dB peak; 187 SEL	2,815 ft (assuming 10 piles/day)	Onset of auditory injury		
	Behavioral Response	204 RMS	150 dB (RMS)	2,815 ft	Disrupted feeding, sheltering, or pupping; potential increased risk of predation; avoidance of area		
Marine Mammals (West Indian Manatee, bottlenose dolphin)	Auditory Injury	220 dB peak; 194 SEL	180 dB (RMS)	131 ft	Physical or auditory injury	Low due to shallow depth and lack of seagrass in barge canal and turning basin	NLAA due to small potential impact radii, low chance of occurrence and relatively short construction duration
	Behavioral Response	204 RMS	160 dB (RMS)	607 ft	Disrupted feeding and avoidance of area		

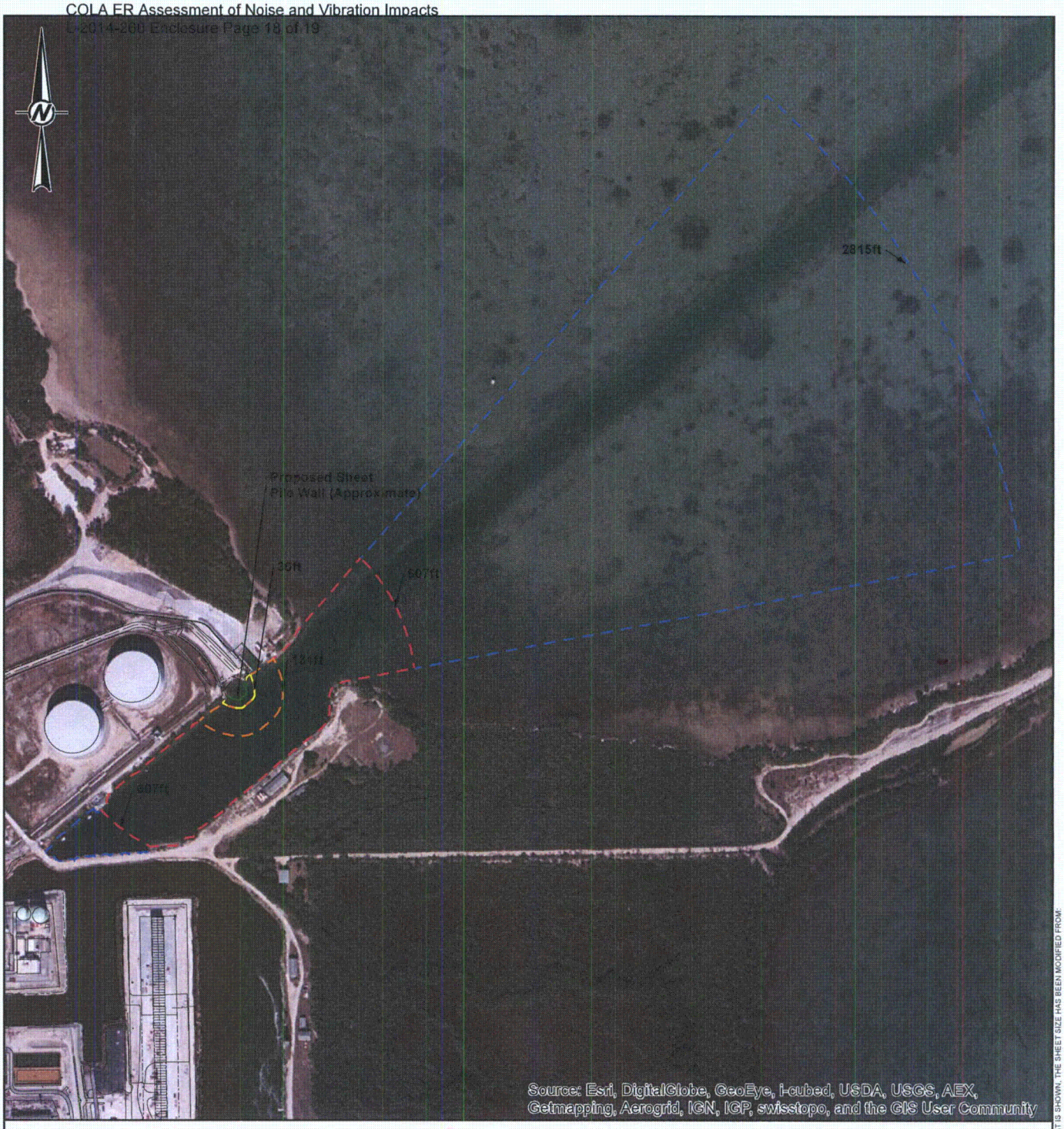
Table 2. Sound Power Levels for Noise Sources Associated With Site Preparation for Turkey Point Units 6 & 7

Sources: Site	Source Type	Number of Sources	Sound Power Level (dB) for Octave Band Center Frequency (Hz)									Overall Sound Power Level (dB)
			31.5	63	125	250	500	1000	2000	4000	8000	
Bulldozer	Point	15	0.0	106.6	103.6	101.6	102.6	99.6	96.6	94.6	96.6	110.9
Pan	Point	12	0.0	106.6	103.6	101.6	102.6	99.6	96.6	94.6	96.6	110.9
Truck	Point	20	0.0	0.0	118.6	116.1	113.1	109.6	106.1	102.1	0.0	121.7
Frontend Loader	Point	6	0.0	111.6	118.6	116.6	114.6	109.6	104.6	98.6	92.6	122.4
Backhoe	Point	3	0.0	111.6	118.6	116.6	114.6	109.6	104.6	98.6	92.6	122.4
Crane	Point	4	0.0	111.6	118.6	116.6	114.6	109.6	104.6	98.6	92.6	122.4
Pile Driver	Point	3	130.6	131.6	126.6	115.6	118.6	121.6	123.6	116.6	109.6	135.5

Table 3. Sound Power Levels for Noise Sources Associated With Construction of Permanent Features for Turkey Point Units 6 & 7

Sources: Site	**Source Type**	**Number of Sources**	**Sound Power Level (dB) for Octave Band Center Frequency (Hz)**									**Overall Sound Power Level (dB)**
			31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	
Concrete Batch Plant	Point	1	109.5	106.5	104.5	105.5	106.5	101.5	98.5	96.5	98.5	114.0
Crane	Point	8	0.0	111.6	118.6	116.6	114.6	109.6	104.6	98.6	92.6	122.4
Truck	Point	15	0.0	0.0	118.6	116.1	113.1	109.6	106.1	102.1	0.0	121.7
Welder	Point	16	0.0	102.6	110.6	105.6	98.6	98.6	93.6	88.6	84.6	112.7
Air Compressor	Point	10	31.6	107.6	101.6	99.6	101.6	103.6	101.6	96.6	90.6	111.4
Impact Wrench	Point	8	31.6	101.6	106.6	107.6	109.6	114.6	119.6	117.6	114.6	122.6
Grinder	Point	13	8.0	83.0	68.0	70.0	83.0	83.0	93.0	93.0	78.0	96.7
Chipping Hammer	Point	11	8.0	83.0	68.0	70.0	83.0	83.0	93.0	93.0	78.0	96.7
Sources: Radial Collector Wells	**Source Type**	**Number of Sources**	**Sound Power Level (dB) for Octave Band Center Frequency (Hz)**									**Overall Sound Power Level (dB)**
			31.5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	
Drill Rig	Point	1	28.0	109.0	109.0	106.0	104.0	102.0	100.0	96.0	91.0	114.1
Truck	Point	2	0.0	0.0	118.6	116.1	113.1	109.6	106.1	102.1	0.0	121.7
Welder	Point	3	0.0	102.6	110.6	105.6	98.6	98.6	93.6	88.6	84.6	112.7
Air Compressor	Point	3	31.6	107.6	101.6	99.6	101.6	103.6	101.6	96.6	90.6	111.4

FIGURES



LEGEND

Proposed Sheet Pile Wall (Approximate)

Predicted Noise Contours

- 206dB (Peak Pressure) / 187dB (sSEL)
- 180dB (RMS)
- 160dB (RMS)
- 150dB (RMS) / 187dB(cSEL)

REFERENCE

CONTOURS, GOLDER ASSOCIATES INC., 2014

500 250 0 500

1:6,000 FEET

CLIENT
FPL

PROJECT
TURKEY POINT UNITS 6 & 7

TITLE
PREDICTED UNDERWATER NOISE LEVEL CONTOURS FROM SHEET PILE DRIVING

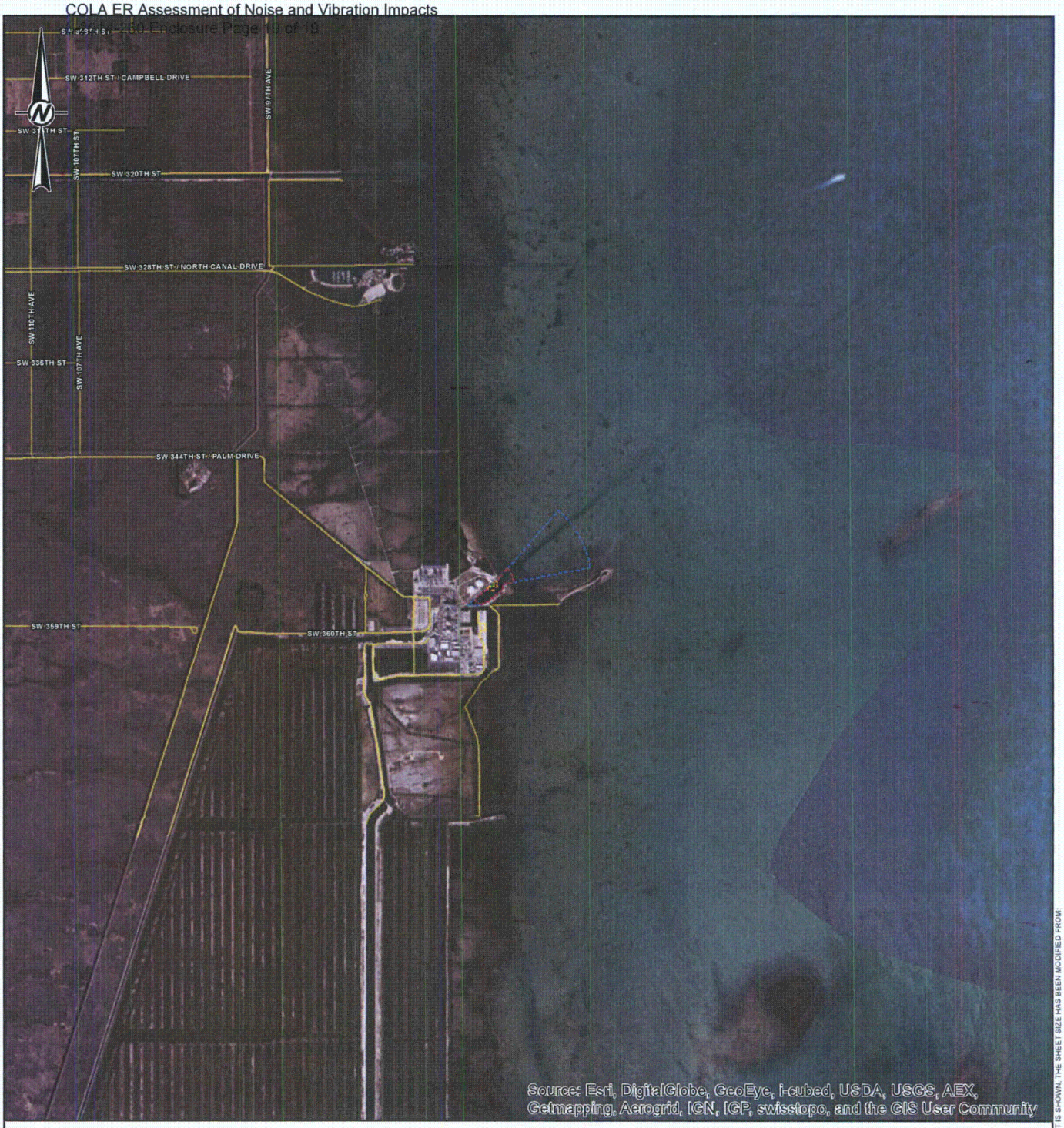
CONSULTANT

Golder Associates

YYYY-MM-DD	2014-07-25
PREPARED	NRL
DESIGN	NRL
REVIEW	KAB
APPROVED	MEH

PROJECT	CONSULTANT	Rev.	FIGURE
09387652	C130	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 1 in



LEGEND

Proposed Sheet Pile Wall (Approximate)

Predicted Noise Contours

- 206dB (Peak Pressure) / 187dB (sSEL)
- 180dB (RMS)
- 160dB (RMS)
- 150dB (RMS) / 187dB(cSEL)

REFERENCE

CONTOURS, GOLDER ASSOCIATES INC., 2014

4,000 2,000 0 4,000

1:48,003 FEET

CLIENT
FPL

PROJECT
TURKEY POINT UNITS 6 & 7

TITLE
PREDICTED UNDERWATER NOISE LEVEL CONTOURS FROM SHEET PILE DRIVING OVERVIEW MAP

CONSULTANT

Golder Associates

YYYY-MM-DD	2014-07-25
PREPARED	NRL
DESIGN	NRL
REVIEW	KAB
APPROVED	MEH

PROJECT	CONSULTANT	Rev.	FIGURE
09387652	C132	0	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 1 in