

## Monthly Pile Driving Summary and Underwater Noise Monitoring Results

**Pile Driving Period: March 22, 2015 – April 18, 2015**

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### Summary:

No sturgeon were observed to have been severely injured or killed as a result of underwater noise from pile driving during this reporting period. This conclusion was reached based on the results of sturgeon monitoring by observers on the barge and vessel-based sturgeon monitoring conducted downstream of the piles being driven.

Based on an analysis using both empirical and modeled data, recoverable injuries caused by exposure to sub-lethal levels of underwater noise could not have been sustained by more than one sturgeon during this reporting period. This conclusion was reached by considering:

- the time required to drive each pile;
- the underwater area that experienced noise levels higher than a level that could potentially result in recoverable injury to the sturgeon (206 dB re 1  $\mu$ Pa peak sound pressure level); and
- the possible number of sturgeon that could have been in that area (number of gill nets x sturgeon encounter rate).

The potential number of sturgeon likely to have experienced recoverable injuries (described as “sturgeon take”) is reported as the probability of a fish being affected by exposure to underwater noise from pile driving, as shown in the table below. If the sturgeon take is listed as 1, then 1 sturgeon was potentially exposed to recoverable noise levels. If sturgeon take is less than 1, then it is less likely that 1 sturgeon was affected. As shown at the bottom right of the table below, the sturgeon take for this reporting period was 0.43 sturgeon (that is, less than 1 sturgeon), which is less than the 0.86 sturgeon that was anticipated based on the NMFS Biological Opinion (NMFS BO).

### Introduction:

As required under the NMFS BO, dated September 23, 2014, Reasonable & Prudent Measures #4 and #5 and Term & Condition #9, underwater noise resulting from pile installation must be monitored. The following is a summary of the installation and underwater noise monitoring of permanent piles for the time period beginning March 22 through April 18, 2015.

As required under this condition, an estimate of sturgeon take for piles driven during the most recent monthly monitoring period is included. The sturgeon take estimate has been calculated using the times required to drive each pile (impact hammer only) and an estimate of the diameter of the 206 dB peak SPL isopleth, which has been conservatively assumed to be equivalent to the largest isopleth measured for piles driven at the same pier (or other representative piles at nearby piers). The take estimate has been compared to that listed for the same piles in Table 12 of the NMFS BO to ensure that sturgeon take is not being exceeded. Sturgeon take summarized in Table 12 applies to both shortnose and Atlantic sturgeon (i.e., it is

anticipated that 37 of each species will be exposed to underwater noise equal to 206 dB re 1 $\mu$  Pa SPL<sub>peak</sub> during pile driving).

### **Pile Installation and Underwater Noise Monitoring:**

During the monthly period from March 22 through April 18, 2015, 43 piles were driven. All of these were [REDACTED] piles driven at [REDACTED], all located on the Rockland approach. These piles correspond to those driven during weeks 45 [REDACTED], 46 [REDACTED], 49 [REDACTED], and 50 [REDACTED] of 2014 in Table 12 of the NMFS BO.

### *Anticipated Sturgeon Take from Table 12 of the NMFS BO*

For the purposes of tracking take associated with the subset of piles from the groups of piles shown in Table 12<sup>1</sup> (i.e., Anticipated Sturgeon Take), total take for each time period was divided by the number of piles scheduled to be driven during the time period. To calculate anticipated sturgeon take per pile from Table 12 for the 43 [REDACTED] piles driven at [REDACTED] [REDACTED] the anticipated take of 1 sturgeon for piles in the group containing 10 of the piles at [REDACTED] and [REDACTED] was divided by the 56 piles for this group. The anticipated take of 1 sturgeon for piles in the group containing 33 of the piles at [REDACTED] [REDACTED] was divided by the 46 piles for this group. The result for both groups of piles was an estimate of 0.02 sturgeon per pile.

Based on these values:

- the anticipated take from Table 12 for the 43 piles driven from March 22 through April 18, 2015 was 0.86 sturgeon, which was calculated as:  
0.02 sturgeon per pile multiplied by 43 piles.
- the cumulative take associated with the [REDACTED] piles driven to date (which includes trestle piles, test piles, and production piles as anticipated in Table 12 of the NMFS BO) is the sum of the anticipated take values for all [REDACTED] piles, or 26.36 sturgeon.

### *Calculated Sturgeon Take for this reporting period*

Following the same method used to estimate incidental sturgeon take for Table 12, the product of pile driving time, number of gill nets to span the width of the 206 dB isopleth, and sturgeon encounter rate of 0.033 sturgeon per net per hour was used to calculate sturgeon take for the piles driven during this reporting period (i.e., Calculated Sturgeon Take). For previous piles that have been monitored for underwater noise, the diameter of the 206 dB peak SPL isopleth was measured based on the maximum peak SPL recorded during pile driving. For the unmonitored piles, the maximum recorded isopleth diameter was assigned based on noise monitoring from the test pile program or from noise monitoring of piles at each pier. Actual pile driving times for each of the piles were used in the calculations.

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<sup>1</sup> Anticipated take was calculated in Table 12 of the NMFS BO as the product of the number of piles, number of hours to drive a pile, number of gill nets to span the 206 dB peak SPL isopleth, and the sturgeon encounter rate of 0.033 sturgeon per net per hour.

Impact pile driving has been completed for 6-foot piles; none were driven during this reporting period.

For the 43 [REDACTED] piles driven at [REDACTED] along the Rockland approach, pile-driving times ranged from 0.60 to 1.72 hours to install and averaged 1.04 hours, which was greater than the anticipated duration of 0.50 hours reported in Table 12 of the NMFS BO. Underwater noise monitoring was conducted by TZC/JASCO for 1 pile at [REDACTED] and 13 piles at [REDACTED]. The average of the maximum peak SPL isopleths measured during monitoring at [REDACTED] was 37 feet in diameter. This value was used as the isopleth diameter for calculating sturgeon take for unmonitored piles at [REDACTED]. For monitoring at [REDACTED], the average of the maximum peak SPL isopleths was 35 feet in diameter. This value was used for unmonitored piles at [REDACTED]. Despite the longer than anticipated drive duration of impact pile driving, the Calculated Sturgeon Take for this reporting period is still well below the Anticipated Sturgeon Take from Table 12 of the NMFS BO.

No 3-foot piles were driven during this reporting period.

Based on the recorded pile-driving times and isopleth widths:

- the incidental sturgeon take for the 43 piles driven during the monthly period from March 22 through April 18, 2015 was calculated as 0.43 sturgeon, which is less than the estimate of 0.86 sturgeon for the same 43 piles listed in Table 12,
- the cumulative incidental take for the [REDACTED] piles driven to date (which includes trestle piles, test piles, and production piles as anticipated in Table 12 of the NMFS BO) was calculated as 7.16 sturgeon, which is less than the anticipated take of 26.36 sturgeon for the same [REDACTED] piles in Table 12.

Despite the longer than anticipated pile-driving times for all 43 of the [REDACTED] piles at [REDACTED] the size of the 206 dB SPL peak isopleth was, in most cases, smaller than that anticipated in Table 12 of the NMFS BO based on underwater noise monitoring conducted by TZC/JASCO for representative piles. In addition, the conservatism applied to estimating sturgeon take in the NMFS BO (i.e., rounding up from 0.05 to the nearest 1 sturgeon) resulted in a total observed sturgeon take for all piles that was less than the anticipated take for piles driven during the current reporting period. Therefore, incidental take for sturgeon was not exceeded during the most recent monthly reporting period for pile driving, nor has the cumulative sturgeon take been exceeded for all piles driven to date.

Report Period: 3/22/2015 to 4/18/2015

Date	Year	Week	Net Impact Pile Driving Duration (hrs/pile)	Pile driving time from Table 12 of the NMFS BO (hrs/pile)	Average width of isopleth for 206-dB peak SPL (feet)	Maximum width of isopleth for 206-dB peak SPL (feet)	Number of gill nets to span the 206-dB peak SPL isopleth	Sturgeon encounter rate (fish/net/hour)	Sturgeon take
3/20/2015	2015	12	0.07	0.5	Not measured	37	0.296	0.033	0.001
3/20/2015	2015	12	0.05	0.5	Not measured	37	0.296	0.033	0.000
3/20/2015	2015	12	0.02	0.5	Not measured	37	0.296	0.033	0.000
3/20/2015	2015	12	0.13	0.5	Not measured	37	0.296	0.033	0.001
3/20/2015	2015	12	0.07	0.5	Not measured	37	0.296	0.033	0.001
3/27/2015	2015	13	0.22	0.5	Not measured	37	0.296	0.033	0.002
3/27/2015	2015	13	0.03	0.5	Not measured	37	0.296	0.033	0.000
3/27/2015	2015	13	0.13	0.5	Not measured	37	0.296	0.033	0.001
3/27/2015	2015	13	0.10	0.5	Not measured	37	0.296	0.033	0.001
3/30/2015	2015	14	0.67	0.5	Not measured	37	0.296	0.033	0.007
3/30/2015	2015	14	0.63	0.5	Not measured	37	0.296	0.033	0.006
3/30/2015	2015	14	0.68	0.5	Not measured	37	0.296	0.033	0.007
3/30/2015	2015	14	0.75	0.5	Not measured	37	0.296	0.033	0.007
3/30/2015	2015	14	0.55	0.5	Not measured	37	0.296	0.033	0.005
3/31/2015	2015	14	0.70	0.5	Not measured	37	0.296	0.033	0.007
3/31/2015	2015	14	0.65	0.5	Not measured	37	0.296	0.033	0.006
3/31/2015	2015	14	0.60	0.5	Not measured	37	0.296	0.033	0.006
3/31/2015	2015	14	0.60	0.5	Not measured	37	0.296	0.033	0.006
3/31/2015	2015	14	0.60	0.5	Not measured	37	0.296	0.033	0.006
4/2/2015	2015	14	1.43	0.5	Not measured	37	0.296	0.033	0.014
4/2/2015	2015	14	1.17	0.5	Not measured	37	0.296	0.033	0.011
4/2/2015	2015	14	0.90	0.5	Not measured	37	0.296	0.033	0.009
4/2/2015	2015	14	1.10	0.5	Not measured	37	0.296	0.033	0.011
4/3/2015	2015	14	1.25	0.5	Not measured	37	0.296	0.033	0.012
4/3/2015	2015	14	1.05	0.5	Not measured	37	0.296	0.033	0.010
4/3/2015	2015	14	1.72	0.5	Not measured	37	0.296	0.033	0.017
4/7/2015	2015	15	1.28	0.5	Not measured	37	0.296	0.033	0.013
4/7/2015	2015	15	1.33	0.5	Not measured	37	0.296	0.033	0.013
4/7/2015	2015	15	1.45	0.5	Not measured	37	0.296	0.033	0.014
4/7/2015	2015	15	1.13	0.5	Not measured	37	0.296	0.033	0.011
4/8/2015	2015	15	1.38	0.5	Not measured	37	0.296	0.033	0.013
4/8/2015	2015	15	1.67	0.5	Not measured	37	0.296	0.033	0.016

Report Period: 3/22/2015 to 4/18/2015

4/8/2015	2015	15	1.72	0.5	Not measured	37	0.296	0.033	0.017
4/13/2015	2015	16	0.55	0.5	Not measured	35	0.280	0.033	0.005
4/13/2015	2015	16	0.52	0.5	21	29	0.230	0.033	0.004
4/13/2015	2015	16	0.52	0.5	17	23	0.187	0.033	0.003
4/13/2015	2015	16	0.48	0.5	16	27	0.217	0.033	0.003
4/13/2015	2015	16	0.52	0.5	27	45	0.358	0.033	0.006
4/13/2015	2015	16	0.57	0.5	33	71	0.568	0.033	0.011
4/13/2015	2015	16	0.52	0.5	22	37	0.294	0.033	0.005
4/14/2015	2015	16	0.57	0.5	27	37	0.296	0.033	0.006
4/14/2015	2015	16	0.58	0.5	29	43	0.344	0.033	0.007
4/14/2015	2015	16	0.65	0.5	26	37	0.296	0.033	0.006
4/14/2015	2015	16	0.68	0.5	13	20	0.160	0.033	0.004
4/14/2015	2015	16	0.72	0.5	11	23	0.184	0.033	0.004
4/14/2015	2015	16	0.48	0.5	23	50	0.400	0.033	0.006
4/14/2015	2015	16	0.62	0.5	14	22	0.176	0.033	0.004
4/15/2015	2015	16	0.68	0.5	17	27	0.216	0.033	0.005
4/15/2015	2015	16	0.48	0.5	13	21	0.168	0.033	0.003
4/15/2015	2015	16	0.57	0.5	13	23	0.184	0.033	0.003
4/15/2015	2015	16	0.45	0.5	19	43	0.344	0.033	0.005
4/15/2015	2015	16	0.47	0.5	30	50	0.400	0.033	0.006
4/15/2015	2015	16	0.57	0.5	30	45	0.360	0.033	0.007
4/15/2015	2015	16	0.52	0.5	16	24	0.192	0.033	0.003
4/16/2015	2015	16	0.52	0.5	14	22	0.176	0.033	0.003
4/16/2015	2015	16	0.40	0.5	13	26	0.208	0.033	0.003
4/16/2015	2015	16	0.38	0.5	16	25	0.200	0.033	0.003
4/16/2015	2015	16	0.55	0.5	25	100	0.800	0.033	0.015
4/16/2015	2015	16	0.37	0.5	9	18	0.144	0.033	0.002
4/16/2015	2015	16	0.33	0.5	16	29	0.232	0.033	0.003
4/16/2015	2015	16	0.37	0.5	Not measured	35	0.280	0.033	0.003
4/17/2015	2015	16	1.12	0.5	23	37	0.296	0.033	0.011
4/17/2015	2015	16	0.83	0.5	Not measured	37	0.296	0.033	0.008
4/17/2015	2015	16	0.68	0.5	Not measured	37	0.296	0.033	0.007
4/17/2015	2015	16	0.78	0.5	Not measured	37	0.296	0.033	0.008
4/17/2015	2015	16	0.88	0.5	Not measured	37	0.296	0.033	0.009
<b>Monthly sturgeon take (Calculated based on pile-driving data/Anticipated from Table 12 of the September 2014 NMFS BO)</b>									<b>0.43/0.86</b>
<b>Cumulative sturgeon take to date (Calculated based on pile-driving data/Anticipated from Table 12 of the September 2014 NMFS BO)</b>									<b>7.16/26.36</b>

\*Impact driving of piles occurred over 2 days.