Monthly Pile Driving Summary
Underwater Noise Monitoring Results

Pile Driving Period: March 18, 2014 - April 17, 2014
DOC Reference: TA_FHWA_03031_RPT_ENV

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 on a monitoring vessel downstream of the piles being driven.

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 the level that could potentially result in recoverable injury to the sturgeon (206 dB re 1 µPa 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 cumulative sturgeon take was 0.55 sturgeon (that is, less than 1 sturgeon) for this reporting period, which is less than the 1.63 sturgeon that was anticipated based on the NMFS Biological Opinion (NMFS BO).

Introduction:

As required under the NMFS BO, dated April 2014, Reasonable & Prudent Measures #4 and #5 and Term & Condition #9, the following is a summary of the installation and underwater noise monitoring of permanent piles, [redacted] for the time period beginning March 18, 2014 through April 17, 2014.

As required under this condition, an estimate of sturgeon take for production piles driven during the most recent 30-day 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 measured for a representative number of the piles installed during this time period. For piles that were not monitored for underwater noise, the size of the isopleth was 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 10 of the NMFS BO to ensure that sturgeon take is not being exceeded.

Pile Installation and Underwater Noise Monitoring:

During the 30-day period from March 18 through April 17, 2014, [redacted] production piles and [redacted] trestle piles were driven. Of these, [redacted] piles were driven at [redacted] and [redacted] piles were driven at [redacted] In addition, [redacted] trestle piles were driven with an impact hammer to support the Rockland work platform. These piles correspond to the piles driven during weeks 11 through 14 in Table 10 of the NMFS BO. Anticipated take for these piles is summarized in Table 10[1] and is a subset of the take for all piles driven during weeks 11 through 21, which totals 7 sturgeon.

Anticipated Sturgeon Take from Table 10 of the NMFS BO

For the purposes of tracking take associated with the subset of piles from the groups of piles shown in Table 10 (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 10, the anticipated take of 1 sturgeon for piles at [redacted] eastbound (EB) and [redacted] was divided by the [redacted] piles in this grouping, which resulted in an estimate of 0.018 sturgeon per pile. Similarly, the anticipated take of 2 sturgeon for piles in the group containing Piers [redacted] was divided by the [redacted] piles for this group and 4 sturgeon at [redacted] westbound (WB), [redacted] was divided by the [redacted] piles for that group, which resulted in an estimate of 0.02 sturgeon per pile and 0.016 sturgeon per pile, respectively for those groups.

Based on these values:

- the anticipated take from Table 10 for the [redacted] piles driven from March 18 through April 17 would be 1.63 sturgeon (i.e., the sum of 0.018 sturgeon per pile multiplied by [redacted] piles, 0.02 sturgeon multiplied by [redacted] piles, and 0.016 sturgeon multiplied by [redacted] piles),
- the cumulative take associated with the [redacted] production piles driven to date (as anticipated in Table 10 of the NMFS BO) is the sum of the anticipated take values for all 187 piles, or 6.00 sturgeon.

Calculated Sturgeon Take for this reporting period

Following the same method used to estimate incidental sturgeon take for Table 10, 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 production 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 production piles at each pier. Actual pile driving times for each of the piles were used in the calculations.

[1] Anticipated take was calculated in Table 10 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.

During this reporting period, none of the [redacted] piles exceeded the maximum allowable pile driving time of 1.0 hour per pile; impact pile-driving times for [redacted] piles were routinely shorter than anticipated (i.e., approximately 0.5 hours). For [redacted] piles driven at [redacted], pile-driving times were equal to, or shorter than, the anticipated time of 0.5 hours. However, for [redacted] piles driven at [redacted], driving times ranged from 0.65 to 1.35 hours and all [redacted] piles were well above the anticipated time of 0.5 hours. These longer than anticipated pile-driving times were a result of low hammer energy, which required a greater number of strikes (i.e., longer pile-driving time) to install the pile. For the subset of [redacted] piles that were monitored for noise, the size of the 206 dB SPL_{peak} isopleths were smaller in diameter (8 to 27 feet) than the anticipated 40-ft isopleth. In several cases, SPL_{peak} noise levels increased at the end of pile driving (for P06EB-01, 02, and 05), which would have resulted in a 206 dB SPL_{peak} isopleth that was greater than 40 feet in diameter (45 to 92 feet), but only for several minutes.

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

- the incidental sturgeon take for the [redacted] piles driven during the 30-day period from March 18 through April 17 was calculated as 0.55 sturgeon, which is less than the estimate of 1.63 sturgeon for the same [redacted] piles listed in Table 10,
- the cumulative incidental take for the [redacted] production piles driven to date was calculated as 1.62 sturgeon, which is less than the anticipated take of 6.00 sturgeon for the same [redacted] piles in Table 10.

Despite the longer pile-driving times and the short-duration increase in underwater noise for piles driven at [redacted] the total observed sturgeon take for all piles driven during this reporting period was less than the anticipated take for these piles. This was because of the shorter than expected drive times for most of the other [redacted] (i.e., less than 0.5 hours per pile vs. 0.5 hours per pile in the NMFS BO) and all of the [redacted] (i.e., less than 0.45 hours per pile vs. 1.00 hours per pile in the NMFS BO). Therefore, incidental take for sturgeon was not exceeded during the most recent 30-day reporting period for production pile driving, nor has the cumulative sturgeon take been exceeded for all production piles driven to date.

Report Period: 03/18/2014 to 04/17/2014

Date	Year	Week		Net Impact Pile Driving Duration (hrs/pile)	Pile Driving Time from Table 9 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
3/18/2014	2014	12		0.45	1	14	49	0.4	0.033	0.006
3/18/2014	2014	12		0.35	1	25	106	0.9	0.033	0.010
3/19/2014	2014	12		0.40	1	28	56	0.4	0.033	0.006
3/19/2014	2014	12		0.30	1	24	39	0.3	0.033	0.003
3/19/2014	2014	12		0.23	1	23	64	0.5	0.033	0.004
3/19/2014	2014	12		0.40	1	34	61	0.5	0.033	0.006
3/19/2014	2014	12		0.42	1	26	76	0.6	0.033	0.008
3/19/2014	2014	12		0.38	1	10	17	0.1	0.033	0.002
3/20/2014	2014	12		0.20	0.5	1	3	0.0	0.033	0.000
3/20/2014	2014	12		0.30	0.5	1	5	0.0	0.033	0.000
3/20/2014	2014	12		0.28	0.5	3	15	0.1	0.033	0.001
3/20/2014	2014	12		0.23	0.5	3	8	0.1	0.033	0.000
3/20/2014	2014	12		0.25	0.5	2	6	0.1	0.033	0.000
3/20/2014	2014	12		0.28	0.5	1	3	0.0	0.033	0.000
3/20/2014	2014	12		0.10	0.5	Not measured	15	0.1	0.033	0.000
3/20/2014	2014	12		0.97	0.5	17	21	0.2	0.033	0.005
3/20/2014	2014	12		0.20	0.17	Not measured	32	0.3	0.033	0.002
3/20/2014	2014	12		0.15	0.17	Not measured	32	0.3	0.033	0.001
3/20/2014	2014	12		0.32	0.17	Not measured	32	0.3	0.033	0.003
3/21/2014	2014	12		0.90	0.5	22	31	0.2	0.033	0.007
3/21/2014	2014	12		0.87	0.5	22	45	0.4	0.033	0.010
3/21/2014	2014	12		0.90	0.5	27	92	0.7	0.033	0.022
3/21/2014	2014	12		0.67	0.5	8	35	0.3	0.033	0.006
3/21/2014	2014	12		0.05	0.17	Not measured	32	0.3	0.033	0.000
3/21/2014	2014	12		0.13	0.17	Not measured	32	0.3	0.033	0.001
3/24/2014	2014	13		0.28	0.5	Not measured	15	0.1	0.033	0.001
3/24/2014	2014	13		0.18	0.5	1	4	0.0	0.033	0.000
3/24/2014	2014	13		0.30	0.5	Not measured	15	0.1	0.033	0.001
3/24/2014	2014	13		0.28	0.5	Not measured	15	0.1	0.033	0.001

Report Period: 03/18/2014 to 04/17/2014

Date	Year	Week		Net Impact Pile Driving Duration (hrs/pile)	Pile Driving Time from Table 9 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
3/24/2014	2014	13		0.15	0.17	Not measured	32	0.3	0.033	0.001
3/24/2014	2014	13		0.12	0.17	Not measured	32	0.3	0.033	0.001
3/25/2014	2014	13		0.23	1	Not measured	60	0.5	0.033	0.004
3/25/2014	2014	13		0.28	1	Not measured	60	0.5	0.033	0.004
3/27/2014	2014	13		0.25	1	Not measured	60	0.5	0.033	0.004
3/27/2014	2014	13		0.25	1	Not measured	60	0.5	0.033	0.004
3/27/2014	2014	13		0.22	1	Not measured	60	0.5	0.033	0.003
3/27/2014	2014	13		0.22	1	Not measured	60	0.5	0.033	0.003
3/27/2014	2014	13		0.23	1	Not measured	60	0.5	0.033	0.004
3/27/2014	2014	13		0.23	1	Not measured	60	0.5	0.033	0.004
4/1/2014	2014	14		0.42	0.5	Not measured	15	0.1	0.033	0.002
4/1/2014	2014	14		0.25	0.5	Not measured	15	0.1	0.033	0.001
4/1/2014	2014	14		0.38	0.5	Not measured	15	0.1	0.033	0.002
4/1/2014	2014	14		0.32	0.5	Not measured	15	0.1	0.033	0.001
4/1/2014	2014	14		0.43	0.5	Not measured	15	0.1	0.033	0.002
4/1/2014	2014	14		0.22	0.5	Not measured	15	0.1	0.033	0.001
4/1/2014	2014	14		0.43	0.5	Not measured	15	0.1	0.033	0.002
4/2/2014	2014	14		0.83	0.5	Not measured	32	0.3	0.033	0.007
4/2/2014	2014	14		0.78	0.5	Not measured	32	0.3	0.033	0.007
4/2/2014	2014	14		0.98	0.5	Not measured	32	0.3	0.033	0.008
4/2/2014	2014	14		0.95	0.5	Not measured	32	0.3	0.033	0.008
4/3/2014	2014	14		1.35	0.5	Not measured	32	0.3	0.033	0.011
4/3/2014	2014	14		0.73	0.5	Not measured	32	0.3	0.033	0.006
4/3/2014	2014	14		0.82	0.5	Not measured	32	0.3	0.033	0.007
4/3/2014	2014	14		0.25	1	Not measured	200	1.6	0.033	0.013
4/3/2014	2014	14		0.32	1	Not measured	200	1.6	0.033	0.017
4/3/2014	2014	14		0.32	1	Not measured	200	1.6	0.033	0.017
4/3/2014	2014	14		0.33	1	Not measured	200	1.6	0.033	0.017
4/3/2014	2014	14		0.30	1	Not measured	200	1.6	0.033	0.016
4/3/2014	2014	14		0.28	1	Not measured	200	1.6	0.033	0.015
4/4/2014	2014	14		0.32	1	Not measured	200	1.6	0.033	0.017

Report Period: 03/18/2014 to 04/17/2014

Date	Year	Week		Net Impact Pile Driving Duration (hrs/pile)	Pile Driving Time from Table 9 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
4/4/2014	2014	14		0.32	1	Not measured	200	1.6	0.033	0.017
4/4/2014	2014	14		0.33	0.5	Not measured	15	0.1	0.033	0.001
4/4/2014	2014	14		0.50	0.5	Not measured	15	0.1	0.033	0.002
4/4/2014	2014	14		0.25	0.5	Not measured	15	0.1	0.033	0.001
4/4/2014	2014	14		0.38	0.5	Not measured	15	0.1	0.033	0.002
4/9/2014	2014	15		0.33	1	Not measured	60	0.5	0.033	0.005
4/9/2014	2014	15		0.25	1	Not measured	60	0.5	0.033	0.004
4/9/2014	2014	15		0.28	1	Not measured	60	0.5	0.033	0.004
4/9/2014	2014	15		0.27	1	Not measured	60	0.5	0.033	0.004
4/9/2014	2014	15		0.25	1	Not measured	60	0.5	0.033	0.004
4/9/2014	2014	15		0.27	1	Not measured	60	0.5	0.033	0.004
4/9/2014	2014	15		0.25	1	Not measured	60	0.5	0.033	0.004
4/9/2014	2014	15		0.28	1	Not measured	60	0.5	0.033	0.004
4/9/2014	2014	15		0.35	0.17	Not measured	32	0.3	0.033	0.003
4/9/2014	2014	15		0.30	0.17	Not measured	32	0.3	0.033	0.003
4/9/2014	2014	15		0.32	0.17	Not measured	32	0.3	0.033	0.003
4/10/2014	2014	15		1.13	0.5	Not measured	32	0.3	0.033	0.010
4/10/2014	2014	15		0.68	0.5	Not measured	32	0.3	0.033	0.006
4/10/2014	2014	15		0.88	0.5	Not measured	32	0.3	0.033	0.007
4/10/2014	2014	15		0.72	0.5	Not measured	32	0.3	0.033	0.006
4/10/2014	2014	15		0.65	0.5	Not measured	32	0.3	0.033	0.005
4/14/2014	2014	16		0.28	1	Not measured	200	1.6	0.033	0.015
4/15/2014	2014	16		0.33	1	Not measured	200	1.6	0.033	0.017
4/15/2014	2014	16		0.33	1	Not measured	200	1.6	0.033	0.017
4/15/2014	2014	16		0.35	1	Not measured	200	1.6	0.033	0.018
4/15/2014	2014	16		0.22	1	Not measured	200	1.6	0.033	0.012
4/16/2014	2014	16		0.27	1	Not measured	200	1.6	0.033	0.014
4/16/2014	2014	16		0.32	1	Not measured	200	1.6	0.033	0.017
4/17/2014	2014	16		0.37	1	Not measured	200	1.6	0.033	0.020
Monthly sturgeon take (Calculated based on pile-driving data/Anticipated from Table 10 of the April 2014 NMFS BO)										**0.55/1.63**
Cumulative sturgeon take to date (Calculated based on pile-driving data/Anticipated from Table 10 of the April 2014 NMFS BO)										**1.62/6.00**