

Monthly Pile Driving Summary and Underwater Noise Monitoring Results

Pile Driving Period: November 27, 2016 – December 24, 2016

DOC Reference: TA_FHWA_03188_RPT_ENV

**Revised: March 2, 2017 to add underwater noise
monitoring results for the drilled shaft [REDACTED]**



Summary:

Production pile driving for steel piles [REDACTED] was completed on June 5, 2015 and no impact pile driving of [REDACTED] piles was conducted during this reporting period. Therefore, no sturgeon were severely injured or killed as a result of underwater noise from pile driving during this reporting period.

Future impact pile-driving activities are scheduled [REDACTED] as indicated in Table 8 of the NMFS BO, dated June 20, 2016. This monthly summary will allow the continued tracking of sturgeon take associated with those piles.

During this reporting period, underwater noise monitoring was conducted during shaft drilling on November 28, 2016 [REDACTED] along the Westchester Approach. The peak SPL level did not exceed the threshold of 206 dB re: 1μPa for this criterion at a distance of 33 feet from the shaft. The 24-hr cSEL level did not exceed the threshold of 187 dB re: 1μPa²/s at a distance of 33 feet from the shaft.

Introduction:

As required under the NMFS BO, dated June 20, 2016, Reasonable & Prudent Measure #1 and Term & Conditions #1, underwater noise resulting from pile installation must be monitored. In addition, the Underwater Noise Monitoring Plan for the Project includes monitoring of underwater noise for one representative pile during shaft drilling along the Westchester Approach and the Rockland Trestle. According to the Plan:

One representative [REDACTED] from the Westchester Approach and the Rockland Approach will be monitored during installation via rock drilling (rock socketing) to establish the Peak SPL and the cSEL, if utilized. However, if the sound levels exceed the thresholds, the need for additional monitoring relative to the NMFS BO requirements will be reassessed.

A summary of the results of noise measurements taken during shaft drilling [REDACTED] along the Westchester Approach on November 28, 2016 is included in this report.

Pile Installation and Underwater Noise Monitoring:

During the monthly period from November 27 through December 24, 2016, no piles were driven. However, a [REDACTED] drilled shaft was constructed [REDACTED] along the Westchester Approach.

Anticipated Sturgeon Take from Table 8 of the NMFS BO

For the purposes of tracking take associated with the subset of piles from the groups of piles shown in Table 8¹ (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. This value is compared with the Calculated Sturgeon Take (described in the next section) to determine whether or not take has been exceeded during the reporting period.

Calculated Sturgeon Take to Date

Following the same method used to estimate incidental sturgeon take for Table 8, 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.

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

- the cumulative incidental take for the [REDACTED] piles² driven as anticipated in Table 8 of the June 2016 NMFS BO was calculated as 0.87 sturgeon, which is less than the anticipated take of 3.25 sturgeon for the same [REDACTED] piles in Table 8.

Results of underwater noise monitoring during shaft drilling

As outlined in the Underwater Noise Monitoring Plan, the peak SPL and cSEL levels were monitored for a drilled shaft along the Westchester Approach. The results of this noise monitoring are summarized in Attachment A.

During this activity, the maximum peak SPL level recorded at a distance of 33 feet during monitoring was 174 dB re: 1 μ Pa, which did not exceed the threshold of 206 dB re: 1 μ Pa for this criterion. The 24-hr cSEL level measured at the same location was estimated to be 186 dB re:

¹ Anticipated take was calculated in Table 8 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.

² The [REDACTED] piles driven [REDACTED] were driven prior to the issuance of the June 2016 BO and were therefore included in previous monthly reports (April 17, 2016 – May 09, 2016 and May 15, 2016 – June 11, 2016) as part of the monthly and cumulative anticipated take calculations. Because those piles are also included in Table 8 of the June 2016 BO, the anticipated take for those piles will also be included as part of the cumulative take estimates reported in future monthly reports. The incidental take associated [REDACTED] has therefore essentially been “counted twice.”

1 μ Pa²•s at a distance of 33 feet, 180 dB re: 1 μ Pa²•s at a distance of 136 feet, and 174 dB re: 1 μ Pa²•s at a distance of 392 feet (Attachment A). Based on these measurements, the threshold of 187 dB re: 1 μ Pa²•s did not exceed a distance of 33 feet from the shaft.

Report Period: 11/27/2016 to 12/24/2016

Date	Year	Week	Pile diameter (feet)	Pier-Pile Number	Net Impact Pile Driving Duration (hrs/pile)	Pile driving time from Table 8 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
No piles were impact driven during the reporting period											
Monthly sturgeon take (Calculated based on pile-driving data/Anticipated from Table 8 of the June 2016 NMFS BO)											-
Cumulative sturgeon take (Calculated based on pile-driving data/Anticipated from Table 8 of the June 2016 NMFS BO)*											0.87/3.25

* As of the September 2014 NMFS BO, the exempted incidental take for sturgeon as a result of exposure to underwater noise during impact pile driving was 37 Atlantic sturgeon and 37 shortnose sturgeon. With the issuance of the June 2016 BO, the exempted take was reduced to 6 Atlantic sturgeon and 6 shortnose sturgeon in order to reflect the anticipated incidental take for the remaining piles that will be installed (i.e., the piles associated with the first 31 sturgeon had been driven, and the take accounted for, as of the issuance of the June 2016 BO). To allow tracking of incidental take with respect to Table 8 of the June 2016 BO, the cumulative take reported in the table above will be with reference to 6 sturgeon. Note that previous monthly reports submitted prior to the issuance of the June 2016 BO accounted for estimates of anticipated sturgeon take for piles driven [REDACTED] April 17, 2016 – May 09, 2016 and [REDACTED] May 15, 2016 – June 11, 2016. Because the piles [REDACTED] are also included in Table 8 of the June 2016 BO, the anticipated take for those piles will also be included as part of the cumulative take estimate reported in future monthly reports.

Attachment A

Drilled Shaft Underwater Noise Log

Monthly Summary of Pile Driving Activities
New NY Bridge Project
11/27/2016 - 12/24/2016
Revision 1

TAPPAN ZEE
CONSTRUCTORS, LLC

Reporting Period 11/27/2016 - 12/24/2016

No. of Piles Impact Driven 0
No. of Piles Monitored for Underwater Noise 0
No. of Sturgeon Observed 0
187 cSEL Acoustic Corridor Maintained at All Times Yes (If no, provide detail)
150 rms SPL Acoustic Corridor Maintained at All Times Yes (If no, provide detail)

Date	Year	Week	Pile Diameter	Pier-Pile Number	Start Time	End Time	Net Impact Pile Driving Duration	Pile Monitored for Underwater Noise	Diameter of 206 dB re 1 µPa peak SPL isopleth	Diameter of 187 dB re 1 µPa ² *s cSEL isopleth	Diameter of 150 dB re 1 µPa rms SPL isopleth	Pile Driving Duration Longer than Anticipated in Table 12 of NMFS BO?	Diameter of 206 dB re 1 µPa Peak SPL isopleth Greater than Anticipated in Table 12 of the NMFS BO? ^b	Estimated Extent of <187-dB cSEL Acoustic Corridor ^c	Estimated Extent of <150-dB rms SPL Acoustic Corridor ^c
(mm/dd/yyyy)	(yyyy)		(feet)		(24:00)	(24:00)	(hrs/pile)	(Yes or No)	(feet) ¹	(feet) ¹	(feet) ¹	(Yes / No)	(Yes, No, N/A)	(feet)	(feet)
No piles were impact driven during the reporting period															

Note: Start Time and End Time reflect overall pile driving activity and does not reflect Net Impact Pile Driving Duration. Impact pile driving information presented after the completion of a given pile.
^a Estimated width of the isopleth is only provided if underwater noise measurements are collected.
^b Comparison with NMFS BO Geographic Threshold is only provided if underwater noise measurements are collected and is based on the 206-dB mean peak SPL isopleth for monitored piles only.
^c See Table 1 for assumed 187-dB cSEL and 150-dB rms SPL values for estimation of Acoustic Corridors for non-monitored piles.

Table 1. Estimated Extents of Non-Monitored Production and Temporary Piles for the 187 dB re 1 μ Pa² s cSEL and the 150 dB re 1 μ Pa rms SPL Acoustic Corridors

Design Unit		cSEL Isopleth Diameter (feet)				rms SPL Isopleth Diameter (feet)			
		2-foot	3-foot	4-foot	6-foot	2-foot	3-foot	4-foot	6-foot
Rockland Trestle		--	338 ^a	--	--	--	1772 ^a	--	--
Design Unit 2		--	418 ^a	204	--	--	1772 ^a	616	--
Design Unit 3		--	--	204	--	--	--	616	--
Design Unit 4		--	--	290	--	--	--	546	--
Design Unit 5		--	--	240	--	--	--	1130	--
Design Unit 6		--	--	146	--	--	--	572	--
Design Unit 7		--	--	140	400	--	--	572	6996
Main Span		--	--	NA	400	--	--	NA	6996
Design Unit 8		--	--	460	190	--	--	1853	924
Design Unit 9		--	418 ^a	--	--	--	1772 ^a	--	--
Westchester Trestle		248 ^a	--	--	--	1192 ^a	--	--	--

Note: Values provided represent the maximum extent of the 187 dB re 1 μ Pa² s cSEL and the 150 dB re 1 μ Pa rms SPL Isopleths from applicable *Description of Underwater Noise Attenuation System* Report. See *Underwater Noise Monitoring Plan, Rev 4* for more information.

^aValues provided in Table 11 of the NMFS BO (NER-2014-11317).

Underwater Acoustic Monitoring Log: Drilled Shaft Underwater Noise Log

Acoustic Engineer: Caitlin O'Neill Date: 28/11/2016

Part 1: Shaft Information

Drilling Method:	Reverse Circulation

Drill Model:	Wirth PBA 933
Water Depth:	16 ft
Tidal Stage:	Ebb

Start of Drilling:	22/11/2016 16:20
End of Drilling:	28/11/2016 13:41
Net Drilling Time:	10:24

Part 2: Hydrophone Information

AMAR ID:	Device Name	Location	Distance to Shaft (feet)	Peak SPL ¹ (dB re 1 μ Pa) ²		cSEL (24 hr) ³ (dB re 1 μ Pa ² ·s) ⁴
				Median	Max	
AMAR-RT	OSM-016	Cross-current	33	153	174	186
AMAR-Primary	AMAR-215	Cross-current	136	145	162	180
AMAR-Secondary	AMAR-298	Cross-current	392	137	162	174

¹ Sound Pressure Level

² Peak Sound Pressure Level calculated over a 1 second average with 50% overlap

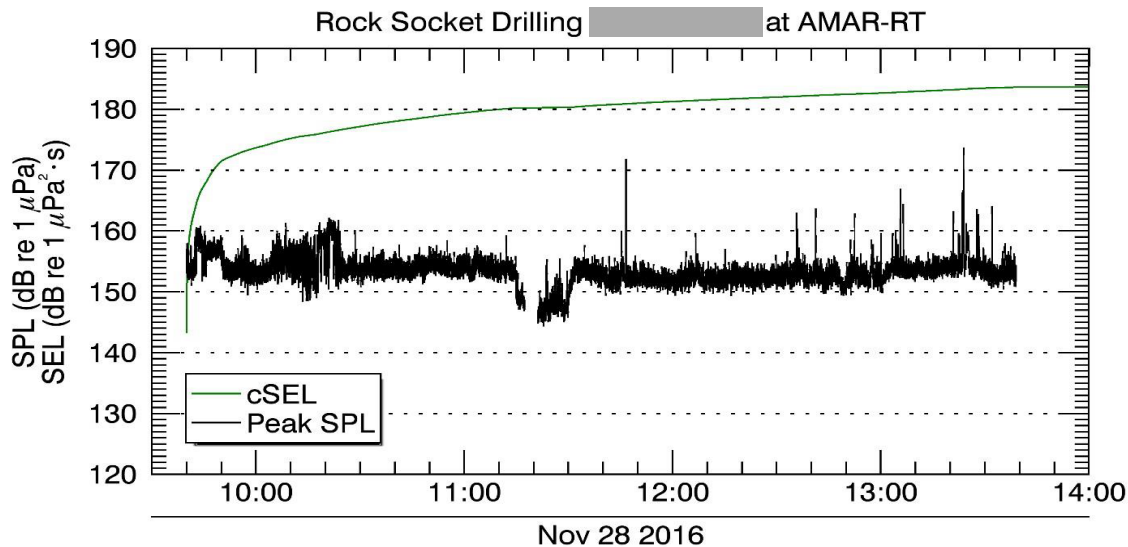
³ Cumulative Sound Exposure Level

⁴ rms SPL calculated over a 1 second average with 50% overlap.

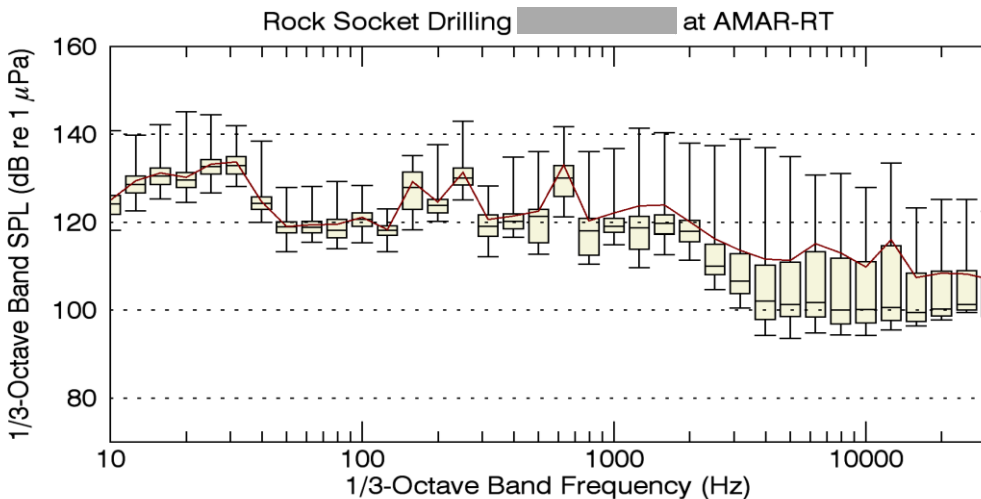
Acoustic Engineer: Caitlin O'Neill

Date: 28/11/2016

Part 3: AMAR-RT Additional Figures



Drilled Shaft: Peak SPL and cSEL versus time (EST) for the drilled shaft [REDACTED] measured 33 ft from the shaft using AMAR-RT.

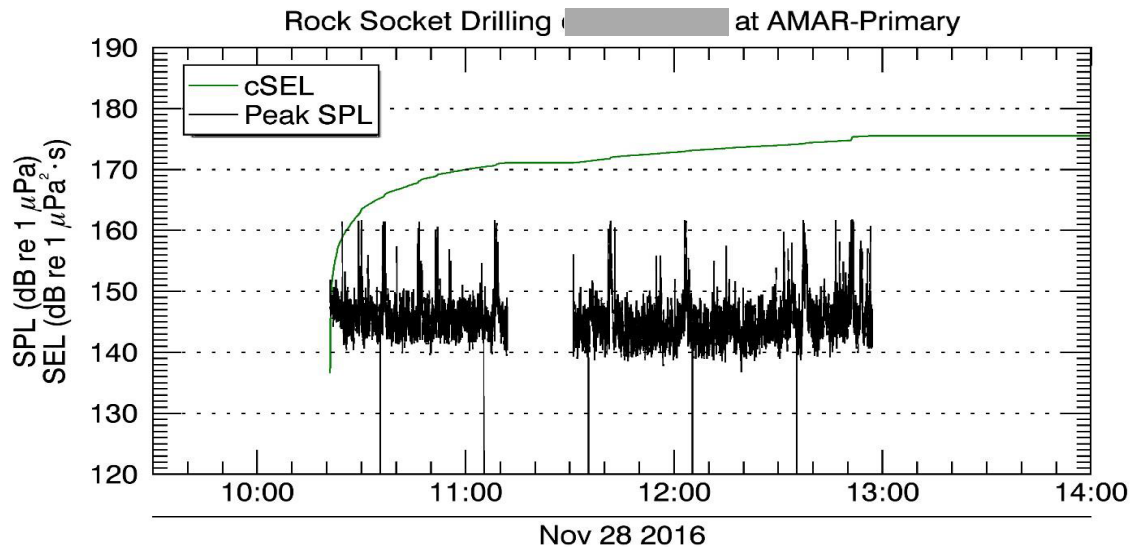


Distribution of 1/3-Octave SPL for drilled shaft [REDACTED] measured 33 ft from the pile using AMAR-RT. Beige bars indicate the first, second, and third quartiles (L25, L50, and L75). Upper error-bars indicate the maximum levels (Lmax). Lower error bars indicate the 95% exceedance percentiles (L95). The maroon line indicates the arithmetic mean (Lmean).

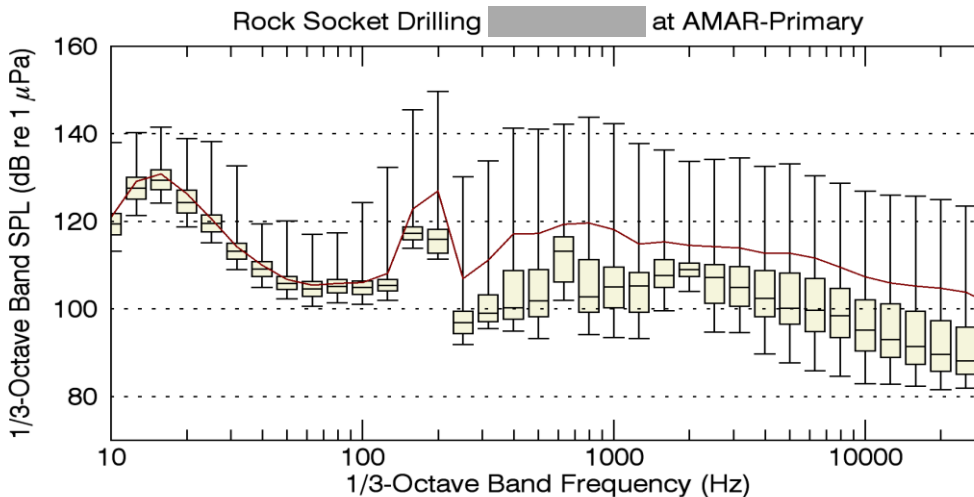
Acoustic Engineer: Caitlin O'Neill

Date: 28/11/2016

Part 4: AMAR-Primary Additional Figures



Drilled Shaft: Peak SPL and cSEL versus time (EST) for the drilled shaft [REDACTED] measured 136 ft from the shaft using AMAR-Primary.

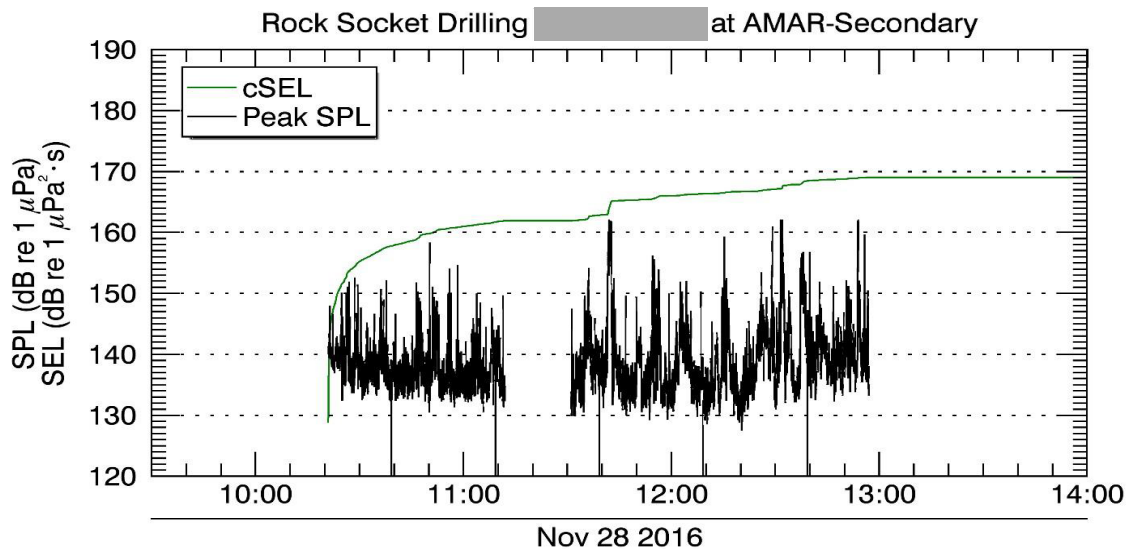


Distribution of 1/3-Octave SPL for the drilled shaft [REDACTED] measured 136 ft from the shaft using AMAR-Primary. Beige bars indicate the first, second, and third quartiles (L25, L50, and L75). Upper error-bars indicate the maximum levels (Lmax). Lower error bars indicate the 95% exceedance percentiles (L95). The maroon line indicates the arithmetic mean (Lmean).

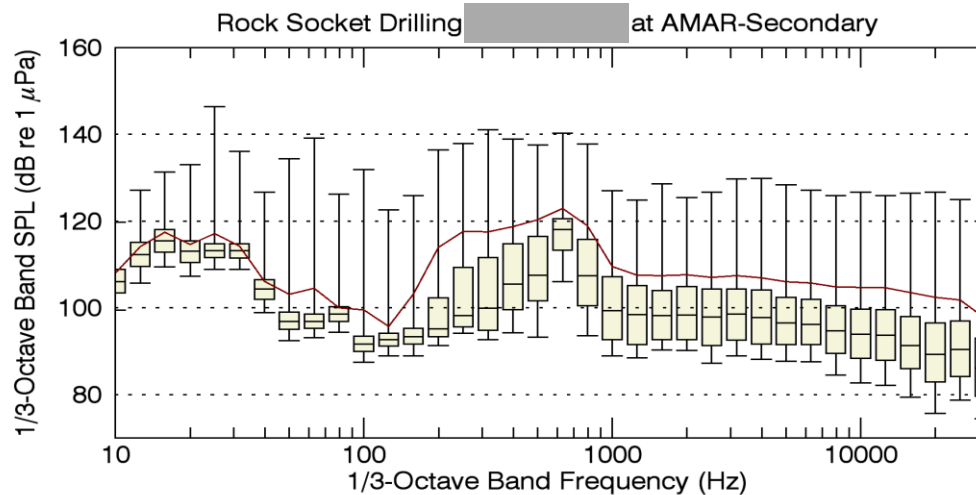
Acoustic Engineer: Caitlin O'Neill

Date: 28/11/2016

Part 5: AMAR-Secondary Additional Figures



Drilled Shaft: Peak SPL and cSEL versus time (EST) for the drilled shaft [REDACTED] measured 392 ft from the shaft using AMAR-Secondary.



Distribution of 1/3-Octave SPL for the drilled shaft [REDACTED] measured 392 ft from the shaft using AMAR-Secondary. Beige bars indicate the first, second, and third quartiles (L25, L50, and L75). Upper error-bars indicate the maximum levels (Lmax). Lower error bars indicate the 95% exceedance percentiles (L95). The maroon line indicates the arithmetic mean (Lmean).

Acoustic Engineer: Caitlin O'Neill

Date: 28/11/2016

Part 6: Comments

L50 (median) values were used instead of mean to remove vessel activity near primary and secondary AMARs. Data where vessel activity saturated the AMARs were removed. There was auger drilling near the AMAR-Secondary, which may have caused higher received levels at this location. Total drilling time reported includes all drilling times for shaft during November 22, 23, and 28. cSEL was calculated from the day with the greatest total drilling time, which was 6 hours and 41 minutes on November 28, 2016. 1/3-Octave SPL is presented instead of SELss because SELss is not used for continuous sounds like rock socket drilling.