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To: Stefan Galvez, California Department of Transportation
From: JAMES REYFF
CC: Ivy Edmonds-Hess, Parsons Brinckerhoff
Courtney Cacace, Garcia and Associates
Date: October 30, 2009
Re: **San Francisco-Oakland Bay Bridge East Span Seismic Safety Project, Self-Anchored Suspension Span**
Subject: **T1 Temporary Access Trestle Installation – Hydroacoustic Measurements For October 29, 2009**

The California Department of Transportation (Department) is in the process of replacing the existing East Span of the San Francisco-Oakland Bay Bridge (SFOBB) with a new bridge immediately to the north. To facilitate the construction of the Self-Anchored Suspension Span portion of the new East Span, twenty 36-inch diameter steel pipe piles will be installed to support a temporary access trestle (see Figure 1). Hydroacoustic data was collected during impact pile driving of three piles with the bubble curtain in operation. The piles were identified from Figure 1 as piles number 11, 12 and 13.

Underwater sound measurements were collected at positions 9 to 10 meters (30 to 33 feet), 26 to 30 meters (85 to 98 feet), and 85 to 120 meters (280 to 394 feet) from the piles, at a depth of 2 to 3 meters (7 to 10 feet) on October 29, 2009 during impact driving. The impact driving was conducted using the Delmag 30-32 diesel impact hammer. There were approximately 110 pile strikes, 208 piles strikes and 218 pile strikes during the driving of piles number 11, 12, and 13, respectively. The peak criteria of 206 dB re: 1 μ Pa at 10 meters from the pile was exceeded for all three pile driving events. The accumulated SEL criterion of 187 dB re 1 μ Pa-sec² at 28 meters (92 feet) from the pile was exceeded for all three pile driving events. Note that the 10-meter (33-foot) and 28-meter (92-foot) positions moved from pile to pile, therefore, it is not possible to measure the daily accumulated SEL at any one position. Each pile was about 5 meters (16 feet) from the other.

Measurements were made at 120 meters (395 feet) south-southeast, 85 meters (280 feet) southeast, and 95 meters (310 feet) southeast in an attempt to identify the distance to the 187 dB accumulated SEL level. These measurements indicate that the 187 dB accumulated SEL for all three piles is within 90 to 120 meters (295 to 395 feet) from the pile being driven. Our best estimate of the distance to the 187 dB accumulated SEL for the three piles driven would be about 90 to 100 meters (295 to 330 feet).

The measurement results for the close-in measurements including accumulated SEL are summarized Table 1. Root-Mean-Square (RMS) sound levels are summarized in Table 2 below.

Table 1: Summary of Measured Sound Levels for October 29, 2009

Pile	Time	Location	Peak		SEL		
			Maximum	Range	Typical Single Strike	Range	Accumulated SEL
11	0957 to 1000	10 meters	208 dB	193 to 208 dB	180 dB	178 to 200 dB	200 dB
	(153 sec)	30 meters	202 dB	198 to 204 dB	173 dB	173 to 175 dB	194 dB
		120 meters	171 dB	168 to 171 dB	148 dB	147 to 148 dB	167 dB
12	1038 to 1043	9 meters	210 dB	204 to 210 dB	180 dB	179 to 181 dB	203 dB
	(290 sec)	28 meters	201 dB	191 to 201 dB	~172 dB	169 to 175 dB	194dB
		85 meters	195 dB	190 to 195 dB	167 dB	164 to 168 dB	188 dB
13	1338 to 1343	10 meters	209 dB	201 to 209 dB	179 dB	175 to 180 dB	202 dB
	(305 sec)	26 meters	205 dB	202 to 205 dB	175 dB	173 to 180 dB	198 dB
		95 meters	186 dB	180 to 186 dB	160 dB	156 to 161 dB	182 dB

Table 2: Summary of Measured RMS Sound Levels for October 29, 2009

Pile	Time	Location	RMS	
			dB re: 1 μ Pa	
			Mean	Range
11	9:57 to 10:00	30 meters	187	184-189
		~120 meters	157	155-158
12	10:38 to 10:43	28 meters	185	179-190
		~85 meters	180	178-181
13	13:38 to 1343	26 meters	189	187-190
		95 meters	171	168-173

Figure 1

