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Reuben Arceo
County of San Bernardino
Land Use Services Department, Planning Division
385 North Arrowhead Avenue, First Floor
San Bernardino, CA 92415-0182

Subject: Recap of Acoustical Analyses Performed For The Lake Arrowhead Village Administration Regarding Summer Concerts at The Center Stage Venue in The Village.

Dear Mr. Arceo,

The county noise control criteria applicable to the Lake Arrowhead Village concert series project is the San Bernardino County Title 8 Development Code; Chapter 83.01; General Performance Standards; Section 83.01.080, Noise. This is the criteria for evaluating noise from stationary noise sources like the musical instruments and audio equipment associated with the Center Stage concert venue in Lake Arrowhead Village. With regard to applicability to the music concerts which take place between 6:30 p.m. and 8:30 p.m., the baseline daytime (7 a.m. to 10 p.m.) limit is 55 dB(A), as measured at any residential property line. The ordinance allows for higher noise levels if the durations are sufficiently short, but the baseline limit was taken to be the "trigger" point with regard to acceptability of the concert series project.

For non-stationary noise sources like aircraft, trains, or vehicular traffic, the Noise Level Standards outlined in the State of California General Plan Guidelines (which have been incorporated into the San Bernardino General Plan) are to be applied with regard to the acceptability of new projects with respect to their being impacted by these transportation noise sources. The metric is Ldn or CNEL¹

¹ CNEL (Community Noise Equivalent level) is the 24-hour time-average A-weighted energy equivalent continuous sound level in decibels, including a weighting penalty of +5 dB for events occurring between 7 pm and 10 pm, and a weighting penalty of + 10 dB for events occurring between 10 pm and 7 am. Ldn (Level Day-Night) is similar with the exception that there is no weighting penalty for the 7-10 pm time period.

The acoustical study for the Lake Arrowhead Village concert series was initiated in August 2012 and environmental noise measurements were performed on several occasions during the summer of 2012 and 2013 both in the Lake Arrowhead Village and in the vicinity of the Village. The measurements were performed at four locations near residential structures using a Bruel & Kjaer 2218 Type 1 Precision Integrating sound level meter during concerts when the bands were playing and during their breaks, and with and without power boat activity on the lake.

Site 1: A 2-story residence at the south end of the Village (see site location on the attached overall Google Earth image on Sheet A and on a more detailed image on Sheet B). The ambient noise level was 48 dB(A) with band playing. The band was barely audible above the ambient noise level even in absence of noise generated by vehicular traffic in the parking lot. This was expected since the Center Stage opening faces the north, away from this measurement location. It was decided that no further study was required at this location because the level was sufficiently below the 55 dB(A) "trigger" level.

Site 2: A location on a land spit at the residence nearest to the Center Stage bandstand, across the lake north of the Village. (see site location on the Attached Google Earth image on Sheet A and on a more detailed image on Sheet C). Note that the noise measurements were made in a boat dockside to facilitate access to this residential area. On the three occasions of measurements in this area, the sound levels while the bands were playing were 46 dB(A), 48 dB(A) and 52 dB(A) during the rare times that boats were not cruising the lake. It should be noted that it was very difficult to obtain measurements of sound levels from the bands because of the incessant noise from power boats and the resultant boat-generated waves slapping against our anchored boat. For reference, the ambient noise level at this measurement position on one occasion was 50-52 dB(A) without the band playing and no boat activity.

Site 3: A location on the land spit at a residence farthest from the Center Stage bandstand, across the lake to the north (see site location on the attached Google Earth image on Sheet A and on a more detailed image on Sheet C). The highest sound level measured at this site was 50 dB(A) with the band playing. Again, it was very difficult to obtain meaningful measurements because of the boat activity. Also, the music was barely audible above the ambient, even without boat activity.

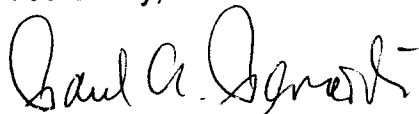
Site 4: The condominium complex located west of the Village (see site location on the attached Google Earth image on Sheet A and on a more detailed image on Sheet B). Measurements were made at the condo nearest the bandstand since this area would be considered to be representative of the "worst case" due to its proximity to the bandstand. Since sound levels measured at the other residential locations were in compliance with the noise ordinance, further study was considered to be not necessary. On the other hand, measurements were made on several occasions at this location because it was found that with certain bands, sound levels were in excess of the applicable 55 dB(A) limit of the noise

ordinance. Through experimentation during live concerts, it was found that holding the sound level as measured at the mixing console in the audience area under the tent to about 85 dB(A), the sound level at the subject condo would be no greater than the 55 dB(A) applicable limit. The Association has since purchased a sound level meter that is being used during concerts to assure that the sound levels at the mixing console do not exceed 85 dB(A). Note that, by default, the sound levels at the other measured residential locations would be comfortably below the 55 dB(A) limit.

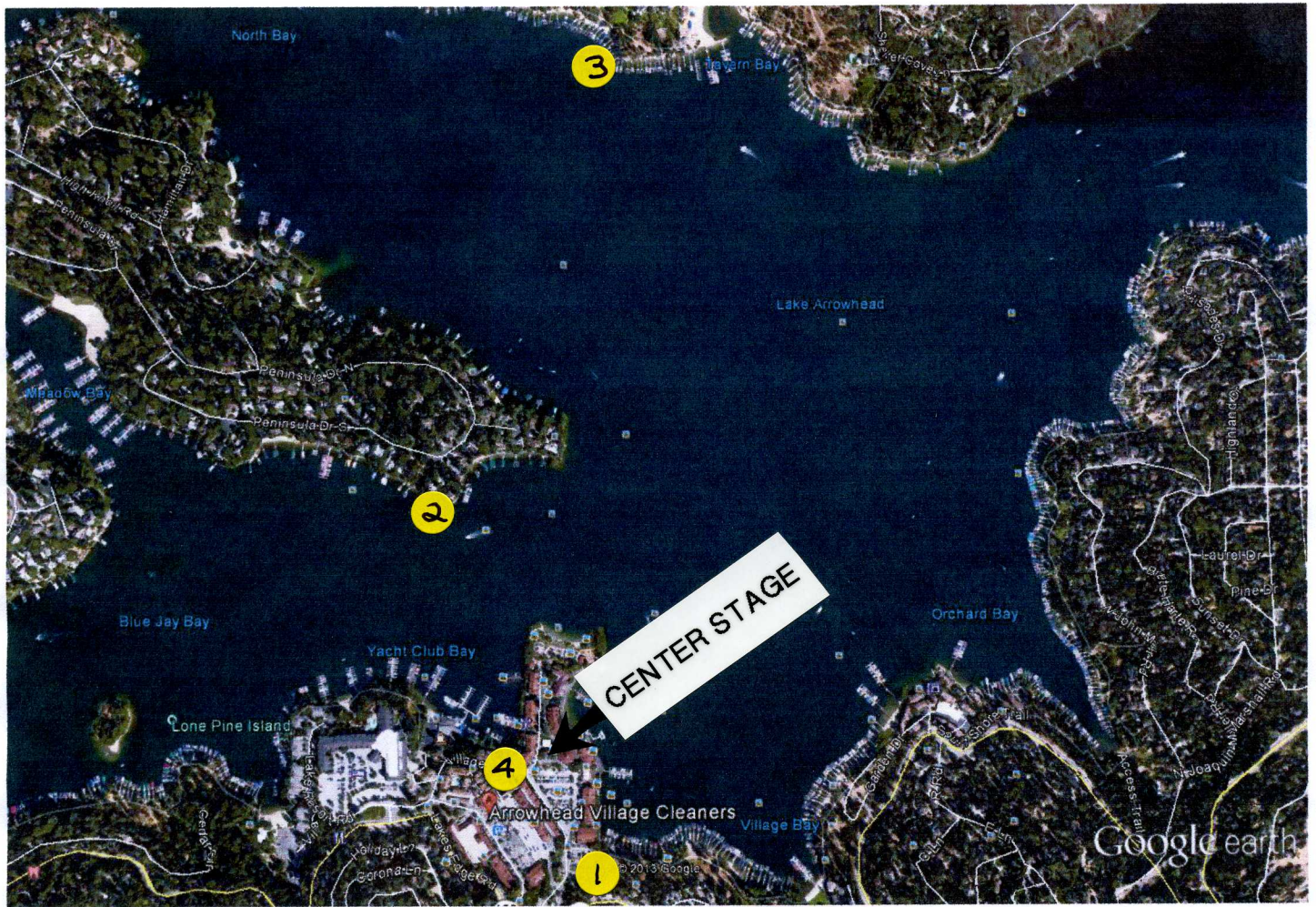
Since the Lake Arrowhead Village Administration is very much concerned that the summer concert series continue, not only for enjoyment of the patrons of the concerts, but for the benefit of the merchants in the Village, additional acoustical studies were requested in the effort to further reduce the sound levels in the vicinity of the Center Stage venue. In May 2013, an electronic pink-noise source fed through the house audio system verified that the sound path to the condos was, as suspected, down through the "corridor" between the Basix building and the one to the south. Since pink noise is a relatively constant source, as opposed to a live band, it allowed us to "calibrate" the system and confirm our original conclusion that, if the sound level at the house mixer location were to be held to a level not exceeding 85 dB(A), the sound level at the condos would be no greater than 55 dB(A), in keeping with the county criteria. While on site, other remedial measures were discussed including the installation of acoustically absorptive curtains on the exterior walls of the two subject buildings that form the sound "corridor" to the condos. These curtains were subsequently installed and in August 2013 the pink-noise measurements were repeated to assess the results. With the pink-noise level held at 85 dB(A) at the location of the mixing console, the noise level at the subject condo was measured to be 50 dB(A), a 5 dB reduction over the previous untreated measurement. This is a noticeable improvement. The end result is that there is now a 5 dB "cushion" in the assurance that the sound level at the "worst case" residential building will not exceed the mandated 55 dB(A) limit if the average sound level from concert bands, as measured at the audio mixing console, is held to 85 dB(A).

Please contact me if you have any questions or if would like to explore this issue further.

Yours truly,



Paul A. Penardi
Acoustical Consultant
Member, Acoustical Society of America



Google earth



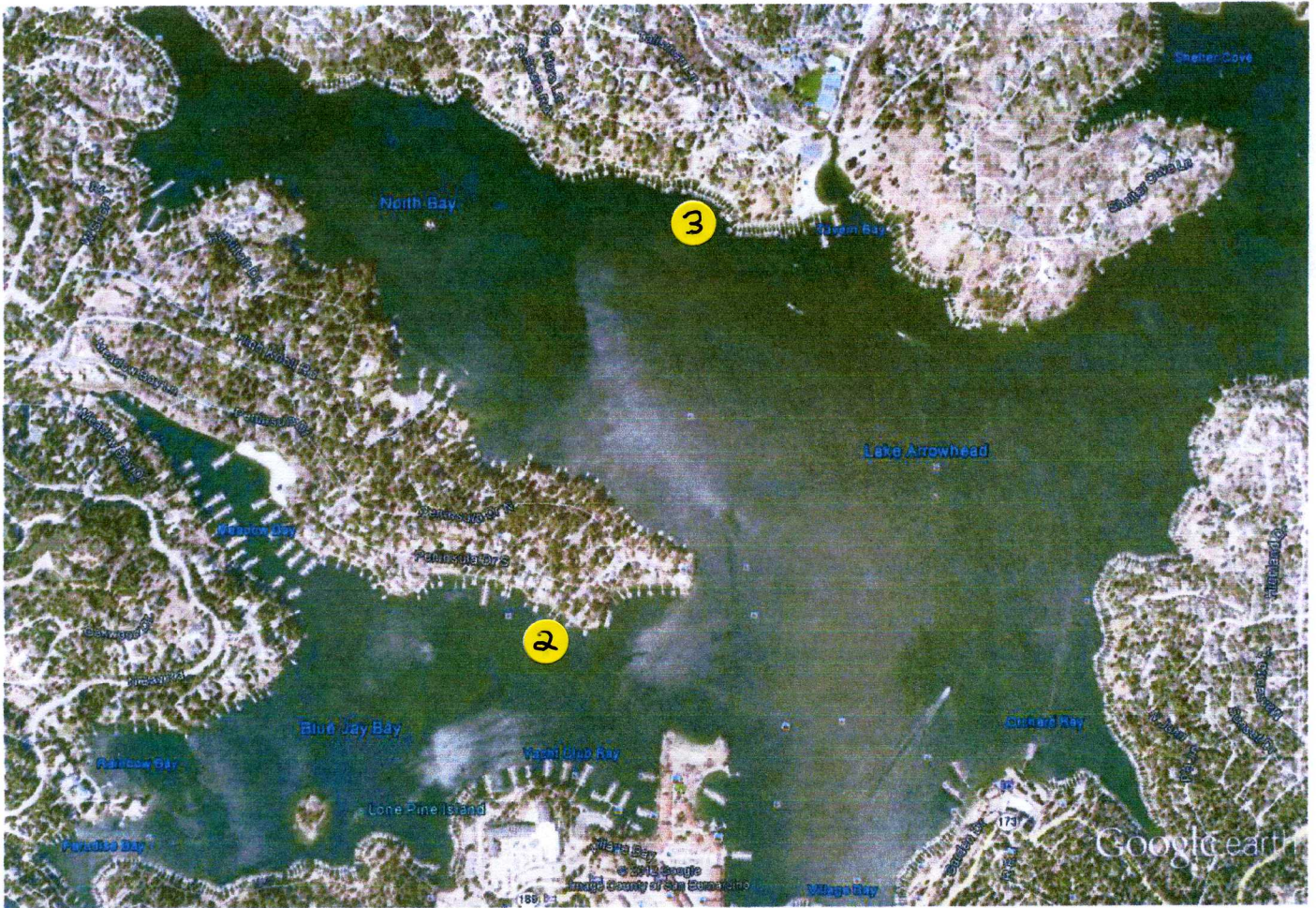
NOISE MEASUREMENT LOCATIONS (SEE TEXT AND SHEETS B & C)



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1 & 4 NOISE MEASUREMENT LOCATIONS (SEE TEXT)



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2 & 3 MEASUREMENT LOCATIONS (SEE TEXT)