

Sowden and Associates

Consultants in Acoustics and Entertainment Technologies

NOISE LEVEL MEASUREMENT AND ANALYSIS

PARKER COUNTY ICE HOUSE

WILLOW PARK

TEXAS

Submitted by:



Christopher Sowden, P.E.

October 19, 2022

Introduction

Sowden and Associates was contracted to review sound levels originating from the Parker County Ice House in Willow Park Texas, to review the sound systems in use at the facility and perform noise measurements at or near the facility. We were also contracted to review the noise regulations for this facility and adjacent properties and develop operational procedures to assist in compliance with these regulations. This report is the result of our meeting with representatives of the City of Willow Park and the measurements of a specific event at the facility on October 1, 2022.

We were informed by representatives of Willow Park that complaints had been filed by property owners since the facility was opened where the police were called regarding sound originating from the facility. We met with City Manager Mr. Grimes and assistant City Manager Mr. Funderburk on July 11, 2022 to discuss the complaints. We were provided with a street map of locations where these complaints were issued. Refer to Figure 1 for these locations.

Observations

The facility is located at 210 Willow Bend Drive in Willow Park, Texas. All documented complaints were observed to be north of the facility and Interstate 20 where traffic noise was observed to cause a majority of the measured ambient noise at all measured locations.

We received code compliance construction documents of the facility from the City on August 10, 2022. These documents were dated November 5, 2020, and were used to observe the construction of the project. We observed the facility on September 1, 2022 and October 1, 2022, and found no variances in the construction of the facility.

We received the City of Willow Park Ordinance No. 566-07 providing for the amendment of Chapter 7, Article 7.400 "Noise Related Offenses" of the Municipal Code of Ordinances of the City of Willow Park. We were notified that this document was to be reinforced.

We held telephone conversations with Mr. Kyle Brysom who operates the facility. Mr. Brysom leases the property from the Owner. Mr. Brysom requested that we not speak with Ryan the facility manager for he is a recent hire, and was not aware of the history of the facility. Mr. Brysom also indicated that they were limiting outdoor performances to 10:00 pm to reduce complaints caused by these performances.

Mr. Brysom referred us to Mr. Gary Langford who installed and operates the technical systems at the facility. Mr. Brysom also referred us to Gary's employee Mike, who sets up the sound system for performers and measures the sound levels of the system during performances within the seating areas of the facility.

We spoke with Mr. Langford regarding the sound system at the facility. Mr. Langford indicated that Mike had disabled the upper loudspeakers from the two arrays reducing the sound levels observed from the sound system outside the facility. We indicated that we would be observing the sound system on September 1, 2022. He indicated that Mike would be at the facility to answer any questions regarding the systems or their operation.

We were informed that some events may have used portable road show sound equipment for use by performers requiring higher sound levels. We did not observe any portable road show sound equipment when we were at the facility. Use of additional sound equipment could impact the sound levels originating from the facility causing greater complaints. We do not recommend use of any additional sound equipment except where previously authorized by the City.

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On September 1, 2022 I spoke with Mike, and observed the sound system operation for that night. It had rained that day, and a simple two-speaker system was set up for a single performer. They did not perform on the stage, and did not use the main loudspeakers configured for the stage. The performer and the loudspeakers were located under the shed roof, and sound observed outside the facility was low in level compared to stage events. Sound levels were not measured on this date.

We observed from the facility schedule that GNRX, a “Guns and Roses” cover band was scheduled for October 1, 2022. From the advertisement, the performance would be using the stage and was advertised to provide “Howling vocals, buzz saw guitar riffs and thunderous bass and drums.”

We attended the October 1, 2022 performance and confirmed the use of the stage and stage sound system for this event. We confirmed that the upper stage loudspeakers were not in operation prior to the performance and observed that there was no additional portable sound equipment used during the event.

The music program was inconsistent in level and frequency response as most music programs due to their dynamics and instrument or vocal solos. An averaging method was used to compare the ambient sound level and performance sound levels at each measurement location.

We observed the fence separating the stage audience from the street. The facility drawings listed a 6’ high stained cedar fence. This fence is approximately 6’ tall and is constructed of wood with metal supports. Refer to Figure 2 for the construction of this fence. The construction of the fence allows leakage of sound due to the spacing between the slats. The elevation of the fence provides limited obstruction of sound generated by the stage loudspeakers due to the elevation of the loudspeakers on the stage wall.

Measurements

Measurements were made using a sound level meter complying with ANSI S1.4-1983 and ANSI S1.11-1986. Each location was observed to determine the perception of sound originating from the facility and the comparison of the observed level with the ambient noise level at the measurement location. All measurements were made in octave bands to assist in determining the sources of the measured sound, and in dBA with slow meter damping compliant with the Ordinance. Refer to Appendix A for definitions of these measurements.

The sound levels originating from the stage were measured at the curb of Willow Crossing Drive East perpendicular to the stage centerline north of the facility. The sound levels measured at this location were 78 dBA average with 89 dBA maximum. This variance between average and peak levels with this style of music program is typically expected to be as much as 10 dB. The Ordinance requires levels no greater than 85 dBA at the property line, confirming that the measured facility sound on this date was approximately 4 dB louder than the Ordinance limit.

We observed that the ambient sound levels measured at each location was not impacted by the facility sound except for location twelve adjacent to the facility. At locations one through eleven, the sound originating from the facility was perceivable only by repetitive beat sequences of individual or multiple instruments. The perception of this sound varied with different locations due to wind variance, differences in ambient sound levels or reflections from adjacent streets. Human perception of music can be confirmed up to 14 dB below consistent ambient sound levels in laboratory conditions.

Standard construction techniques and interior ambient sound levels of housing observed in the area can reduce the sound originating from the facility to be very faint near or below the normal perception of sound. We did not perform any measurements within a facility. All observations were observed on the street adjacent to each measurement location.

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Refer to Figure 1 for the locations used to perform measurements. These locations were used since they were the documented locations of previous complaints.

Refer to Figure 3 for the measurements observed at each location. We documented our observations of the sound at each location in the paragraphs below. They are listed by measurement location. They are:

1. I-20 traffic and cicada noise was the greatest observed ambient noise at this location. We detected voice and snare drum sounds below the ambient noise level.
2. I-20 traffic and cicada noise was the greatest observed ambient noise at this location. We detected bass guitar and snare drum sounds below the ambient noise level.
3. I-20 traffic and cicada noise was the greatest observed ambient noise at this location. We detected snare drum stick sounds below the ambient noise level.
4. I-20 traffic and cicada noise was the greatest observed ambient noise at this location. The sound levels at this location were affected by dogs irritated by our presence in the area. We did not hear any sound originating from the facility.
5. Same as Item 4 above. On the opposite side of the same street.
6. I-20 traffic and cicada noise was the greatest observed ambient noise at this location. Reflections of sound originating from the facility were observed on Willow Park Drive. We detected voice, snare drum and bass guitar below the ambient noise level.
7. I-20 traffic and cicada noise was the greatest observed ambient noise at this location. We detected voice, snare drum, and bass guitar below the ambient noise level.
8. I-20 traffic and cicada noise was the greatest observed ambient noise at this location. We detected voice and snare drum below the ambient noise level.
9. I-20 traffic and cicada noise was the greatest observed ambient noise at this location. Reflections of sound originating from the facility were observed on Ranch House Road. We detected voice and snare drum below the ambient noise level.
10. I-20 traffic and cicada noise was the greatest observed ambient noise at this location. We detected voice and snare drum below the ambient noise level.
11. Same observations as Item 10 above. Observation locations were within 100 feet of each other.
12. The sound originating from the facility was the greatest observed levels at this location. Measurements were performed at the property line adjacent to Willow Crossing Drive East.

Recommendations:

The sound levels originating from the facility indicated that sound attenuation of approximately 4 dB is required for the facility to operate with similar programs from the stage compliant with the sound levels listed in the Ordinance.

Enclosed is a list of recommendations to assist in the reduction of sound originating from the facility. These are listed in order of their value of reducing sound levels. We recommend implementation of the items in order of the list to assist in reducing complaints in the least amount of time, effort and cost. The

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remaining recommendations should be considered for further implementation if complaints persist after implementation of each listed item.

The recommendations are:

1. Modify program schedules to limit programs using the stage sound system after 9:00 pm to avoid the 70 dBA limit after this time.
2. Provide modifications to the existing sound system to limit system output levels to comply with the Ordinance.
3. Modify the fence construction of the north audience fence facing Willow Crossing Drive East extending approximately 78 feet. Increase the height of this fence to 12'-0". The new fence construction should be made to restrict airflow through the fence. We further recommend similar fence construction directly behind the stage although complaints have not been received south of the facility at this time.
4. Install a large sound level display on the north fence facing the stage. This monitor should be of a size sufficient to allow observation of the sound by the operations staff and the performers to manage performance sound levels. Provide management and operation of the facility to comply with the Ordinance outside the facility.
5. Provide and install a pole mounted permanent noise monitor system with AC power provision adjacent to the north fence. Monitor levels should be available through SIMM card exchange on a monthly basis and 4G cellular communications allowing PC observation of the levels by the police and City. The SIMM cards should be harvested monthly allowing permanent documentation of sound levels originating from the facility during each month.

Materials:

The reference to "large sound level display" is interpreted as TestHelper SW-526A 18" LED sign mounted in a weather proof enclosure modified to allow direct observation of the sound by the unit microphone and observation of the levels by the performers. Provide local AC power and 120 volt power supply for operation of this unit. Locate on the north fence centered with the center of the stage adjacent to the top edge of the fence.

The reference to "pole mounted permanent noise monitor system" is interpreted as a system similar to Larson Davis NMS045 with software, mounting pole and local AC power provisions installed allowing local storage and transmission of sound levels using cellular technology to a personal computer. The height of the microphone should be approximately 14' above grade.

Conclusion:

Sowden and Associates visited the Parker County Ice House and adjacent areas in Willow Park, Texas to review the operation of the facility and perform noise measurements adjacent to and near the facility. We also reviewed the noise regulations in effect for this and adjacent properties to develop operational procedures and solutions to assist in compliance with the regulations.

The eleven locations where observed where a noise complaint was received by the city. The sound levels observed at each of the locations were not increased by the sound originating from the performance at

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Parker County Ice House. The sound originating from the facility was below the measured ambient noise at each location.

Recommendations were provided to assist the facility in reducing the complaints originating from performances originating from the facility and to comply with the local codes of the City of Willow Park and Parker County.

Please review this report and contact us if you have any questions regarding the observations, recommendations, or additional solutions not covered in this report.

End of Report

Enclosures

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Appendix A

ENVIRONMENTAL NOISE AND HUMAN PERCEPTION OF SOUND

Noise is expressed in decibels (dB), which is a logarithmic measure of the acoustic sound pressure divided by a reference pressure, and is called “sound level.” The noise signal being measured, for most community noise purposes, is filtered using the A-weighting scale. This filtering adjusts the frequency content of the sound to be similar to human perception of sound wherein the ear is more sensitive to mid-frequency sounds (from about 1,000 Hertz to about 4,000 Hertz) and less sensitive to frequency components lower or higher than the mid-frequency band. The un-weighted, or no weight, measure, designated as Z, for zero weighting, does not filter the signal, so the contribution for any frequency band is treated the same as all others.

Since the decibel is logarithmic, decibels cannot be added arithmetically. Decibels must be converted back to the sound energy value, the total sound energy is then calculated and the sound level is re-calculated.

Definitions

dB_A – the primary unit for environmental noise measurement is the A-weighted decibel (dB_A). The term “A-weighting” refers to the filtering effect that the human ear has on sound as it is perceived by the listener. Sound level meters have A-weighting filters that simulate the effect of the ear on the approaching sound such that the meters’ displayed sound level correlates with the perceived loudness of the sound at a moderate level. The A weighted curve is presented in Figure A1, below. The A-weighting curve discounts the impact that low frequency sounds can have in the environment, especially at higher levels. The other weighting curves are normally not used for environmental noise measurements.

Human perception of sound changes as the level increases. At low levels we are more sensitive to mid to high frequency sounds but at higher sound levels this difference lessens. Figure A2, Equal Loudness Contours/ Fletcher Munson Curves, shows this variation in frequency sensitivity versus sound level. Note the dynamic range (the range from the lowest to the highest level) for low frequency sound is smaller than that for sounds in the mid-band range.

The wide range of common easily recognized sounds are listed in order of increasing sound levels in decibels in Figure A3, Common Sounds in Decibels. The sound levels shown for occupied rooms are only example activity levels and do not represent criteria for design. Note that thresholds vary from individual to individual.

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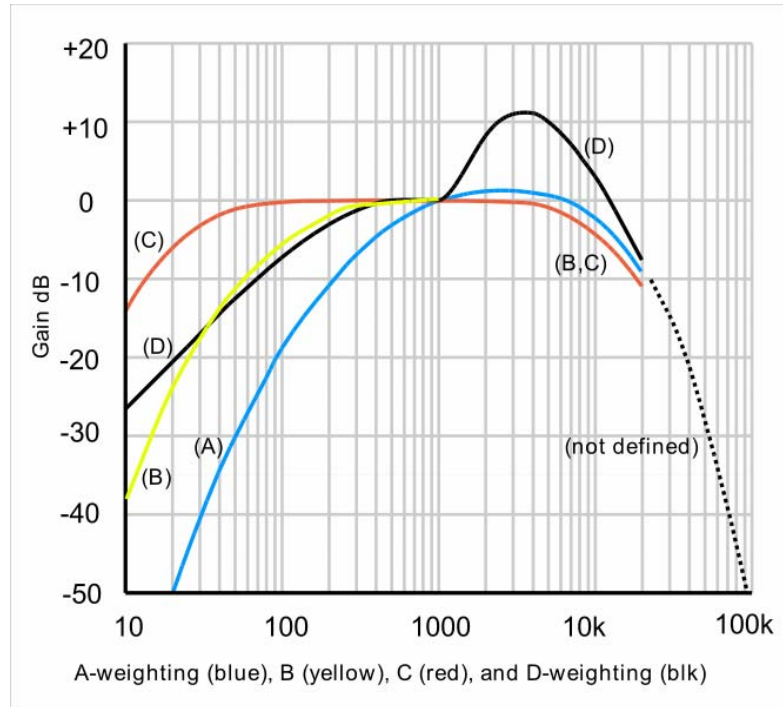


Figure A1 – Acoustic Weighting Curves
Reference: Wikipedia

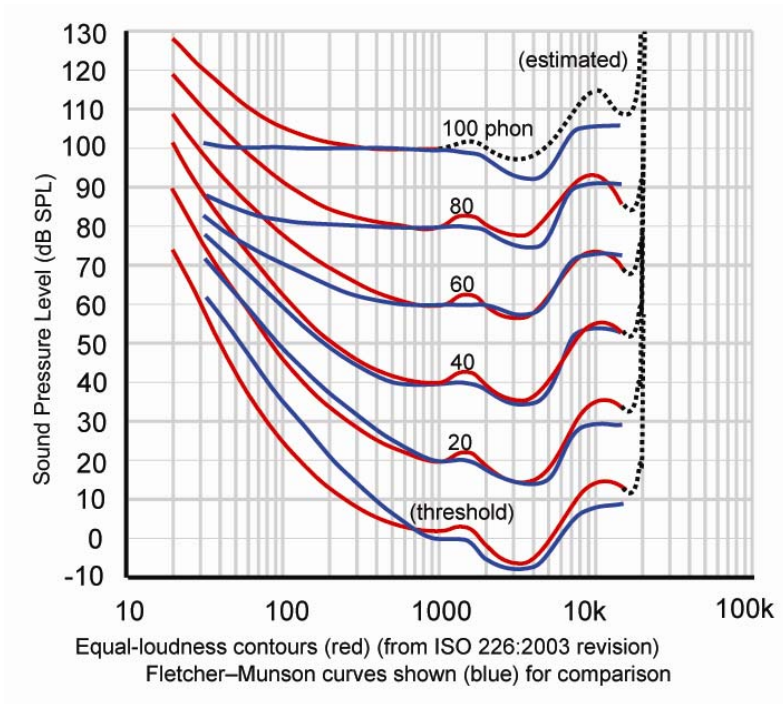


Figure A2 – Equal Loudness Contours/ Fletcher Munson Curves
Reference: Wikipedia

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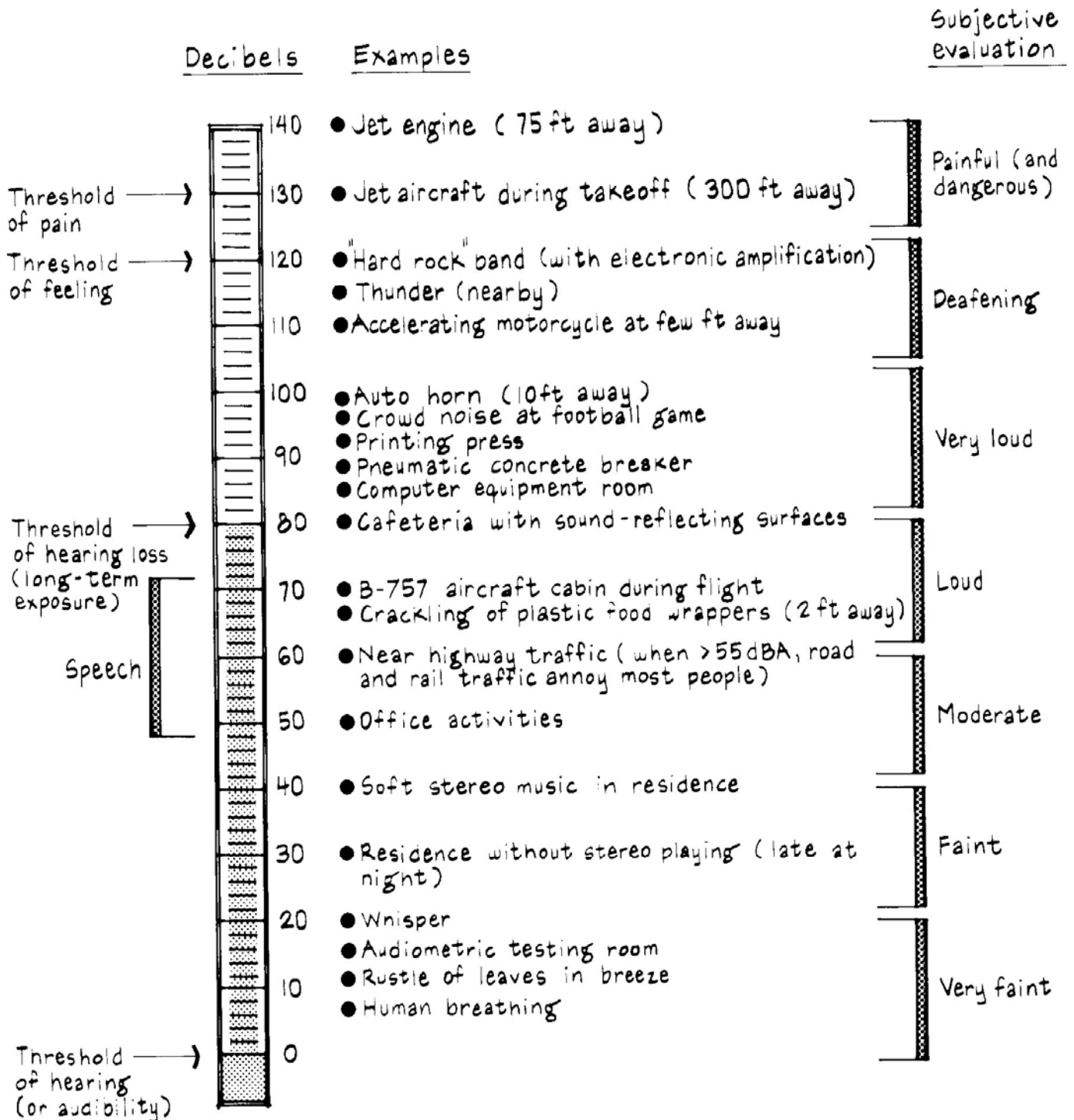


Figure A3 –Common Sounds in Decibels
 Reference: Architectural Acoustics, Egan, 1988, McGraw Hill, page 13

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Basics of Sound Propagation

In air the main cause of acoustical attenuation between a noise source and a receiver is hemi-spherical spreading, by which a sound source's acoustical energy spreads out over a larger area as it travels away from the source. More specifically, the sound level in air due to an acoustical "point source" drops by 6 dBA for every doubling of the source-to-receiver distance. A sound source is characterized as a "point source" if the closest source-to-receiver distance of interest is at least twice the source's largest dimension. For example, for a 20-foot long truck, the rule of "6 dBA per distance-doubling" applies for all receptors that are more than 40 feet from the noise source. All of the noise sources in this study were point sources. The "6 dBA per distance-doubling rule" applies if the ground is hard and sound-reflective. If the ground is covered with grass or other foliage, the attenuation rate can be, but may not be, as much as 9 dBA per distance-doubling. This report uses only the "6 dBA per distance-doubling" rule, so all calculation results are conservative where there is grass or ground foliage between the noise sources and the receptors.

Audible Sound Level Differences

A 3 dB increase in sound level represents twice the sound energy but is just perceptible to humans while a 10 dB increase in sound level, which represents a 10 times increase in energy, is perceived only as a doubling in loudness. Similarly, a 3 dB decrease in sound level is just perceptible, while a 10 dB decrease in sound level is perceived as being one-half as loud.

Table A1, below, summarizes the human perception of different sound levels for sounds of the same general acoustical content.

Subjective Perceptions of Sound Level Changes	
Sound Level	Subjective Perception
Reference Sound Level + 10 dBA	Twice as loud
Reference Sound Level + 5 dBA	Noticeably louder
Reference Sound Level + 3 dBA	Just noticeably louder
Reference Sound Level	Baseline
Reference Sound Level – 3 dBA	Just noticeably quieter
Reference Sound Level – 5 dBA	Noticeably quieter
Reference Sound Level – 10 dBA	Half as loud

Table A1 - Subjective Perceptions of Sound Level Changes

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PROJECT: ACOUSTICAL TEST LOCATIONS CITY OF WILLOW PARK TX		SHEET: FIG-01
PROJECT NO: 22F70701	DATE: 10/19/22	

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Fig01.dwg



Figure 2
Detail of North Fence facing Willow Run

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FIELD MEASUREMENTS

Parker County Ice House										
Acoustical Measurements										
October 1, 2022										
FREQUENCY	MEASUREMENT NO.									
	1	2	3	4 & 5	6	7	8	9	10 & 11	12
dBA	52	52	50	44	46	47	46	49	46	78
dBC										
NC										
20										
25										
31.5										
40										
50										
63	52	51	48	47	49	51	46	50	47	83
80										
100										
125	50	49	46	42	52	47	47	52	42	81
160										
200										
250	44	47	43	41	42	45	44	46	39	76
315										
400										
500	49	51	50	42	44	44	44	48	41	74
630										
800										
1000	48	49	46	42	43	45	43	43	43	73
1250										
1600										
2000	40	42	39	32	32	33	31	43	39	71
2500										
3150										
4000	43	28	31	21	23	22	24	27	23	69
5000										
6300										
8000	22	22	24	22	21	21	22	22	24	63
10000										
12500										
16000										
20000										