03-08-22

ITEM #8

City Council

Item # 8 RTC 22-242

Action on Amendment No. 5 to the Agreement for the Performance of Services with Wilson, Ihrig & Associates for Noise Monitoring Services at Levi's Stadium

March 8, 2022

1

City of Santa Clara
The Center of What's Possible

Noise Monitoring Agreement

Background

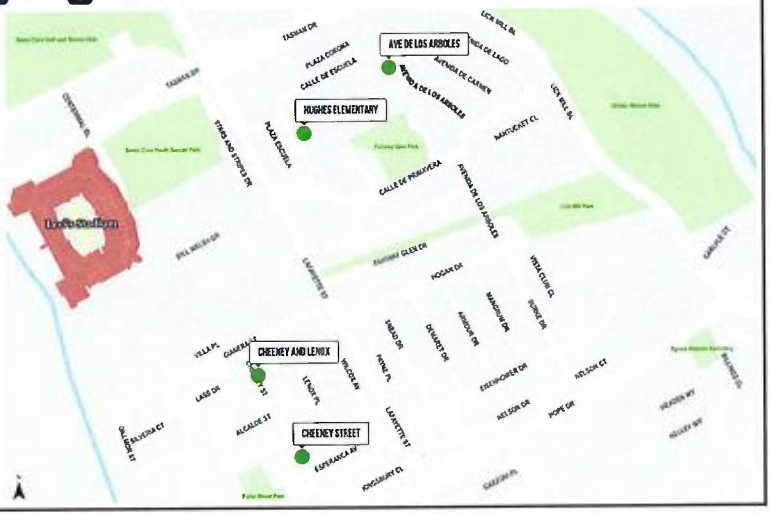
- August 30, 2016, City Council directed staff to establish a noise monitoring system for Levi's Stadium and training facility.
- City solicited bids from acoustic engineers and entered into an agreement on February 7, 2017 with Wilson, Ihrig & Associates to provide noise monitoring services.
- Services include rental of four monitoring stations and the maintenance of a website portal to share noise data received by the monitors and for residents to issue noise complaints.

2

City of Santa Clara
The Center of What's Possible

Noise Monitoring Agreement

Noise Monitor Locations

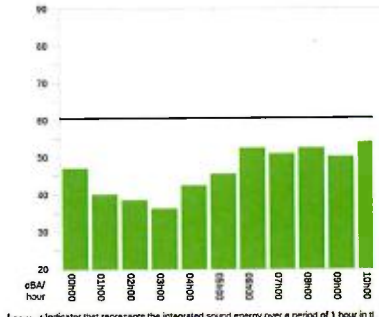


3

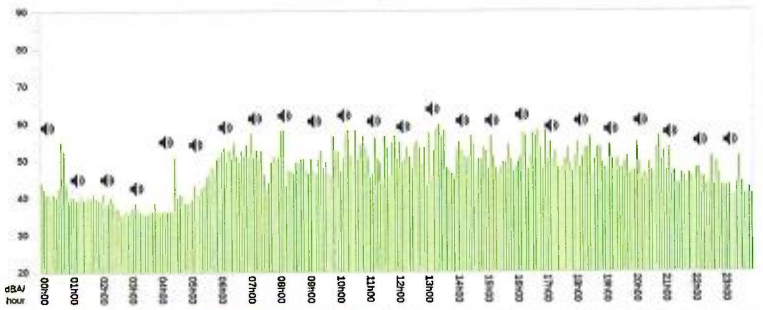
City of Santa Clara
The Center of What's Possible

Noise Monitoring Agreement

Website Data



$L_{EQ,1h}$: Indicator that represents the integrated sound energy over a period of 1 hour in t fluctuating sound level measured for 1 hour. Jet noise has been removed from data.



$L_{EQ,5min}$: Indicator that represents the integrated sound energy over a period of 5 minutes in this case. Corresponds to the level of continuous noise that would have the same energy as the fluctuating sound level measured for 5 minutes. Jet noise has been removed from data.

4

City of Santa Clara
The Center of What's Possible

Noise Monitoring Agreement

Council Information Requests

- Four Amendments have been made to the original agreement to extend contract term and add commensurate funding
- Agreement term expires March 31, 2022
- At the September 7, 2021 Council meeting, the Council extended the agreement six months and requested:
  - deeper analysis of the noise data and
  - information regarding an option to purchase the noise monitoring equipment rather than the current rental approach

5

City of Santa Clara
The Center of What's Possible

Noise Monitoring Agreement

Analysis & Reporting

- Consultant is available to provide additional analysis and reporting if requested by City Council.
- Possible activities include supplemental in person monitoring, study sessions, etc.
- Sample reports provided as attachments
- Council objectives?

6

City of Santa Clara
The Center of What's Possible

Noise Monitoring Agreement

Purchase Options for Monitoring Equipment

- Information gathered from three noise monitoring equipment firms to determine the estimated cost of purchasing equipment:
  - Seti Media, whose equipment is currently used by Wilson Ihrig, & Associates, for Stadium monitoring, does not offer the sale of their equipment. *Note that only Seti Media has the capacity to filter out jet noise.
  - Two other firms sell monitoring equipment for a one-time cost that range between $50,740 and $51,300 for four stations; however additional support costs range between $15,020 and $30,240 annually.

7

City of Santa Clara
The Center of What's Possible

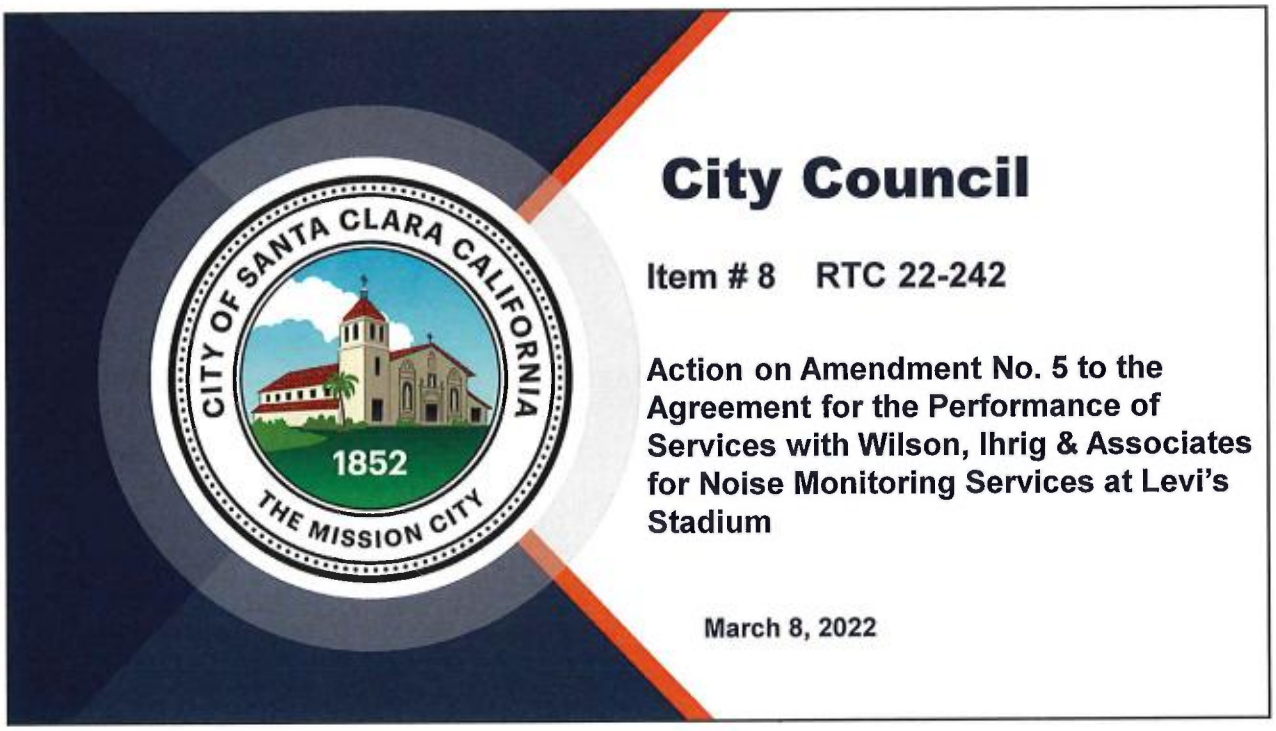
Noise Monitoring Agreement

Alternatives

1. Authorize the City Manager's Office to execute Amendment No. 5 with Wilson, Ihrig & Associates to extend the term of the Agreement by 2 years ending on March 31, 2024, and increase maximum compensation by $140,000 for a total not to exceed amount of $439,840, subject to Santa Clara Stadium Authority Board appropriation of funds.
2. Authorize the City Manager to execute Amendment No. 5 with Wilson, Ihrig & Associates to extend the term of the Agreement through March 31, 2023, and increase maximum compensation by $70,000 for a total not to exceed amount of $369,840, subject to Santa Clara Stadium Authority Board appropriation of funds and direct staff to initiate a Request for Proposals to evaluate a new potential vendor for noise monitoring services.
3. Direct staff on an alternate approach to noise monitoring adjacent to the 49ers Stadium

8

8


City Council
Item # 8 RTC 22-242
Action on Amendment No. 5 to the Agreement for the Performance of Services with Wilson, Ihrig & Associates for Noise Monitoring Services at Levi's Stadium
March 8, 2022
CITY OF SANTA CLARA CALIFORNIA
1852
THE MISSION CITY

9

03-08-2022

ITEM #8

WILSON IHRIG
ACOUSTICS, NOISE & VIBRATION

CALIFORNIA
WASHINGTON
NEW YORK

WI #16-125

MEMORANDUM

4 March 2022

To: Reena Brilliot, Leah Ruch, Andrew Crabtree
Community Development Department, City of Santa Clara

Fr: Sarah Kaddatz, Derek Watry

Re: Levi's Stadium Noise Level Monitoring Project
San Francisco 49ers 2021 Sunday Game-Day Noise Levels (Cheeney & Lenox)

This memorandum presents NFL game-day noise levels , compares them to the community noise level target set in the Stadium's Development Permit, and puts them in the context of average non-game-day noise levels and noise level estimates taken from the Stadium's environmental impact report (EIR).

Data is being collected continuously in the neighborhoods around the Stadium using Seti-Media noise monitoring stations installed expressly for this purpose. Measurements are being made at four locations around the Stadium (see Figure 1), but this memo only reports data from the monitor at Cheeney and Lenox. The Cheeney and Lenox monitor characterizes noise in the neighborhood south of the Stadium which was the focus of the Stadium's EIR noise analysis. It is about the same distance from the Stadium as the Hughes Elementary School monitor and is lined up with the open, southern end of the Stadium. The Hughes location is shielded from Stadium noise to a some extent by the bleacher seats on the eastern side. At the City's request, data from the Hughes and the other monitors could be analyzed and added to this report.

Game-Days Analyzed The football game-day data analyzed to date are for the following San Francisco 49ers game days, all Sundays:[1]

[1] Analysis of data from other game days (Saturdays, Monday) could be done if desired. Data from Sunday 10/24/21 (Colts) are not analyzed because the noise monitoring station at Cheeney & Lenox was not functioning properly on that day due to rainfall.

SUPPLEMENTAL MATERIAL

Event Date	Event	Start Time	End Time
8/29/2021	49ers vs. Raiders	1:05 p.m.	3:56 p.m.
9/26/2021	49ers vs. Packers	5:22 p.m.	8:30 p.m.
10/3/2021	49ers vs. Seahawks	1:05 p.m.	4:14 p.m.
11/7/2021	49ers vs. Cardinals	1:25 p.m.	4:25 p.m.
11/28/2021	49ers vs. Vikings	1:25 p.m.	4:33 p.m.

Explanation of Sound Level Metrics Sound (noise) levels vary continuously, so the acoustical engineers and scientists have developed a number of metrics to characterize this variability. This section explains the two used in this memo.

Average or Equivalent Level (Leq) The *equivalent level*, abbreviated "Leq" is the steady sound level that contains the same amount of acoustical energy during the measurement period as the actual, time-varying sound level did. For all intents and purposes, it is the average level and shall be referred to as such in this memo.

L1 Statistical Noise Levels ("Maximum") The L1 is the noise level exceeded 1% of the time during a measurement period. For a one-hour measurement period (3,600 seconds), the noise level is higher than the L1 for 36 seconds and lower for the other 59 minutes and 24 seconds. It more fairly represents the "maximum" noise level during the hour for a source like Levi's Stadium, and it is used in this report as a proxy for the maximum noise level.[2]

Data Analysis & Presentation

- The data analysis uses data collected in 1-hour intervals.
- The noise monitoring system can filter out most jet noise based on the typical characteristics of jet noise.[3] When it detects a jet, the system disregards the 30 seconds during which the jet flies over. Data with and without the inclusion of jet noise are presented in this report. The levels without jet noise include Stadium noise and all other non-jet sources.
- The Stadium's Development Permit includes the following condition regarding noise:

> In order to control noise, the stadium loudspeakers systems (permanent and temporary) shall be oriented in a manner consistent with Community Noise Analysis prepared by WJHW, dated May 27, 2010 for the proposed 49ers Stadium,

[2] The true maximum noise level during the hour is the single loudest second.

[3] If the jet is not particularly loud or there is another, constant noise source such as a lawnmower at the time, the filter may not identify the jet. The filter excludes the noise from about 85% of all jets.

> in order to control noise impacts to adjacent residential neighborhoods. In accordance with Section 9.10.070(c) of the Santa Clara City Code, and the recommendations of this noise analysis, sound system levels shall be limited to 100 dBA for NFL games and other uses of the permanent speaker system, and not more than 105 dBA for temporary concert speaker systems as presented in the analysis. For sound system installations and modifications within the stadium site, the target for maximum sound level exposure in residential areas to the east and south shall be 60 dBA, in order to minimize noise impacts to sensitive receptors.[4]

The game day noise levels are compared to the 60 dBA target. As established in the WJHW report, this decibel level target is intended for the 1-hour Leq ("average") level.

- For context, the data from the 46 Sundays in 2021 when there was not an NFL game (non-game days) were arithmetically averaged to ascertain representative levels for non-game days.

- Also for context, the Stadium noise level estimates in the project EIR are presented. From the Environmental Noise Assessment done for the project:[5]

  > Hourly average noise levels generated during the game are calculated to range from 61 to 66 dBA Leq at the nearest residential receivers to the south . . . Game-related hourly-average noise levels would exceed typical Sunday afternoon average noise levels by about 4 dBA Leq . . .
  >
  > Maximum instantaneous noise levels generated by various sources associated with an NFL game (e.g., PA System, music, crowd cheering) would typically range from about 55 to 68 dBA at the nearest residential receivers . . .

  The EIR predictions are for the residences closest to the Stadium whereas the Cheeney & Lenox sound monitoring station is more deeply embedded in the community, about 50% farther away. To account for the extra attenuation with distance, 4 dB have been subtracted from the levels predicted in the EIR.[6]

---

[4] Development Permit PLN2008-06947, 11/30/2010, Condition P23

[5] Illingworth & Rodkin, *49ers Stadium Project Environmental Noise Assessment*, Santa Clara, California, I&R Job No. 08-046, 24 February 2009, p 14.

[6] Technical note: Noise attenuates with distance for the same reason that the height of circular waves resulting from a rock thrown in a still lake get smaller as they travel away from the source location: the energy in the wavefront is spread over a larger and larger area which reduces the wave's amplitude. This is called "attenuation due to geometric spreading". Noise that is fairly far from the source – even a large source such as Levi's Stadium – spreads at a rate of 6 dB per doubling of distance. The distance from the center of the stadium (which is the effective location of the noise source) to the homes where the EIR predicted noise levels is about 1,200 feet, whereas the distance from the center of the stadium to the Cheeney and Lenox monitor is about 1,800 feet, a 50% increase. Given the logarithmic mathematics of decibels, one may calculate that the expected attenuation for a 50% increase in distance is about 4 dB using the equation $20 \log_{10} (\text{distance}_1/\text{distance}_2)$.

- The 2021 Sunday game-day hourly average levels (Leq) are plotted along with the 60 dBA target from the Development Permit and the contextual backdrop of average non-game Sunday noise levels and the EIR-predicted noise levels. The approximate timeframe of the football game is indicated on each data plot. The data for each of the five games along with commentary are presented in Figure 2 8-29-21 (Raiders) – Hourly-Average Noise Levels to Figure 6.
- The "maximum" (L1) data for all five game days with jet noise removed are presented in Figure 7. Also shown in Figure 7, for context, is the range of maximum Stadium noise levels predicted in the EIR. The L1 data for non-game days with the jet noise removed has not yet been analyzed for comparison, but could be.

* * * * *

Figure 1 Area Map with Noise Monitoring Locations
(Distances are measured from the center of the Stadium)

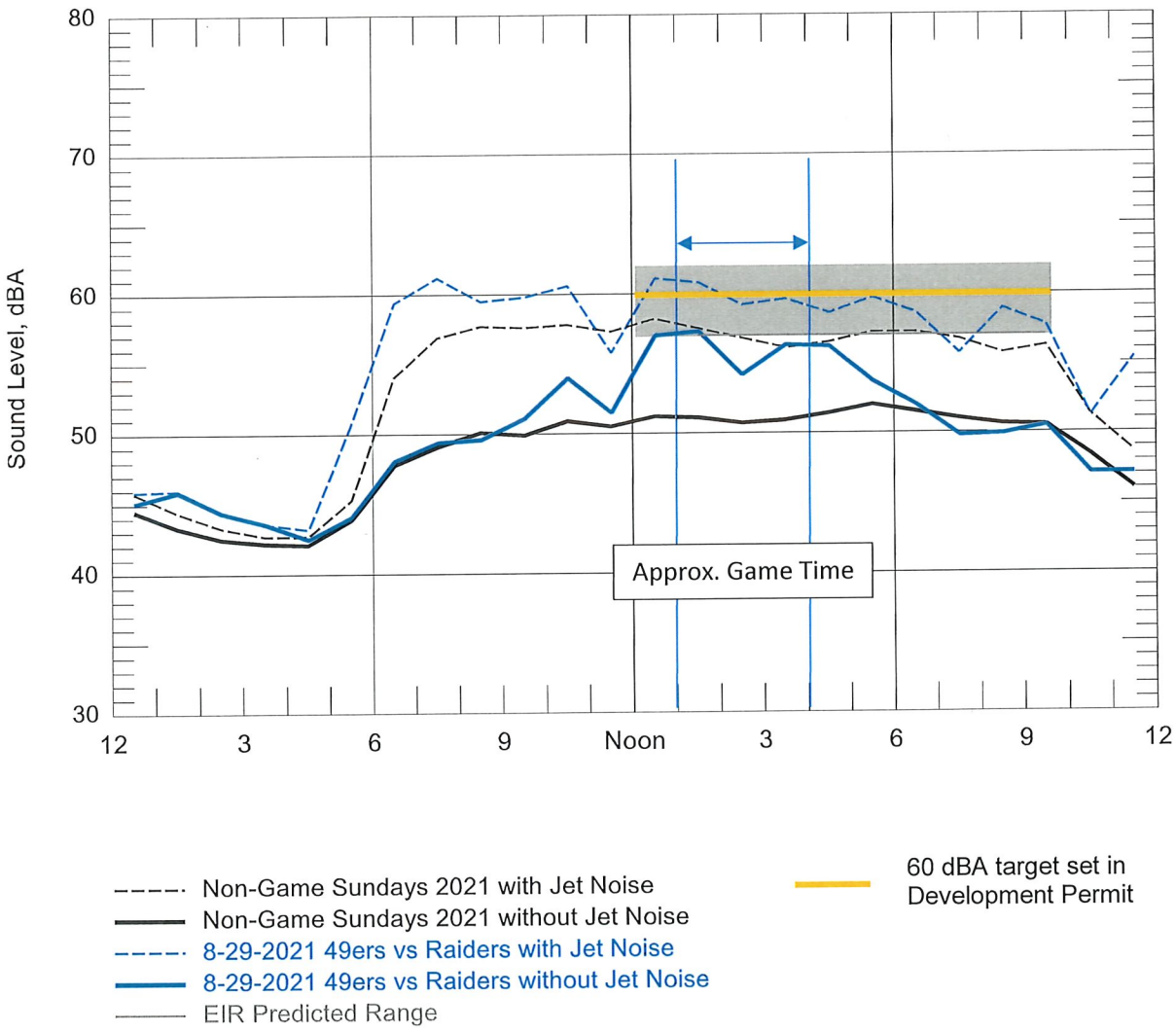


Figure 2 8-29-21 (Raiders) – Hourly-Average Noise Levels
49ers 34 Raiders 10

It is reasonable to atrribute the game-day noise levels without jet noise (solid blue line) that exceed the average non-game-day noise levels without jet noise (solid black line) to activities at Levi's Stadium.

Over the 6-hour period centered on the game time, game-day levels did not reach or exceed 60 dBA. They were 2 to 6 dB higher than average non-game-day levels, but were generally below the range predicted for the EIR.

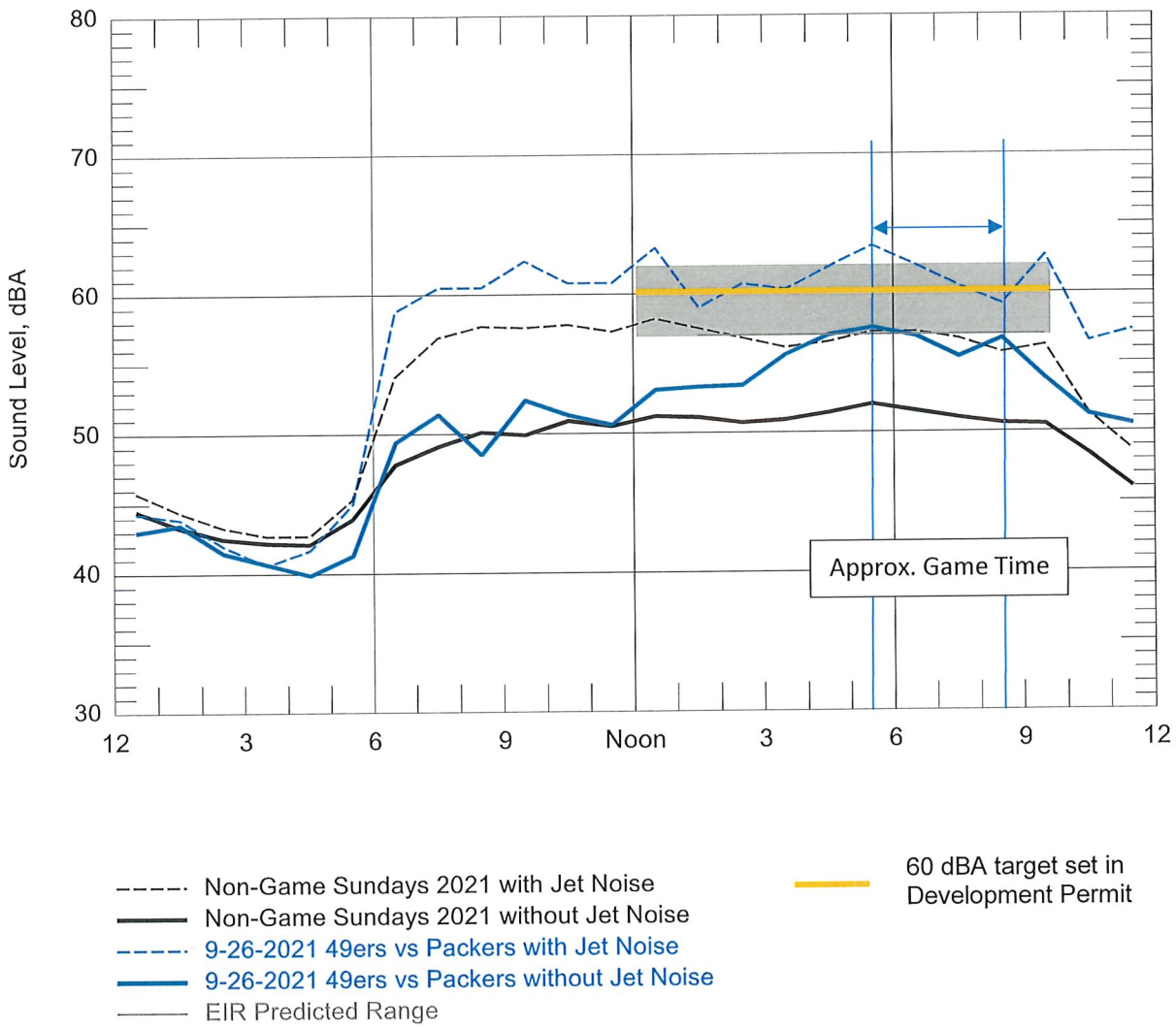


Figure 3 9-26-21 (Packers) – Hourly-Average Noise Levels
49ers 28 Packers 30

Over the 6-hour period centered on the game time, game-day levels did not reach or exceed 60 dBA. They were 3 to 6 dB higher than average non-game-day levels, but were generally below the range predicted for the EIR.

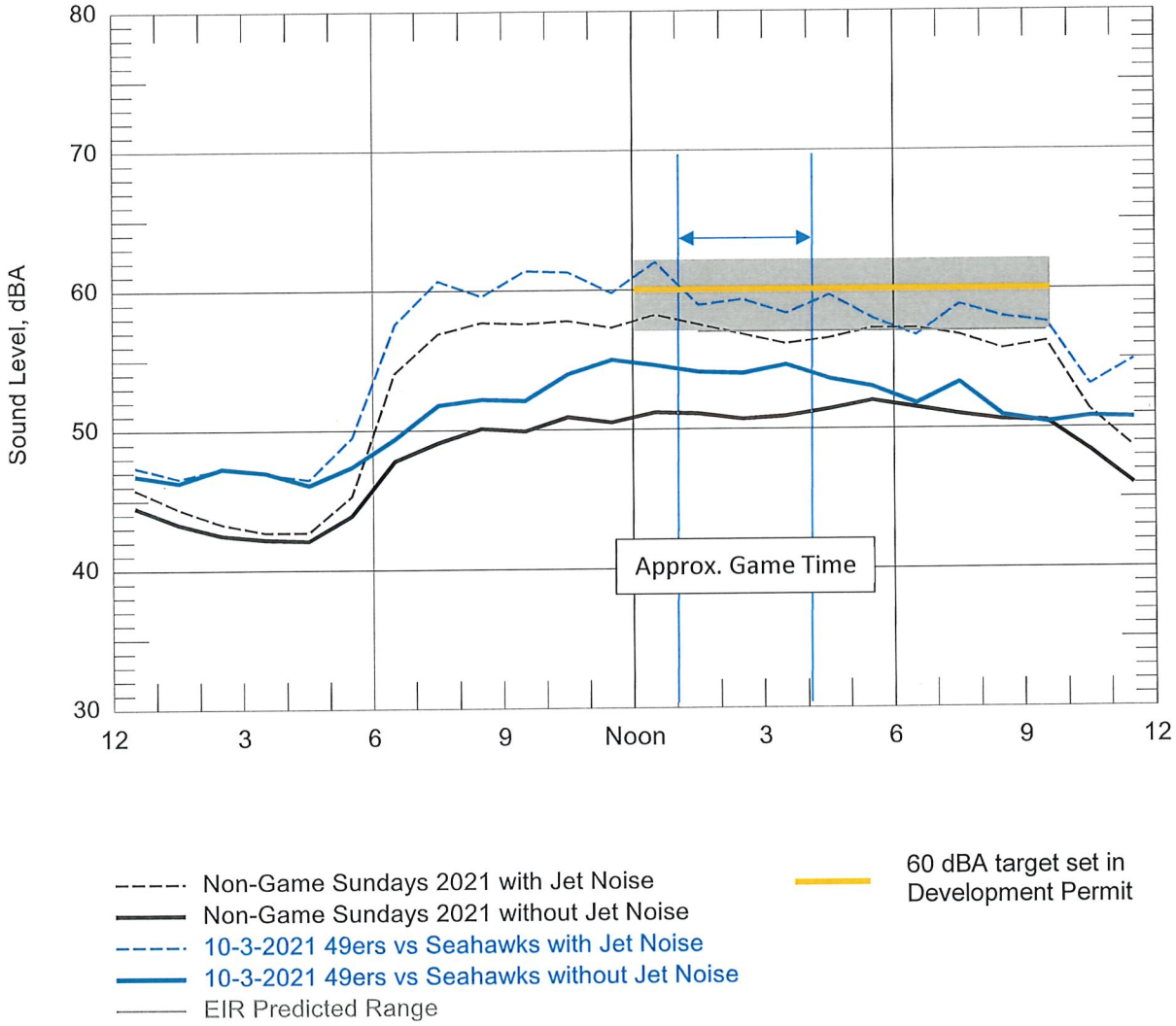


Figure 4 10-3-21 (Seahawks) – Hourly-Average Noise Levels
49ers 21 Seahawks 28

Over the 6-hour period centered on the game time, game-day levels did not reach or exceed 60 dBA. They were 1 to 4 dB higher than average non-game-day levels, but were generally below the range predicted for the EIR.

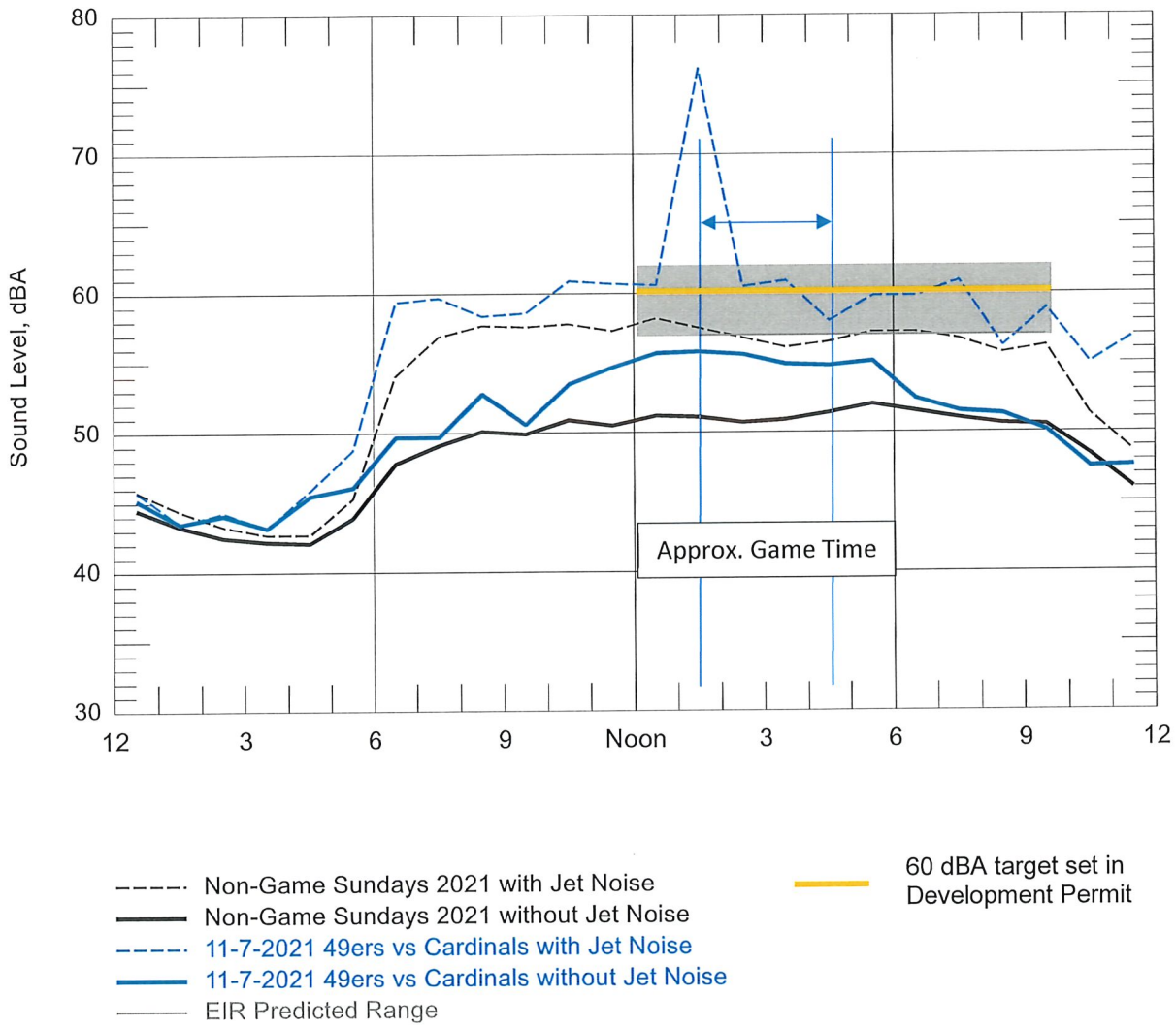


Figure 5 11-7-21 (Cardinals) – Hourly-Average Noise Levels
49ers 17 Cardinals 31

Over the 6-hour period centered on the game time, game-day levels did not reach or exceed 60 dBA. They were 3 to 5 dB higher than average non-game-day levels, but were generally below the range predicted for the EIR.

The high noise level in the game-day data including jet noise (dashed blue line) appears to have been caused by jets flying low over the Stadium just before game time. Although not confirmed, this may have been part of the NFL and 49ers' salute to veterans given the proximity to Veteran's Day.

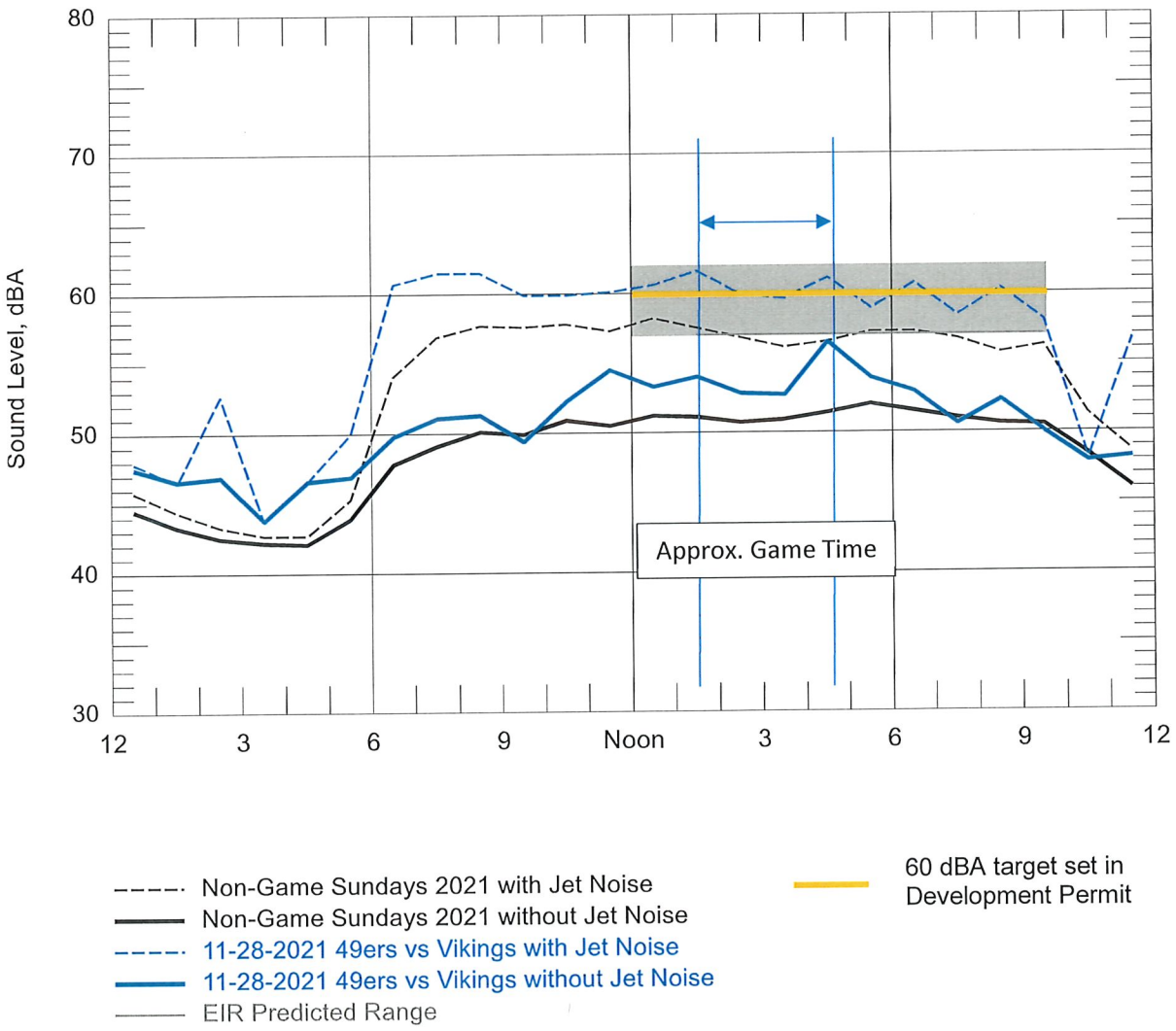


Figure 6 11-28-21 (Vikings) – Hourly-Average Noise Levels
49ers 34 Vikings 26

Over the 6-hour period centered on the game time, game-day levels did not reach or exceed 60 dBA. They were 2 to 5 dB higher than average non-game-day levels, but were generally below the range predicted for the EIR.

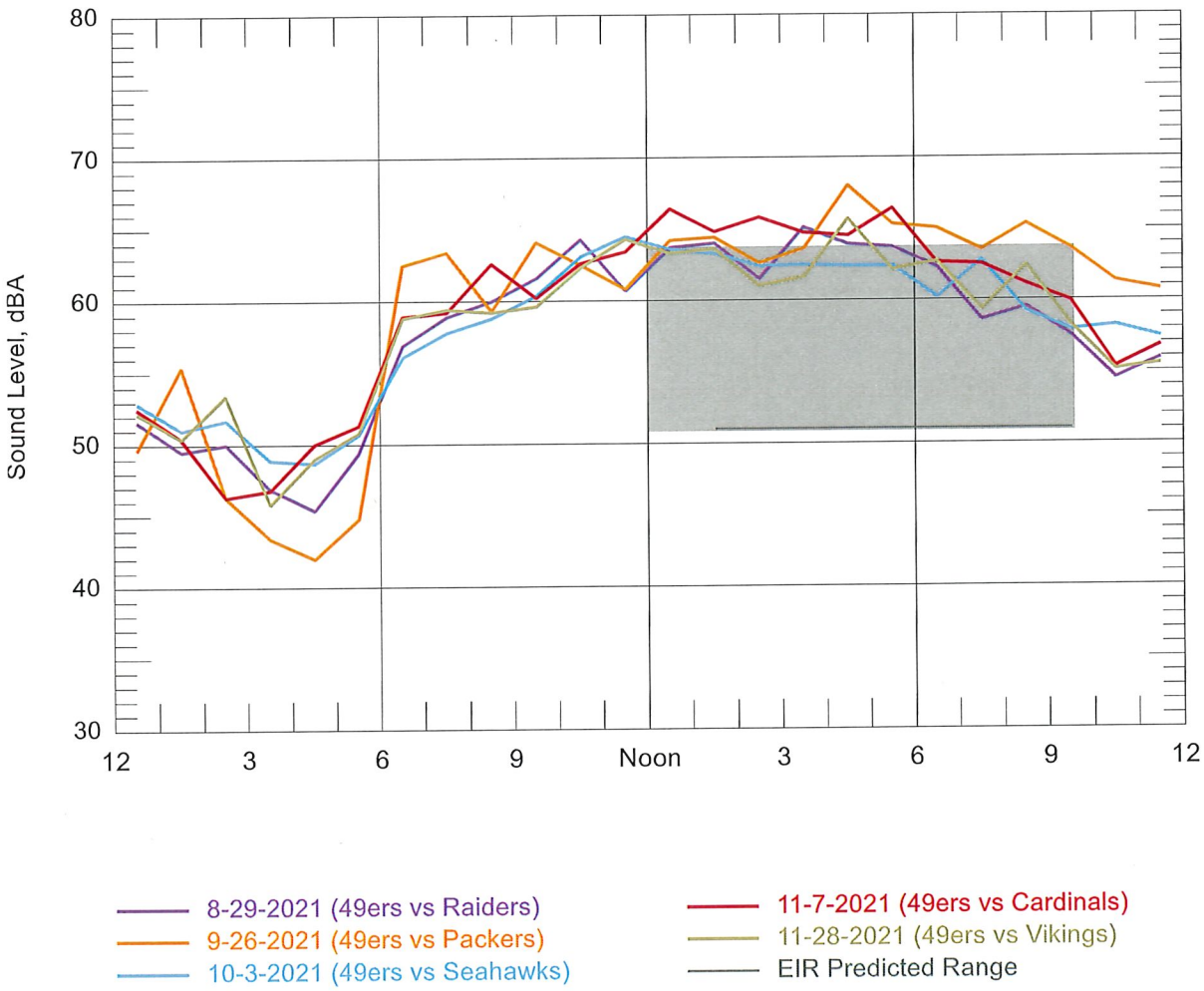


Figure 7 "Maximum" (L1) Noise Levels on Sunday Game Days (without Jet Noise)

In contrast to the hourly-average noise levels, the measured "maximum" noise levels on most NFL game days were at the higher end of or above the range predicted for the EIR. Jet noise has been filtered out of these data, so they set an upper bound on noise from Levi's Stadium, but they may not all be attributable to Levi's Stadium noise.