Response to Sound Study Conducted for Edgewood by TALASKE

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On Jan 8, I was informed of the existence of a document titled AMBIENT NOISE MEASUREMENTS AND GRANDSTAND NOISE SIMULATION MODEL for EDGEWOOD HIGH SCHOOL GOODMAN ATHLETIC COMPLEX Madison, Wisconsin prepared by TALASKE and TLC Engineering For Professional Audio Designs, Inc. Wauwatosa, WI Issue Date: January 4, 2019. My understanding is that this document was submitted to the city to support their application for an amendment to their Campus/Institutional Master Plan.

Unfortunately, this document contains a number of technical and legal errors, omissions, and misstatements, which invalidate much of its analysis and conclusions.

Ordinance Error

The most significant issue is in Section III, Review of Madison Noise Ordinance, in which the authors cite an obsolete version of the city's noise ordinance, which references limits of 70 dBA at night and 75 dBA during the day. This language appears from a version of MGO 24.08 that was passed in September 1974 and is inconsistent with the current ordinance, which imposes a limit of 65 dBA at all times. As many other portions of their analysis were based around achieving noise levels under 70-75 dBA, this is a major error that invalidates many of their claims of compliance.
To further exacerbate this issue, the authors state in Section V that the averaging method is not clearly identified within the Noise Ordinance.. While this may have been true for the 1974 ordinance, the current regulations specify fast meter response for impulsive noises and slow meter response for all other noises. These response times are defined by ANSI standard to be 0.125 s and 1.0 second respectively.

LAeq 1-Hour Error

Their noise study instead uses a one-hour average and concludes that The average exposure of residents (LAeq 1-Hour Average) to noise from a typical football game event at the stadium is less than the stated maximum 70 dBA level within the Madison Noise Ordinance. This is wrong on so many levels they used the wrong limit, the wrong averaging period, and many of the assumptions that calculations that led to that estimate are absent. When noise levels are measured according to the City's standard for regulation instead of by this standard of their own invention, the numbers will be far higher than reported here and far in excess of the City's standard.

Noise Map Errors Continued

The next major issue is in their noise maps at the end of the document. The right figure for each is labeled LAmax (Peak), which is presumably the

units with which the numbers labeling the isolines should be interpreted. Unfortunately, this is a self-contradictory unit and demonstrates a lack of understanding among the authors of how noise is measured. LAmax is the highest value shown by a noise meter with a specific response function over a period of time. Typically it would instead be written LAFmax or LASmax, or Lmax_A,F, to make it clear what response function was being used. This report not only omits that (is it 0.125 s, 1.0 s, or something else?), but then writes (Peak) afterwards, which introduces confusion as to whether they are actually reporting LAmax (Maximum Sound Level) or Lpk (Peak Sound Pressure Level), which is an instantaneous measurement that is only weakly related to Maximum Sound Level, and only relevant in regulating extremely loud impulsive sounds to prevent hearing damage. As these maps are the critical result for determining the area over which stadium noise would exceed city regulations (the one-hour average maps on the left are irrelevant to that), it is essential that we understand what exactly they are showing.

Estimates do not Match Experience

Assuming the maps on the right are showing a slow or fast-weighted maximum dBA figure, they demonstrate the implausibility of the model the authors have used to estimate stadium noise. We can see this because Case 101 shows a simulation with no wall, 150 spectators, 22 players on field, 1 referees whistle, 2 R2-94 loudspeakers, and 28 pep band musicians, at a point 1.5 m above terrain. It shows a 70 dBA contour running along front-line homes on Monroe Street. On October 11, I took measurements using a noise meter, from the steps of a home at 2310 Monroe Street, at a point roughly 1.5 m above ground level, for a JV game at which there were approximately 50 spectators in the stands, the standard number of players on the field, and no band or PA system. During a short period of data collection, I observed a sound level of 68.6 dBA, using fast response time but no peak hold functionality (so the true maximum was likely higher). Tripling the crowd from 50 to 150 would increase this 4.8 dB to 73.4 dB, and there is no question that a band and PA system operating simultaneously would add more than an additional 1.6 dB, pushing this contour over 75 dBA. Measurements of the band alone at Waunakee from distances comparable to homes on Woodrow and Monroe yielded levels of 82 dBA for fast response and 78 DBA for slow response. Even a smaller band would likely be comparable or louder than crowd noise, and the PA system would necessarily need to be louder than the crowd for the crowd to hear it, so realistically we are talking about a 3-6 dB increase in levels, which puts the levels from an event of this size up closer to 80 dBA. It is clear that Edgewood is underestimating sound levels in this map by at least 5 dBA, and possibly more.

Computer Model Assumptions

In addition to the lack of correspondence with actual real-world measurements, their model is suspect because they fail to identify many of

the assumptions that went into building it. Spectator noise was merely described as Each human noise source in the model is based on measured laboratory data for spectral content and directivity of people shouting, with no quantitative metric defining how loud those people were shouting or reference to the literature that they used to come up with that number. The same is true for the band there are no numbers, methodology, or reference to the literature that they may have used to pick out those numbers. For the speakers, they dont even define how the volume knob would be set, or what the estimated amount of time per hour that they would be used (not that that is relevant to whether the City's noise ordinance is exceeded, as that is based on a one-second response time, not a one-hour response time). If they want this sort of models to be taken seriously, they should use them to simulate crowds at existing stadiums, then compare their predictions to actual measurements taken at those stadiums under the same conditions if they can show correspondence between simulation and reality over a range of the parameter space, then there is validity in trusting their model to accurately predict what would happen should their stadium be built.

Edgewood Admits: It's Too Loud

However, all flaws in their model aside, it is useful to note that Edgewood has acknowledged, through this report, that not only would a stadium would generate sound levels on neighboring properties that would exceed the city's legal limits, even without a crowd as small as 150 people. Any home within the purple 65-70 dB contour on the right map in #101 would be so affected. In their 1000-spectactor/no-wall scenario in #103, this contour is shown to extend out past Terry Place and West Lawn Avenue.

Ambient Noise Measures are Unrealistic

In Section II, the authors discuss measurements of ambient noise levels in the neighborhood, and carefully identify the equipment they used, sampling points, noise levels, and dates, but fail to mention what time the data was collected except to say that it was late afternoon. Presumably late afternoon means rush hour, since the 51-63 dBA levels they report are far higher than the 42 dBA that others have measured. While a rush-hour ambient baseline would be appropriate for games conducted at rush hour, Edgewood is proposing holding games that start at 7 PM and last until nearly 10 PM, so it is extremely misleading to use rush-hour sound levels as an ambient. In any case, even the exaggerated ambient baseline claimed in their report does not equal or exceed the levels they are proposing to generate, so no 24.08(7) variance should be issued under these grounds.

Hearing Loss?

In Section V, their observation that noise levels will be below OHSA limits to prevent hearing damage, and not threatening to the general public are appreciated, but not relevant, as nobody has been arguing that that is the case this is a stadium proposed in a residential neighborhood, not a

factory where we are trying to protect employees hearing. We are arguing that the noise would be disruptive, irritating, illegal, and would interfere with the use and enjoyment of our homes, not that it would cause hearing damage.

Windows Open/Closed

While the 5 dB drop for indoor noise levels with windows open is reasonable, but 30-plus decibels less they predict with windows closed is enormous in excess of the 20 dB attenuation reported elsewhere. In any case, the city regulates outdoor noise levels on neighboring properties, not indoor levels, so they should not be able be issued a variance or exemption on the grounds that neighbors will be able to tolerate the sound if they close their windows from September through May.

Noise Barrier

Finally, I would like to note that the concept of erecting a noise barrier is a recent addition to their proposal and nobody has had time to fully examine it, but a general rule of thumb for highway noise is that a noise barrier that blocks line-of-sight will achieve a ~5 dB reduction, and that each meter above that yields an additional 1.5 dB of attenuation. Due to the short timeframe, I have not yet been able to fully analyze this, but some quick modeling shows that, for a 5m tall grandstand (16.4 feet), a wall between 8-9 m (26.2-29.5 ft) would be required along Monroe Street to block the direct path between the grandstand and front-line homes and achieve a 5 dB reduction, and that achieving a 9.5 dB reduction would thus require an additional 3 m, for a height between 11-12 m (36.1-39.4 ft). This is substantially higher than what they discuss in their noise report, and my initial renderings of this show it would be a visually enormous structure that is much more imposing than what Figure 5 and Figure 7 imply. I would be very opposed to letting Final details on wall construction be addressed as part of the architectural review submittal, as Edgewood requests in their letter to Mr. Arntsen on Jan 7. Noise barriers of this sort only reduce noise over a short distance, typically on the order of 200 feet, so only this would only mitigate sound levels for front-line homes and do little or nothing to reduce noise levels that the rest of the neighborhood would be subjected to. Even with a 10 dB reduction in noise level adequately-sized noise barrier, stadium noise would still be substantially higher than city limits over a large area.