Acoustic Associates
Specialists in Hearing and Acoustics

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Noise Study for the Proposed Garage at 1717 Deerfield Road

Prepared for: Mariah DiGrino, DLA Piper
March 19, 2018

To serve its office tenants, a parking garage is proposed at 1717 Deerfield Road. The site is bordered on the west by I-90 and on the east by Meadow/Tennaqua Lane. Beyond this road is a residential area with back yards that face the road - and I-90.

Questions have been raised as to the effect of the proposed garage, both positive and negative, on the residential area. To address these questions, we conducted a site visit on Thursday, March 8, to identify the chief sources of ambient noise and to examine the surrounding topography. We also set up audio recording equipment to monitor the current ambient noise levels.

Ambient Noise Monitoring

To assess the current ambient noise levels near the residential area, we set up audio recording equipment at the location shown in **Figure 1**. The major noise at this location is from vehicle traffic travelling on I-94. The ambient noise was continuously recorded from 1:00 PM on Thursday, March 8, until 12:00 PM the next day. **Figure 2** is a view looking west from this location. Note that I-90 is in direct view.

At the start of the recording, the temperature was 33°F with 14 mph winds from the west-by-northwest. These conditions were conducive to good sound recording.

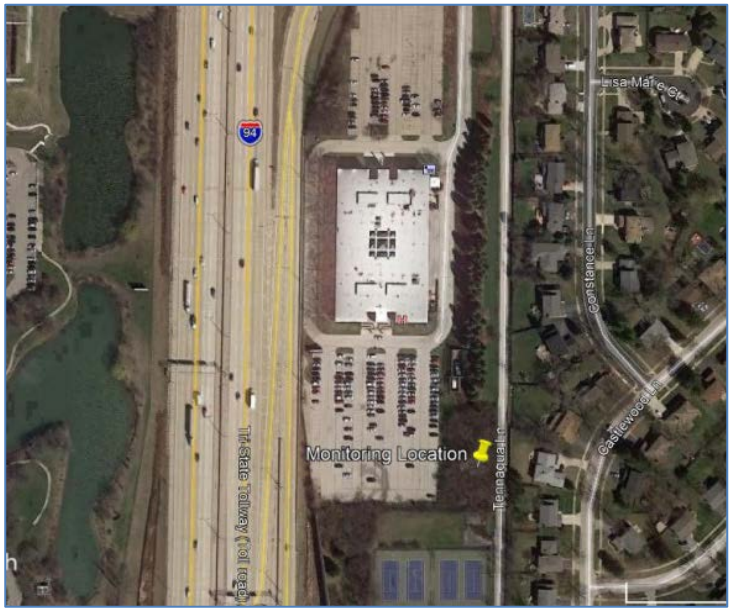

Figure 1 - Aerial view of the location selected to obtain ambient noise data with respect to the nearby residential community

Once the data was downloaded, we ran an analysis to determine the sound level at 1-second intervals. **Figure 3** shows this data and reveals that even though the median level (given by the red line) declines steadily after the evening rush hour period, the variation in noise level becomes quite large. This is likely because the mix of trucks increases despite the decline of the hourly traffic volume. The median sound levels during the evening and morning rush periods were 64-67 dB. At night, the level dropped to 57 dB during the early morning hours.

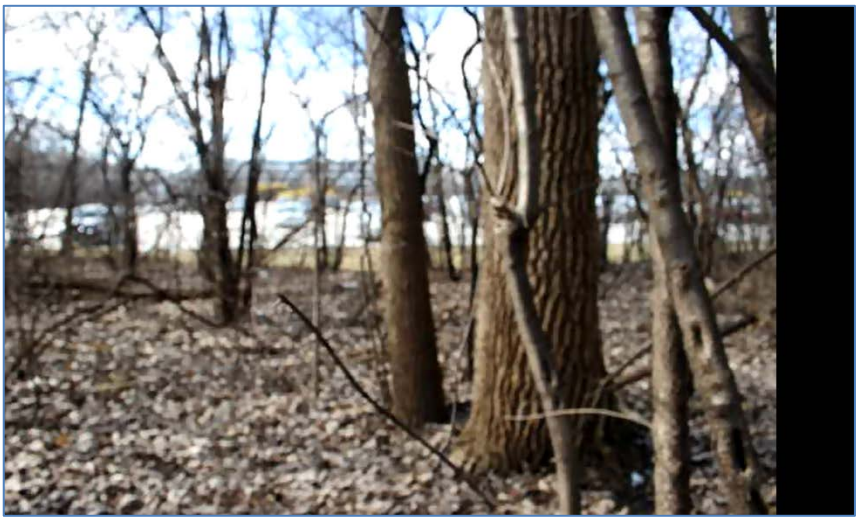

Figure 2 - A view from the monitoring location looking west toward the I-90 expressway across the current parking lot.

Potential Noise Effect

The cars that currently use the parking lot will also use the parking garage. Hence, there are no new noise sources. Compared with travelling on the flat ground of the parking lot, the cars travelling in the parking garage will, at times, be moving up ramps. While this will generate slightly more noise from the engines, it will still be masked by the car and truck noise traveling on I-90.

Higher sound levels from the garage will come from car-lock sounds. These days, car doors are commonly locked without a sound. However, to confirm a lock, a chirp or brief horn is often sounded when the remote is pressed a second time. The car horn is often used for this purpose as the manufacturer does not have to install a secondary loudspeaker. But horn blasts are commonly louder than a chirp. Manufacturers limit the duration of the horn blast to a fraction of a second in order to limit the effective loudness of the sound.

Based on our measurements on a sample of cars, a horn blast at 10 feet reaches levels of about 87 dB. While these sounds already occur in the parking lot, there would be a slight amplification of this sound because the sound wave cannot spread upward. Instead, they are constrained by the reflective ceiling (at least for the lower floors). Hence, the horn sounds leave the sides of the garage a bit higher than at the same distance on an open lot.

To examine the level of the horn-lock sound, we extrapolated it from the garage to the nearest residential backyard to the east based on the natural spreading of sound waves. Based on this analysis, we expect the short impulse of sound to reach a level of about 65 dB. To show this level in relation to the existing ambient noise, we plotted it as the dotted line in **Figure 3**. Since this type of noise will occur most often in the 6:00-10:00 AM and 3:00-7:00 PM period, we only show this line on the graph during these two periods. This evaluation indicates that the car horn noise would be generally inaudible during the evening and morning periods. If the noise would occur at night, the horn sound might be

audible, but the occurrences would be very infrequent and within the normal variation of ambient noise found at the site.

The Effect of Extending the Berm

Berms are effective at reducing noise depending on their height. In this project, the berm is planned for a height of 15 feet. This is tall enough to reduce the garage noise emissions for the ground and 2nd levels even further than shown in **Figure 3**.

The presence of the berm would also reduce the noise from I-90 – possibly by 5 dB. However, this effect would only pertain to those residents immediately east of the berm. For those residents further south where I-90 would be in view, the benefit would be negligible.

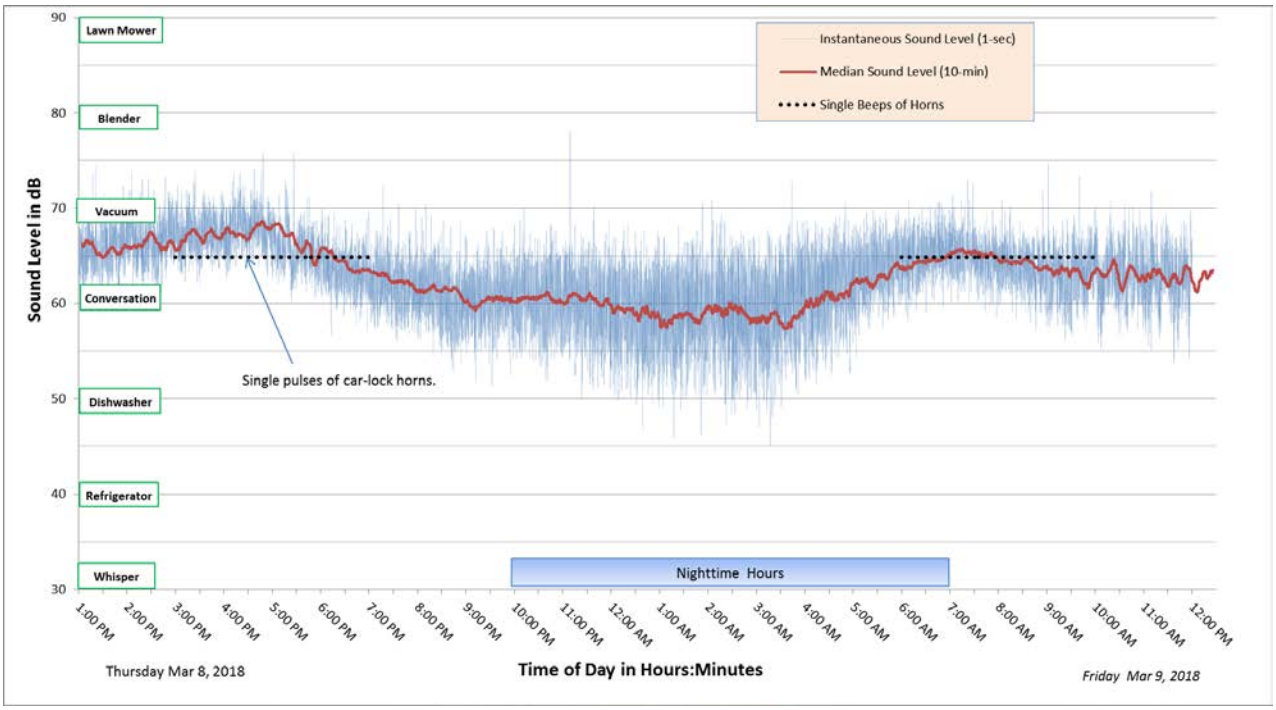

Figure 3 – Ambient sound levels recorded over a nominal 24-hour period near the residential area just east of the proposed garage.

Submitted by:

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Dr. Tom Thunder is both an audiologist and an acoustical specialist. He heads a professional practice that specializes in hearing and acoustics and has consulted on a variety of issues including hearing problems, audibility of warning devices, occupational noise, hearing conservation, environmental noise, speech intelligibility, acoustical privacy, building noise, and classroom acoustics. He has conducted numerous independent examinations to assess the work-relatedness of hearing loss and now coordinates audiological testing and conducts records reviews for hearing loss cases.

Education:

Salus University, AuD (Audiology) 2002
Illinois Institute of Technology, Post Grad (Acoustics) 1979-1982
Northern Illinois University, M.A. (Audiology) 1976
Northern Illinois University, B.S. (Communication Disorders) 1974

Certification:

American Board of Audiology – Board Certified
Institute of Noise Control Engineering – Board Certified
Illinois Department of Professional Regulation – Licensed Audiologist
Council for Accreditation in Occupational Hearing Conservation – Certified Director

Experience:

Dr. Thunder began his career as a research assistant with Northern Illinois University where he studied hearing protectors. During this time, he completed internships at University of Chicago's Billings Hospital and at Rush University Medical Center. He later served in a variety of positions including clinical audiologist for a metropolitan speech and hearing center, noise control engineer for a major engineering firm, manager of acoustics for a noise control manufacturer, applications engineer for a worldwide supplier of acoustical instruments, and audiologist for a large medical practice. He began his own practice in 1988 to combine his skills and knowledge in both hearing and acoustics.

With more than 30 years of experience in hearing and acoustics, Dr. Thunder has been called upon to testify as an expert witness in cases involving occupational noise, environmental noise, audibility, and hearing loss. The diversity of his experience has given him a unique perspective on hearing and acoustical issues.

Dr. Thunder is on staff at Rush University and Northern Illinois University and teaches courses in hearing science, audiology, noise assessment, acoustics, psychoacoustics, and hearing conservation. He also teaches online courses for Salus University in Philadelphia and the University of Nebraska in Lincoln. He regularly conducts seminars on audiometric testing and hearing conservation strategies. These seminars have been recognized by CAOHC as the leading course in Midwest. Dr. Thunder has served on the Board of the American Academy of Audiology Foundation and the Community Perceptions of Technology Panel of the Homeland Security Institute.

Membership:

American Academy of Audiology *(Fellow)*
Illinois Academy of Audiology *(Past President)*
Acoustical Society of America *(Past President of the Chicago Chapter)*
Institute of Noise Control Engineering *(Board Certified)*
National Hearing Conservation Association