WI #16-024

April 12, 2017

Nichelle Seely
Design Manager
Neenan Archistruction
3325 S. Timberline Road, Suite 100
Fort Collins, Colorado 80525

Subject: Acoustic Study for the Fresno United Health Care Administration Building Fresno, California

Dear Ms. Seely,

Wilson Ihrig has completed an acoustical study for the proposed Fresno United Health Care Administration Building to be located at 3804 West Herndon Avenue, Fresno, California 93722. The dominate sources of exterior noise are surface traffic on Herndon Avenue bounding the site to the south and the Sierra Sky Park Airport located immediately to the west of the site. The majority of the project site is within the 65 CNEL (Community Noise Exposure Level) contour of the airport. The study was based upon site plan and architectural drawings provided by Neenan Archistruction, additional information provided via email to date, and Wilson Ihrig's experience with similar projects.

This report summarizes the acoustical measurements conducted on site and provides recommendations to be incorporated into the project design in order to achieve compliance with the acoustical standards outlined in the California Green Building Standards Code and the City of Fresno Municipal Code.

A glossary of acoustical terms is attached to the end of this report for reference.

1 APPLICABLE CRITERIA

1.1 California Green Building Standards Code

The California Green Building Standards Code (CGBSC), Chapter 5 Nonresidential Mandatory Measures, Section 5.507 Environmental Comfort, states that for buildings located within the 65 CNEL noise contour, wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level ($L_{eq,1Hr}$) of 50 dBA in occupied areas during any hour of operation.

1.2 City of Fresno Municipal Code

Section 15-2506, Noise, of the City of Fresno Municipal Code states that an acoustic study shall be required for any proposed project which could create or be subject to noise exposure in excess of an $L_{eq,1Hr}$ of 45 dBA within a building due noise exposure from transportation noise sources.

The City of Fresno Municipal Code standard is more stringent than that of the CGBSC above. Therefore, the more stringent standard was used for assessing the acoustical performance of the proposed building.

2 ACOUSTIC ENVIRONMENT

2.1 Long Term Noise Survey

Three precision, calibrated, digitally logging sound level meters were installed on light poles and trees at the perimeter of the site on March 31, 2017 at the locations labeled LT1, LT2, and LT3 in Figure 1. The microphones of the meters were approximately 12' above grade at each of the locations. The meters at LT2 and LT3 continually logged the 1/3 octave band sound pressure levels over 1 second intervals, simulating the slow meter setting. The meters at LT2 and LT3 also stored continuous digital recordings that were used for identifying sources of noise detected during the measurements. The above information was used to identify noise events from aircraft using the airport and to determine the spectral content of the aircraft noise for use in developing our recommendations for the building shell design.

All three meters at LT1, LT2, and LT3 continually logged the hourly equivalent noise levels ($L_{eq,1Hr}$) while on site. The meters were recovered on April 4, 2017, providing acoustic data for four complete days, 24 hours each.

Figures 2 through 4 indicate the $L_{eq,1Hr}$ measured by the three meters. The dominant source of noise at locations LT1 and LT2 was traffic on Herndon Avenue. The data in Figures 2 and 3 show the typical variation of noise level throughout the day that is associated with the increase of traffic flow in the morning, which tapers off slowly in the evening hours, and reaches a minimum during the early morning hours.

The data in Figure 4, from location LT3 on West Beechwood Avenue, indicate a greater amount of variation from hour to hour and day to day due to unsteady residential traffic, noise from aircraft using the airport, and other, local sources of intermittent noise such as landscaping taking place on or near the site. Two of the data peaks in Figure 4 were caused by the latter source, as indicated in the figure. Discounting those events, the highest hourly noise level at LT3 was detected during the noon hour on 1 April 2017 (Saturday) and was caused by an aircraft approaching or departing the airport, as determined by reviewing the 1 second 1/3 octave band data and listening to the digital recording.

Figure 5 is a plot of the maximum 1/3 octave band sound pressure levels at location LT3 from the seven loudest aircraft detected for the duration of the survey. The variation in the data that is likely due to the variety of airplane models and landing/takeoff patterns.

2.2 Short Term Noise Survey

Calibrated, digital recordings were made at three short term locations labeled ST1, ST2 and ST3 in Figure 1 on 30 March 2017, after installing the long-term survey equipment, between 11:00 a.m. and noon. The microphone at ST1 was located next to the microphone at the long-term survey location LT1, approximately 12' above grade. The microphone was positioned 5 feet above grade at locations ST2 and ST3. The noise was recorded for a minimum of 15 minutes at each location.

The above recorded data were analyzed into 1/3 octave band sound pressure levels upon return to the Wilson Ihrig office. The 1/3 octave band sound pressure levels are plotted in Figure 6. The data at locations ST2 and ST3 were strongly influenced by wind and therefore the data indicated at frequencies below 500 Hz should be discounted.

2.3 Projections of Noise at Completed Project

The data from the long term and short term noise surveys above were utilized to project contours of the maximum expected hourly equivalent noise levels ($L_{eq,1Hr}$) onto the site plan of the completed project as indicated in Figure 7. Separate contours were developed for traffic noise and aircraft noise. The shapes of the contours for the aircraft noise are based upon the CNEL contours that are publicly provided as required by the airport land use policy.

3 RECOMMENDATIONS

3.1 Windows

Recommendations are presented in terms of the Outdoor-Indoor Transmission Class (OITC) and Sound Transmission Class (STC) acoustical performance ratings, both of which should be met by the window manufacturer by providing laboratory test data for the specific window assembly types submitted for this project. Laboratory test reports should include 1/3 octave band sound isolation performance data for the specific glazing system proposed. Window manufacturers may provide alternative glazing configurations which might be appropriate for this project if they satisfy the minimum recommended OITC and STC ratings.

Traditionally, manufacturers of exterior doors and windows have used the single-number Sound Transmission Class (STC) metric to rate the acoustical performance of their products. However, STC is a metric optimized for human speech. The Outdoor-Indoor Transmission Class (OITC), as defined in the ASTM Standard E1332, is the preferred metric for rating the sound performance of building shell materials. OITC ratings are based on a typical noise spectrum shape from transportation sources which have more low frequency sound than of human speech or television audio.

To meet the City of Fresno Municipal Code requirement of maximum 45 dBA $L_{eq,1Hr}$ within occupied non-residential spaces, I recommend window glazing which meets or exceeds **OITC 24 and STC 29** for all windows on the west and south façades and a portion of the east façade closest to the intersection of Herndon Avenue and North Brawley Avenue, as indicated in Figure 8. Any window assemblies meeting the project thermal requirements may be used for all other windows not specified above or in Figure 8.

3.2 Exterior Walls

Project exterior walls will be comprised of either 3-layer stucco with metal lath or 1-5/8" thick cast stone on 2" thick rigid polyiso insulation, weather barrier, on 6" metal framing, 5-1/4" batt insulation, and 5/8" gypsum board for the interior face. If constructed correctly, the above assemblies will provide sufficient sound insulation to satisfy the City of Fresno requirements for interior noise from transportation sources, both for street traffic and aircraft.

The actual sound isolation provided by the building shell is highly dependent on the quality of workmanship and attention to detail that is followed during construction. The following recommendations are aimed at delivering the full sound isolating potential of the building shell:

- If possible, avoid electrical outlets in exterior walls. If this is not possible, apply outlet box pads such as those manufactured by Lowry's or Dottie (#68 pads) to all electrical boxes in exterior walls. Thoroughly caulk around all edges of electrical outlet boxes and other penetrations with non-hardening acoustical sealant. Penetrations larger than 4 square inches should be boxed in with gypsum board and acoustically caulked.
- Carefully caulk the intersection between the interior layer of GWB at the floor and ceiling with resilient, non-hardening acoustical sealant.

3.3 Roof/Ceilings

The project roof will be comprised of a roof membrane protection board on 5" thick rigid insulation board on metal deck. Ceilings with suspended panels or a 5/8" thick gypsum board finish surface will provide sufficient sound insulation to satisfy the City of Fresno requirements.

Do not have any occupied areas that are exposed to the underside of the metal deck.

Although the noise levels inside rooms with a suspended ceiling are expected to satisfy the criteria for a maximum 45 dBA $L_{eq,1Hr}$, aircraft will likely be clearly audible within many areas of the building. I recommend using ceiling panels with a minimum Ceiling Attenuation Class (CAC) of 35 or 40, or installing gypsum backing boards, above sensitive rooms such as the Board Room, conference rooms, the CEO office, etc. to avoid possible disturbances during talking, utilizing a conferencing system, or while in concentration. For gypsum board ceilings above sensitive rooms, it may be desirable to add a second layer of gypsum board or utilize a single layer of internally damped gypsum board such as QuietRock 510 or QuietRock EZ-SNAP or identical.

Please feel free to contact me with any questions on this information.

Very truly yours,

WILSON IHRIG

James E. Phillips, MS, FASA
Principal

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Figure 1: Noise survey locations.

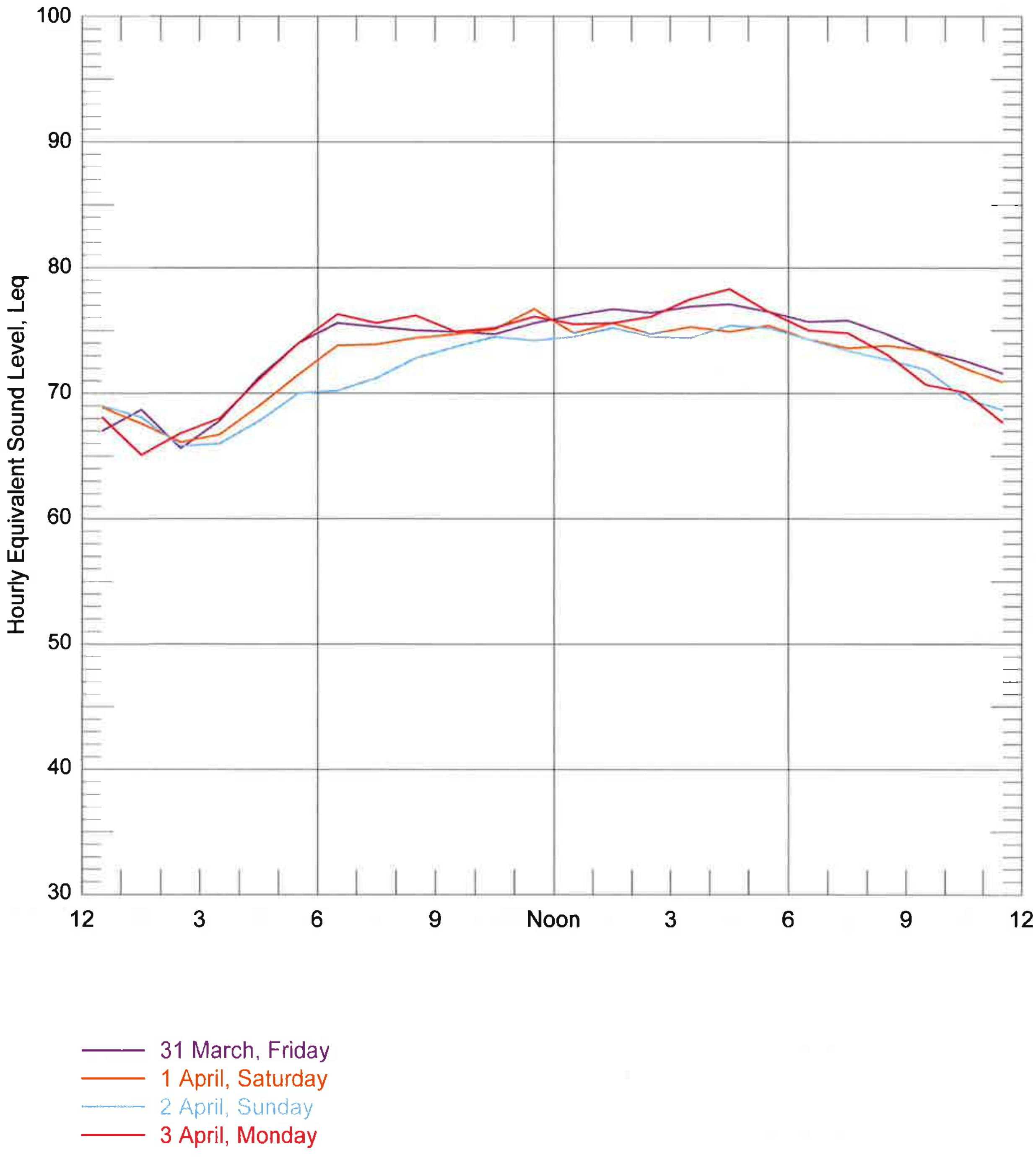

Figure 2: Hourly equivalent noise levels at LT1, Herndon Avenue near North Brawley Avenue, 31 March – 3 April 2017

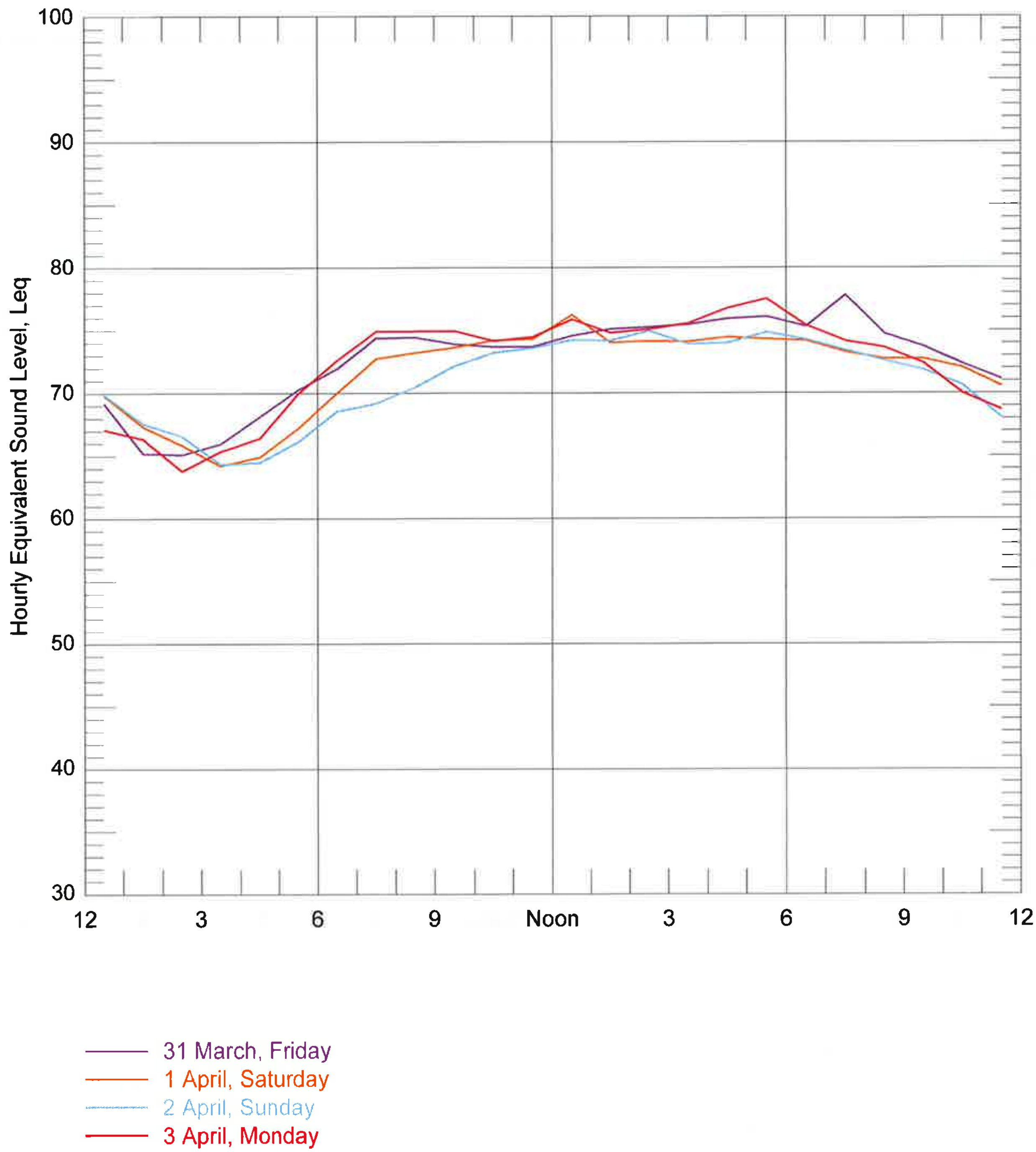

Figure 3: Hourly equivalent noise levels at LT2, Herndon Avenue near west end of site, 31 March – 3 April 2017

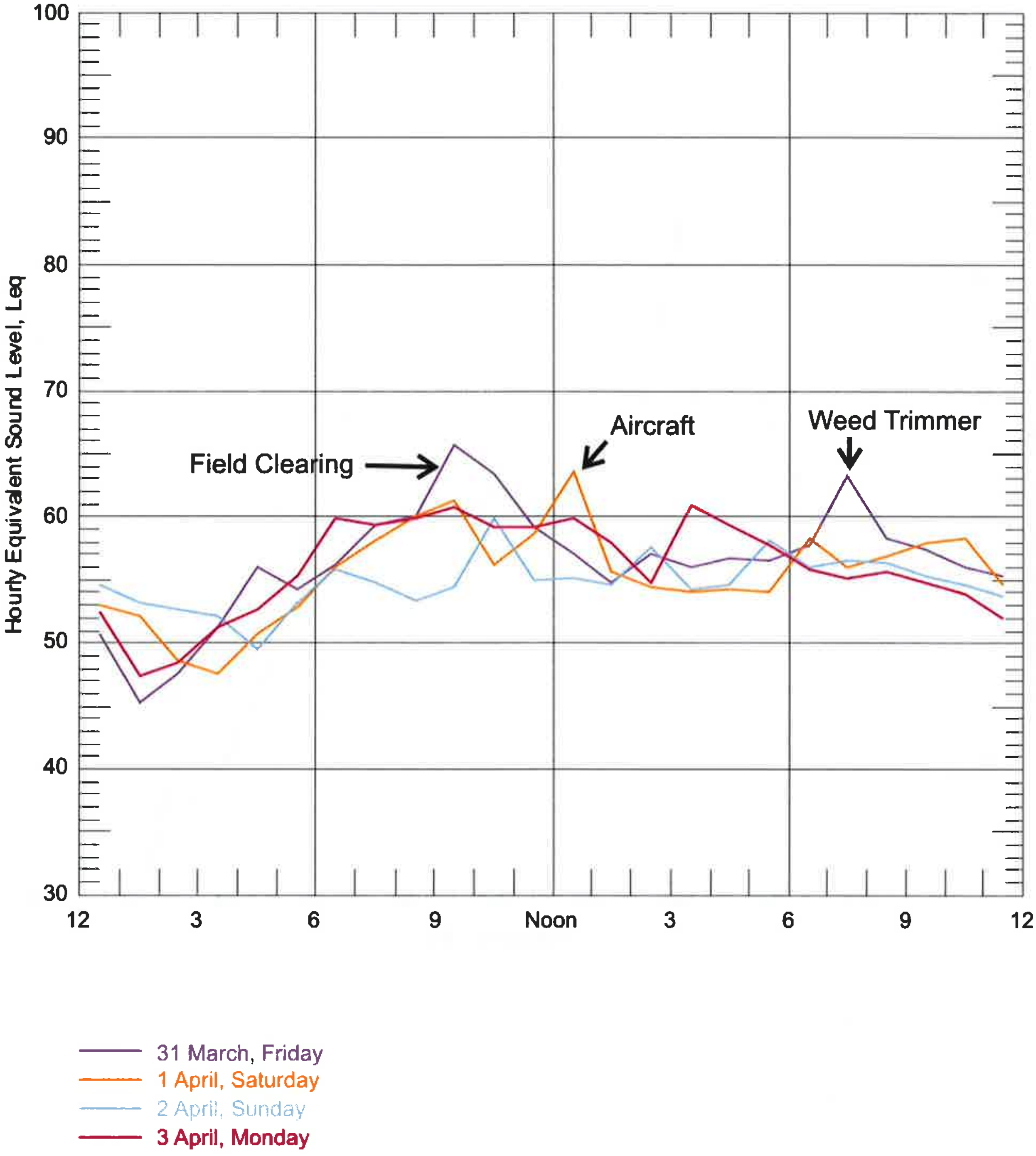

Figure 4: Hourly equivalent noise levels at LT3, West Beechwood Avenue, 31 March – 3 April 2017

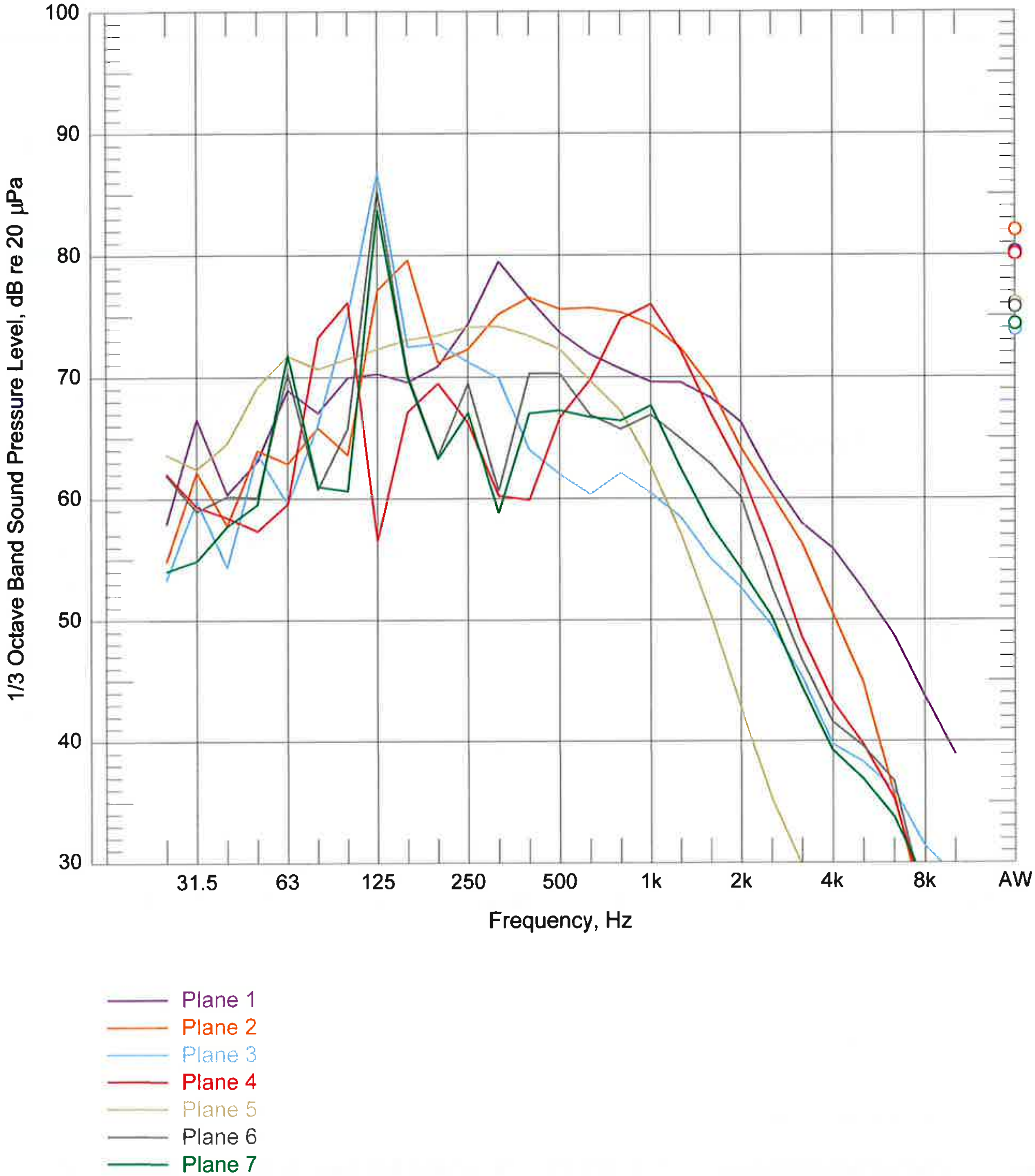

Figure 5: 1/3 Octave band sound pressure levels from planes over site at LT3

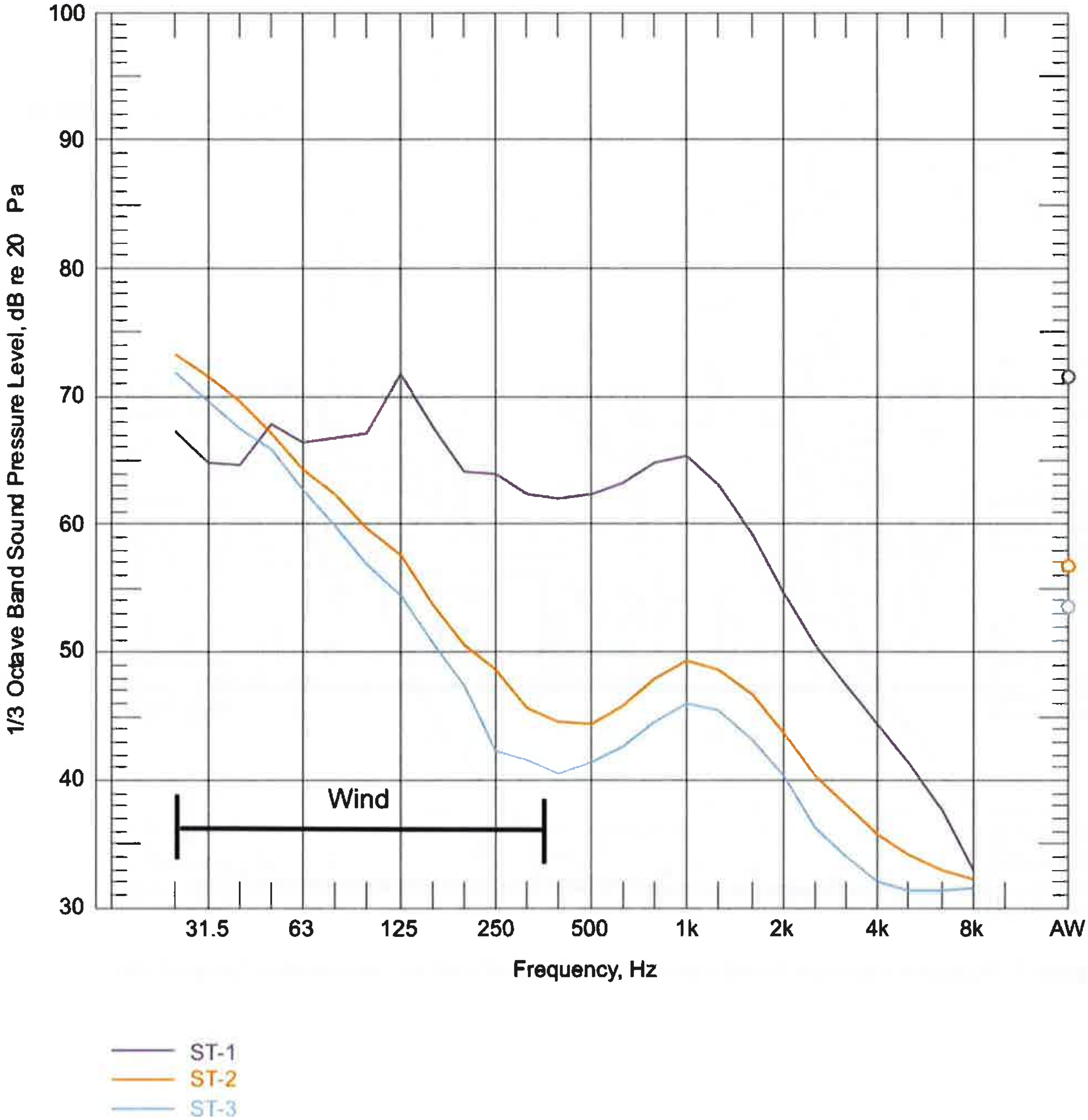

Figure 6: 1/3 Octave band sound pressure levels from traffic noise at the short term noise survey locations

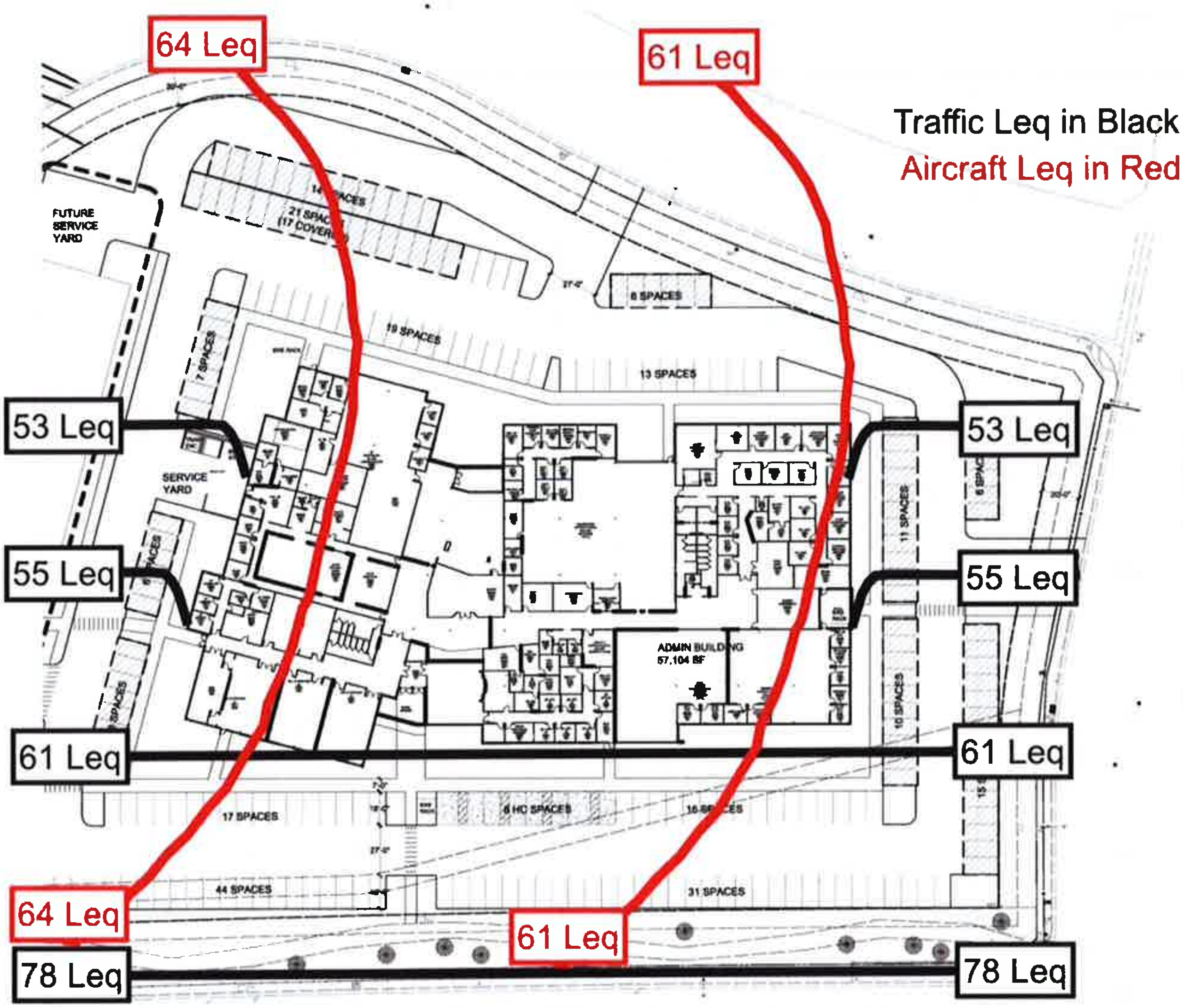

Figure 7: Projected maximum hourly equivalent noise level contours at completed project site

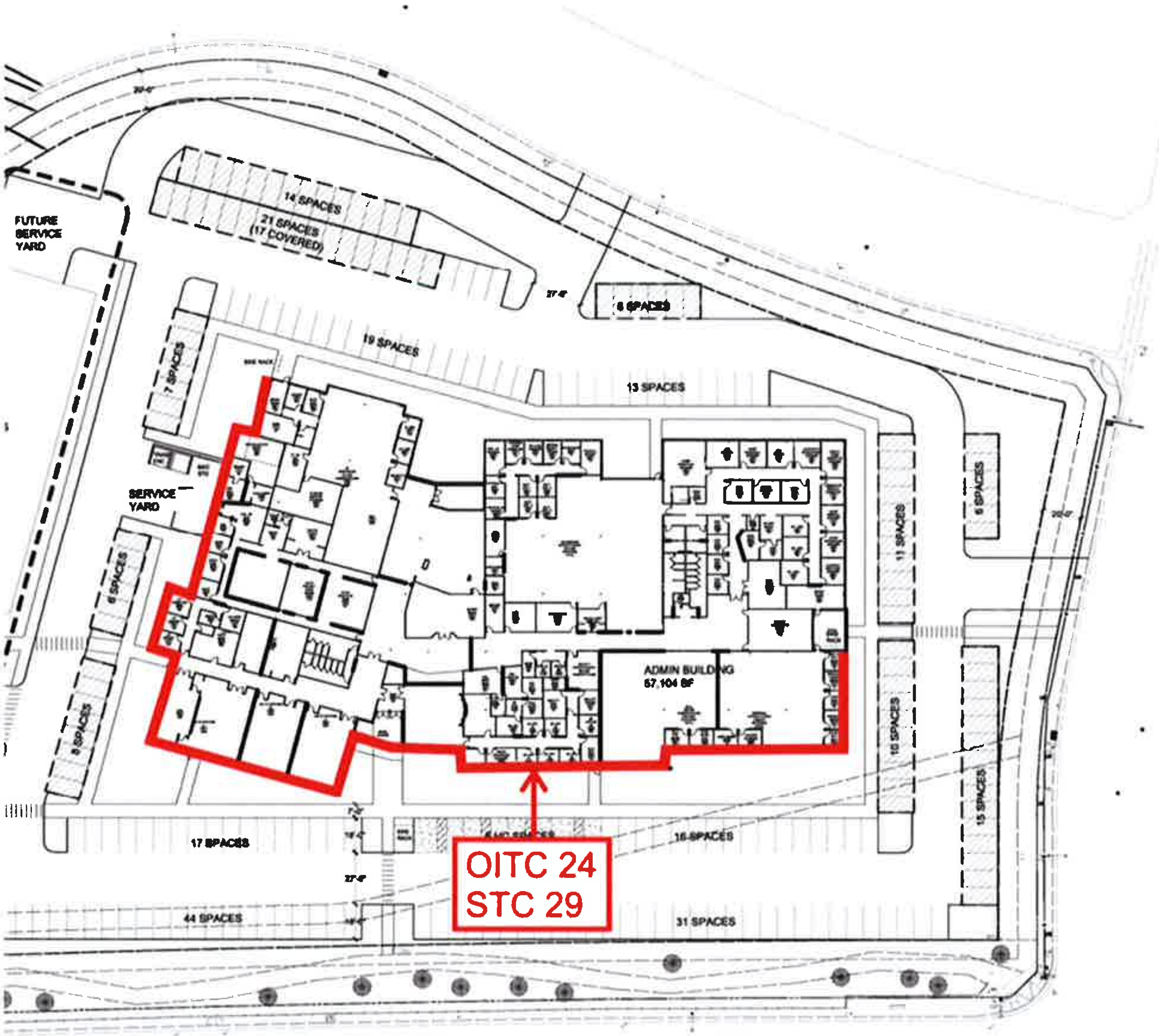

Figure 8: Extent of recommended acoustical ratings for windows