

ACOUSTICAL ANALYSIS

**MIXED-USE RESIDENTIAL DEVELOPMENT
CHOWCHILLA, CALIFORNIA**

WJVA Project No. 23-18

PREPARED FOR

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INTRODUCTION

The proposed Project is a mixed multi-family residential development, to be located within the City of Chowchilla. The Project involves the construction of two types of affordable housing. The northeastern portion of the parcel will be subdivided into seventeen (17) lots that are planned for the development of 17 duplex homes. The central and western portions of the parcel will be developed in two phases with multi-family residential developments. The multi-family development will include a total of 160 apartments. Along the eastern boundary of the parcel, a pond and park, an open space area, a trail, and emergency/fire access road are planned.

This analysis, prepared by WJV Acoustics, Inc. (WJVA), is based upon the project tentative tract maps, traffic data provided by Caltrans and the Madera County Transportation Commission (Madera CTC) and the findings of on-site noise level measurements. Revisions to the tract maps may affect the findings and recommendations of this report. The project site plan provided as Figure 1.

Appendix A provides a description of the acoustical terminology used in this report. Unless otherwise stated, all sound levels reported are in A-weighted decibels (dB). A-weighting de-emphasizes the very low and very high frequencies of sound in a manner similar to the human ear. Most community noise standards utilize A-weighting, as it provides a high degree of correlation with human annoyance and health effects. Appendix B provides typical A-weighted sound levels for common noise sources.

In terms of human perception, a 5 dB increase or decrease is considered to be a noticeable change in noise levels. Additionally, a 10 dB increase or decrease is perceived by the human ear as half as loud or twice as loud. In terms of perception, generally speaking the human ear cannot perceive an increase (or decrease) in noise levels less than 3 dB.

NOISE EXPOSURE CRITERIA

CITY OF CHOWCHILLA

For transportation noise sources (e.g., traffic and railway noise), the City of Chowchilla General Plan Noise Element establishes noise level criteria in terms of the Community Noise Equivalent Level (CNEL) metric. The CNEL is the time-weighted energy average noise level for a 24-hour day, with a 4.77 dB penalty added to noise levels occurring during the evening hours (7:00 p.m.-10:00 p.m.) and a 10 dB penalty added to noise levels occurring during the nighttime hours (10:00 p.m.-7:00 a.m.). The CNEL represents cumulative exposure to noise over an extended period of time and is therefore calculated based upon *annual average* conditions.

For residential land uses, the Noise Element establishes a land use compatibility criterion of 60 dB CNEL as “Normally Acceptable” and a noise exposure level of 60-65 dB CNEL as “Conditionally Acceptable”. For some multi-family residential land uses, a noise exposure of up to 70 dB CNEL is considered “Conditionally Acceptable”. While not explicitly stated in the General Plan, outdoor noise level standards are typically applied to outdoor activity areas. Outdoor activity areas generally include backyards of single-family residences, individual patios or decks of multi-family developments and common outdoor recreation areas of multi-family developments (pool areas, picnic areas, playgrounds, etc.). The intent of the exterior noise level requirement is to provide an acceptable noise environment for outdoor activities and recreation.

The Noise Element also requires that interior noise levels attributable to exterior noise sources not exceed 45 dB CNEL. The intent of the interior noise level standard is to provide an acceptable noise environment for indoor communication and sleep.

Table I provides the land use compatibility guidelines (noise level standards) for transportation noise sources. Table II provides the land use compatibility guidelines for non-transportation (stationary) noise sources.

Table I: Transportation Noise / Land Use Compatibility Guidelines for Exterior Noise Levels

Land Use	Exterior Noise Exposure (dBA CNEL)			
	Normally Acceptable ¹	Conditionally Acceptable ²	Normally Unacceptable ³	Clearly Unacceptable ⁴
Single Family Home, Duplex, Triplex, Mobile Home	≤ 60	60 - 65	65 - 70	> 70
Fourplex, Apartment, Condominium, Townhome	≤ 60	60 - 70	70 - 75	> 75
Mixed Use, Infill Residential	≤ 65	65 - 75	75 - 80	> 80
Commercial – Motel, Hotel, Transient Lodging	≤ 65	65 - 75	75 - 80	> 80
School, Library, Church, Hospital, Nursing Home	≤ 60	60 - 70	70 - 80	> 80
Auditorium, Concert Hall, Amphitheater		≤ 65		> 65
Sports Arena, Outdoor Spectator Sport		≤ 70		> 70
Playgrounds, Park	≤ 70	70 - 75		> 75
Golf Course, Water Recreation, Cemetery	≤ 70		70 - 80	> 80
Office Building, Business, Commercial, Retail	≤ 65	65 - 75	> 75	
Freeway Adjacent Commercial, Office and Industrial Uses	≤ 65	65 - 80	> 80	
Industrial, Manufacturing, Utility, Agriculture	≤ 70	70 - 80	> 80	

Notes:

¹**Normally Acceptable** = Specific land use is satisfactory, based on the assumption that any building is of normal conventional construction, without any special noise insulation requirements.

²**Conditionally Acceptable** = New construction or development should be undertaken only after a detailed analysis of noise reduction requirements is made and needed noise insulation features included in design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning, will normally suffice.

³**Normally Unacceptable** = New construction or development should be generally discouraged. If new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in the design.

⁴**Clearly Unacceptable** = New construction or development is not to be undertaken, unless it can be demonstrated that noise reduction requirements can be employed to reduce noise impacts to an acceptable level. If new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in the design.

Table II: Stationary Noise / Land Use Compatibility Guidelines for Exterior Noise Levels

Land Use	Exterior Noise Exposure (dBA L _{eq} / L ₅₀)					
	Normally Acceptable ¹		Conditionally Acceptable ²		Unacceptable ³	
	Daytime (10 pm - 7 am)	Nighttime (10 pm - 7 am)	Daytime (10 pm - 7 am)	Nighttime (10 pm - 7 am)	Daytime (10 pm - 7 am)	Nighttime (10 pm - 7 am)
Single Family Home, Duplex, Triplex, Mobile Home	≤ 55	≤ 45	55 - 60	45 - 50	> 60	> 50
Fourplex, Apartment, Condonimum, Townhome	≤ 55	≤ 50	55 - 65	50 - 55	> 65	> 55
Mixed Use, Infill Residential	≤ 60	≤ 50	60 - 70	50 - 60	> 70	> 60
Commercial – Motel, Hotel, Transient Lodging	≤ 65	≤ 50	65 - 70	50 - 60	> 70	> 60
School, Library, Church, Hospital, Nursing Home	≤ 60	≤ 50	60 - 65	50 - 55	> 60	> 55
Auditorium, Concert Hall, Amphitheater			≤ 65	≤ 60		
Sports Arena, Outdoor Spectator Sport			≤ 75	≤ 70		
Playgrounds, Park	≤ 65	≤ 50	65 - 70	≤ 60		
Golf Course, Water Recreation, Cemetery	≤ 55	≤ 50	55 - 60	50 - 55	> 60	> 55
Office Building, Business, Commercial, Retail	≤ 65	≤ 55	65 - 70	55 - 60	> 70	> 60
Freeway Adjacent Commercial, Office and Industrial Uses	≤ 65	≤ 60	65 - 70	60 - 65	> 70	> 65
Industrial, Manufacturing, Utility, Agriculture	≤ 65	≤ 60	65 - 70	60 - 65	> 70	> 65

Notes:

¹**Normally Acceptable** = Specific land use is satisfactory, based on the assumption that any building is of normal conventional construction, without any special noise insulation requirements.

²**Conditionally Acceptable** = New construction or development should be undertaken only after a detailed analysis of noise reduction requirements is made and needed noise insulation features included in design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning, will normally suffice. With the exception of industrial, manufacturing, utility and agricultural uses, the analysis shall identify attenuation required to maintain an indoor level of ≤ 45 dBA.

³**Unacceptable** = New construction or development should not be undertaken, unless it can be demonstrated that noise reduction requirements can be employed to reduce noise impacts to an acceptable level. With the exception of industrial, manufacturing, utility and agricultural uses, the Analysis shall identify attenuation required to maintain an indoor level of ≤ 45 dBA.

HUD

The United States Department of Housing and Urban Development (HUD) noise standards can be found in 24 CFR Part 51, Subpart B.

“For proposed new construction in high noise areas, the project must incorporate noise mitigation features. Consideration of noise applies to the acquisition of undeveloped land and existing development as well.

All sites whose environmental or community noise exposure exceeds the day night average sound level (DNL) of 65 decibels (dB) are considered noise-impacted areas. For new construction that is proposed in high noise areas, grantees shall incorporate noise attenuation features to the extent required by HUD environmental criteria and standards contained in Subpart B (Noise Abatement and Control) of 24 CFR Part 51. The interior standard is 45dB.

The "Normally Unacceptable" noise zone includes community noise levels from above 65 decibels to 75 decibels. Approvals in this noise zone require a minimum of 5 dB additional sound attenuation for buildings having noise-sensitive uses if the day-night average sound level is greater than 65 dB but does not exceed 70 dB, or a minimum of 10 decibels of additional sound attenuation if the day-night average sound level is greater than 70 dB but does not exceed 75 dB.

Locations with day-night average noise levels above 75 dB have “Unacceptable” noise exposure. For new construction, noise attenuation measures in these locations require the approval of the Assistant Secretary for Community Planning and Development (for projects reviewed under Part 50) or the Responsible Entity’s Certifying Officer (for projects reviewed under Part 58). The acceptance of such locations normally requires an environmental impact statement.”

Both the L_{dn} (DNL) and CNEL represent the time-weighted energy average noise level for a 24-hour day, with a 10 dB penalty added to noise levels occurring during the nighttime hours (10:00 p.m.-7:00 a.m.). The CNEL includes an additional penalty of 5 dB (technically 4.77 dB) that is added to noise levels occurring during the evening hours between 7:00 p.m. and 10:00 p.m. Both the L_{dn} and CNEL represent cumulative exposure to noise over an extended period of time and are therefore calculated based upon *annual average* conditions. The L_{dn} and CNEL are considered to be equivalent descriptors of the community noise environment for the purposes of this study.

CONSTRUCTION NOISE & VIBRATION

The City of Chowchilla General Plan provides guidance in regards to noise associated with construction activities and limits allowable hours of construction. The General Plan Noise Element states the following:

- Policy N 4.6: The City of Chowchilla shall limit construction activities to the hours of 7:00 am to 7:00 pm, Monday through Saturday. No construction shall occur on Sundays or national holidays without a permit from the City.
- Implementation Measure N 4.6. A For all temporary construction, demolition or maintenance noise and other necessary short-term noise events, the stationary noise standards in Policy N 4.1 (Table II above), may be exceeded within the receiving land use by:
 1. 5 dBA for a cumulative period of no more than fifteen (15) minutes in any hour.
 2. 10 dBA for a cumulative period of no more than five (5) minutes in any hour.
 3. 15 dBA for a cumulative period of no more than one (1) minute in any given hour.
 4. In order to allow for temporary construction, demolition or maintenance noise and other necessary short-term noise events, the stationary noise standards in Policy N 4.1 above, shall not be exceeded within the receiving land use by more than 15 dBA any period of time.

The City of Chowchilla does not have regulations that define acceptable levels of vibration. One of the most recent references suggesting vibration guidelines is the California Department of Transportation (Caltrans) Transportation and Construction Vibration Guidance Manual². The Manual provides guidance for determining annoyance potential criteria and damage potential threshold criteria. These criteria are provided below in Table III and Table IV and are presented in terms of peak particle velocity (PPV) in inches per second (in/sec).

TABLE III		
GUIDELINE VIBRATION ANNOYANCE POTENTIAL CRITERIA		
Human Response	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Barely Perceptible	0.04	0.01
Distinctly Perceptible	0.25	0.04
Strongly Perceptible	0.9	0.1
Severe	2.0	0.4

Source: Caltrans

TABLE IV		
GUIDELINE VIBRATION DAMAGE POTENTIAL THRESHOLD CRITERIA		
Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile, historic buildings, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Source: Caltrans

PROJECT SITE NOISE EXPOSURE

The Project involves the construction of two types of affordable housing. The northeastern portion of the parcel will be subdivided into seventeen (17) lots that are planned for the development of 17 duplex homes. The central and western portions of the parcel will be developed in two phases with multi-family residential developments. The multi-family development will include a total of 160 apartments. Along the eastern boundary of the parcel, a pond and park, an open space area, a trail, and emergency/fire access road are planned.

The project site is exposed to traffic noise associated with vehicles on Robertson Boulevard (State Route 233), and to a lesser extent, vehicles on Road 15. The distance from the centerline of Robertson Boulevard to the closest proposed residential buildings is approximately 65 feet. The distance from the centerline of Road 15 to the closest proposed residential buildings is approximately 55 feet. Other sources of noise observed during the project site visit include noise associated with agricultural activities as well as occasional small aircraft overflights.

Noise exposure from traffic on Robertson Boulevard and Road 15 was calculated using the FHWA Traffic Noise Model and traffic data obtained from Caltrans and Madera CTC. A description of the noise model, applied data, methodology and findings is provided below.

FHWA Traffic Noise Model-

WJVA utilized the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (FHWA-RD-77-108). The FHWA Model is a standard analytical method used for roadway traffic noise calculations. The model is based upon reference energy emission levels for automobiles, medium trucks (2 axles) and heavy trucks (3 or more axles), with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site. The FHWA Model was developed to predict hourly L_{eq} values for free-flowing traffic conditions, and is generally considered to be accurate within ± 1.5 dB. To predict L_{dn} values, it is necessary to determine the hourly distribution of traffic for a typical day and adjust the traffic volume input data to yield an equivalent hourly traffic volume.

Noise level measurements and concurrent traffic counts were conducted by WJVA staff within the project site on May 25, 2023. The purpose of the measurements was to evaluate the accuracy of the FHWA Model in describing traffic noise exposure within the project site. One traffic noise measurement was conducted along Robertson Boulevard. Traffic volumes along Road 15 were too low to accurately measure traffic noise along the roadway. The location of the Robertson Boulevard traffic noise measurement location and the project vicinity is provided as Figure 2. A photograph of the traffic noise measurement site provided as Figure 3.

Noise monitoring equipment consisted of a Larson-Davis Laboratories Model LDL-820 sound level analyzer equipped with a B&K Type 4176 1/2" microphone. The equipment complies with the specifications of the American National Standards Institute (ANSI) for Type I (Precision) sound level meters. The meter was calibrated in the field prior to use with a B&K Type 4230 acoustic

calibrator to ensure the accuracy of the measurements. The microphones were located on a tripod at 5 feet above the ground. The project site presently consists of undeveloped land.

Noise measurements were conducted in terms of the equivalent energy sound level (L_{eq}). Measured L_{eq} values were compared to L_{eq} values calculated (predicted) by the FHWA Model using as inputs the traffic volumes, truck mix and vehicle speed observed during the noise measurements. The results of the comparison are shown in Table V.

From Table V it may be determined that the traffic noise levels predicted by the FHWA Model were 1.2 dB lower than those measured for the conditions observed at the time of the noise measurements for Robertson Boulevard. This is considered to be reasonable agreement with the model and therefore no adjustments to the model are necessary.

TABLE V COMPARISON OF MEASURED AND PREDICTED (FHWA MODEL) NOISE LEVELS CHOWCHILLA MULTI-FAMILY RESIDENTIAL DEVELOPMENT	
	Robertson Boulevard
Measurement Start Time	2:40 p.m.
Observed # Autos/Hr.	696
Observed # Medium Trucks/Hr.	24
Observed # Heavy Trucks/Hr.	0
Observed Speed (MPH)	50
Distance, ft. (from center of roadway)	40
L_{eq} , dBA (Measured)	69.4
L_{eq} , dBA (Predicted)	68.2
Difference between Predicted and Measured L_{eq}, dBA	1.2

Note: FHWA "soft" site assumed for calculations.
Source: WJV Acoustics, Inc.

Annual Average Daily Traffic (AADT) data for Robertson Boulevard in the project vicinity was obtained from Caltrans (existing traffic conditions) and Madera CTC (Future 2046 traffic conditions). AADT data for Road 15 in the project vicinity was obtained by Madera CTC (Future 2046 conditions only). Truck percentages along Robertson Boulevard (SR 233) was obtained from Caltrans. Truck percentages (Road 15) and the day/night distribution of traffic were estimated by WJVA, based upon previous studies conducted in the project vicinity since project-specific data were not available from government sources. A speed limit of 50 mph was assumed for the Robertson Boulevard and a speed limit of 45 mph was assumed for Road 15. Table VI summarizes annual average traffic data used to model noise exposure at the closest proposed residential buildings to each roadway.

TABLE VI
TRAFFIC NOISE MODELING ASSUMPTIONS
CHOWCHILLA MULTI-FAMILY RESIDENTIAL DEVELOPMENT

	Robertson Boulevard		Road 15	
	Existing	2046	Existing	2046
Annual Avenue Daily Traffic (AADT)	3,700	4,557	--	103
Day/Evening/Night Split (%)	83/7/10		83/7/10	
Assumed Vehicle Speed (mph)	50		45	
% Medium Trucks (% AADT)	3.4		2	
% Heavy Trucks (% AADT)	4.6		1	

Sources: Caltrans, Madera CTC
WJV Acoustics, Inc.

Using data from Table VI, the FHWA Model, annual average traffic noise exposure was calculated for the closest proposed residential buildings to both Robertson Boulevard and Road 15. Table VII provides the noise exposure levels for both existing (Robertson Boulevard only) and 2046 traffic conditions at the closest proposed residential buildings to each roadway.

TABLE VII
MODELED TRAFFIC NOISE LEVELS, dB CNEL
CHOWCHILLA MULTI-FAMILY RESIDENTIAL DEVELOPMENT

Roadway	Existing Conditions	2046 Conditions
Robertson Boulevard	63.4	64.3
Road 15	--	46.1

Source: WJV Acoustics
Caltrans
Madera CTC

¹At closest proposed residential buildings to the roadway

Reference to Table VII indicates that the traffic noise exposure at the project site, adjacent to Robertson Boulevard would be approximately 63 dB CNEL for existing conditions and approximately 64 dB CNEL for future (2046) traffic conditions, at the closest proposed residential buildings to the roadway. Traffic noise exposure at the project site, adjacent to Road 15 would be approximately 46 dB CNEL for future (2046) traffic conditions, at the closest proposed residential buildings to the roadway.

HUD DNL Calculator-

WJVA also calculated project site traffic noise exposure using the same above-described traffic assumptions and the HUD DNL Calculator. The HUD DNL Calculator noise level exposure for 2046 traffic conditions (worst case scenario) was calculated to be 66 dB L_{dn} at a setback distance of 65 feet from the centerline of Robertson Boulevard. The HUD DNL Calculator noise level exposure for 2046 traffic conditions (worst case scenario) was calculated to be 48 dB L_{dn} at a setback

distance of 55 feet from the centerline of Road 15. The calculated project site noise exposure using the HUD DNL Calculator was approximately 2 dB higher than that which was calculated using the FHWA Traffic Noise Model.

Exterior Noise Level Compliance-

As described above, the future (2046) traffic noise exposure was calculated to be approximately 64 dB CNEL at the closest proposed residential setbacks to Robertson Boulevard. The exterior noise standard of 60 dB CNEL applies at the outdoor activity areas. The site plan indicates that there would be a common use swimming pool and tot lot area located along the Robertson Boulevard project frontage.

Exterior Noise Mitigation-

The project site plan (Figure 1) indicates the project would include a 6-foot CMU wall along the entirety of the project perimeter. A sound wall insertion loss program based on the FHWA Model was used to calculate the insertion loss (noise reduction) provided by the proposed sound wall. The model calculates the insertion loss of a wall of given height based on the effective height of the noise source, height of the receiver, distance from the receiver to the wall, and distance from the noise source to the wall. The standard assumptions used in the sound wall calculations are effective source heights of 8, 2 and 0 feet above the roadway for heavy trucks, medium trucks and automobiles, respectively. The standard height of a residential receiver is five (5) feet above the ground elevation. It was assumed by WJVA that project site grade would be comparable to that of Robertson Boulevard.

Based upon the above-described assumptions and method of analysis, the noise level insertion loss values for sound walls of various heights were calculated. The calculations indicate that a sound wall along Robertson Boulevard, constructed to a minimum height of six (6) feet relative to project site elevations would reduce traffic noise exposure by approximately 5 dB. This would result in exterior noise levels of approximately 59 dB CNEL at the closest proposed residential buildings to Robertson Boulevard and would reduce noise levels within the common use pool and tot lot areas to below the City's 60 dB CNEL exterior noise level standard.

The project would also include individual unit balconies. The sound wall would provide noise attenuation at first floor patio locations only and would not provide noise attenuation for second-floor balconies facing Robertson Boulevard.

The U.S. Department of Housing and Urban Development (HUD) provides some guidance regarding exterior noise levels at balconies located within high noise exposure areas. A HUD policy guidance document (dated December 22, 2016) addresses the department's position on building facades exposed to noise, and in particular, noise levels within individual balconies of proposed multi-family residential developments. The document is included for reference as Appendix C.

The HUD document, reviewed by WJVA, provides the department's interpretation of the applicability of exterior noise standards to individual unit balconies and patios of multi-family residential land uses. The HUD document states the following:

"Balconies are amenities. Balconies are not required for the full functioning of dwelling units that have reliable, alternative spaces within the structure; therefore, they are ancillary to the principal land use—housing. Because their use is optional, the negative effects of noise exposure are not an important determinant of overall project viability."

HUD considers noise levels within interior spaces to be the primary concern with respect to noise-sensitive environments within noise-impacted areas.

"Sleep is the most noise-sensitive activity in a HUD-assisted project, and therefore, bedrooms are the most noise-sensitive interior spaces."

"Balconies are not locations where it is determined that quiet outdoor space is required in an area ancillary to the principal use on the site"

And

"Furthermore, balconies are not indicative of an "outdoor noise sensitive activity"

Based upon this guidance provided by HUD, noise exposure levels within individual unit balconies are not considered to be a significant impact, in respect to outdoor noise exposure levels.

Interior Noise Level Compliance-

The interior noise level standard is 45 dB L_{dn}/CNEL. As described above, the worst-case exterior noise exposure level at proposed residential buildings adjacent to Robertson Boulevard would be approximately 64 dB CNEL (2046 traffic conditions). This means that the proposed residential construction must be capable of providing a minimum outdoor-to-indoor noise level reduction (NLR) of approximately 19 dB (64-45=19).

A specific analysis of interior noise levels was not performed. However, it may be assumed that residential construction methods complying with current building code requirements will reduce exterior noise levels by approximately 25 dB if windows and doors are closed. This will be sufficient for compliance with the City's 45 dB CNEL interior standard. Requiring that it be possible for windows and doors to remain closed for sound insulation means that air conditioning or mechanical ventilation will be required.

Construction Noise and Vibration

Construction noise would occur at various locations within and near the project site through the build-out period. The distance from the closest residences to the project site is approximately 150 feet. Table VIII provides typical construction-related noise levels at distances of 100 feet, 200 feet, and 300 feet.

TABLE VIII TYPICAL CONSTRUCTION EQUIPMENT MAXIMUM NOISE LEVELS, dBA			
Type of Equipment	100 Ft.	200 Ft.	300 Ft.
Concrete Saw	84	78	74
Crane	75	69	65
Excavator	75	69	65
Front End Loader	73	67	63
Jackhammer	83	77	73
Paver	71	65	61
Pneumatic Tools	79	73	69
Dozer	76	70	66
Rollers	74	68	64
Trucks	80	72	70
Pumps	74	68	64
Scrapers	81	75	71
Portable Generators	74	68	64
Backhoe	80	74	70
Grader	80	74	70

Source: FHWA

Noise Control for Buildings and Manufacturing Plants, Bolt, Beranek & Newman, 1987

Construction noise is not considered to be a significant impact if construction is limited to the daytime hours and construction equipment is adequately maintained and muffled. Extraordinary noise-producing activities (e.g., pile driving) are not anticipated. The City of Chowchilla states that construction activities must be limited to the hours of 7:00 a.m. to 7:00 p.m., Monday through Saturday. Construction noise impacts could result in annoyance or sleep disruption for nearby residents if nighttime operations were to occur or if equipment is not properly muffled or maintained.

The dominant sources of man-made vibration are sonic booms, blasting, pile driving, pavement breaking, demolition, diesel locomotives, and rail-car coupling. None of these activities are anticipated to occur with construction or operation of the proposed project. Typical vibration levels at distances of 100 feet and 300 feet are summarized by Table IX. These levels would not be expected to exceed any significant threshold levels for annoyance or damage, as provided above in Table III and Table IV.

TABLE IX
TYPICAL VIBRATION LEVELS DURING CONSTRUCTION

Equipment	PPV (in/sec)	
	@ 100'	@ 300'
Bulldozer (Large)	0.011	0.006
Bulldozer (Small)	0.0004	0.00019
Loaded Truck	0.01	0.005
Jackhammer	0.005	0.002
Vibratory Roller	.03	0.013
Caisson Drilling	.01	0.006

Source: *Caltrans*

After full project build out, it is not expected that ongoing operational activities will result in any vibration impacts at nearby sensitive uses. Activities involved in trash bin collection could result in minor on-site vibrations as the bin is placed back onto the ground. Such vibrations would not be expected to be felt at the closest off-site sensitive uses. Additional mitigation is not required.

CONCLUSIONS AND RECOMMENDATIONS

The City of Chowchilla exterior and interior noise level standard for multi-family residential land uses is 60 dB CNEL and 45 dB CNEL, respectively. The project will comply with all exterior and interior noise level standards. This determination was based upon noise exposure levels calculated by the above-described FHWA traffic noise model, based upon worst-case (2046) traffic conditions. Furthermore, this determination of compliance is based upon the 6-foot CMU wall indicated on the site plan, as well as the HUD guidance policy on balconies of multi-family residential developments.

In summary, the determination of project compliance noise is based upon the following requirements/assumptions:

- As indicated on the site plan, the project will include a 6-foot CMU perimeter wall.
- The project will comply with the 45 dB CNEL indoor noise standard without the need for any interior noise mitigation measures, as long as mechanical ventilation or air conditioning is provided for all residential units, so that windows and doors can remain closed for sound insulation purposes.

The conclusions and recommendations of this acoustical analysis are based upon the best information known to WJV Acoustics Inc. (WJVA) at the time the analysis was prepared concerning the proposed tract maps, traffic volumes and roadway configurations. Any significant changes in these factors will require a reevaluation of the findings of this report. Additionally, any significant future changes in motor vehicle technology, noise regulations or other factors beyond WJVA's control may result in long-term noise results different from those described by this analysis.

Respectfully submitted,



Walter J. Van Groningen
President

WJV:wjv

FIGURE 2: PROJECT SITE VICINITY AND NOISE MEASUREMENT LOCATION

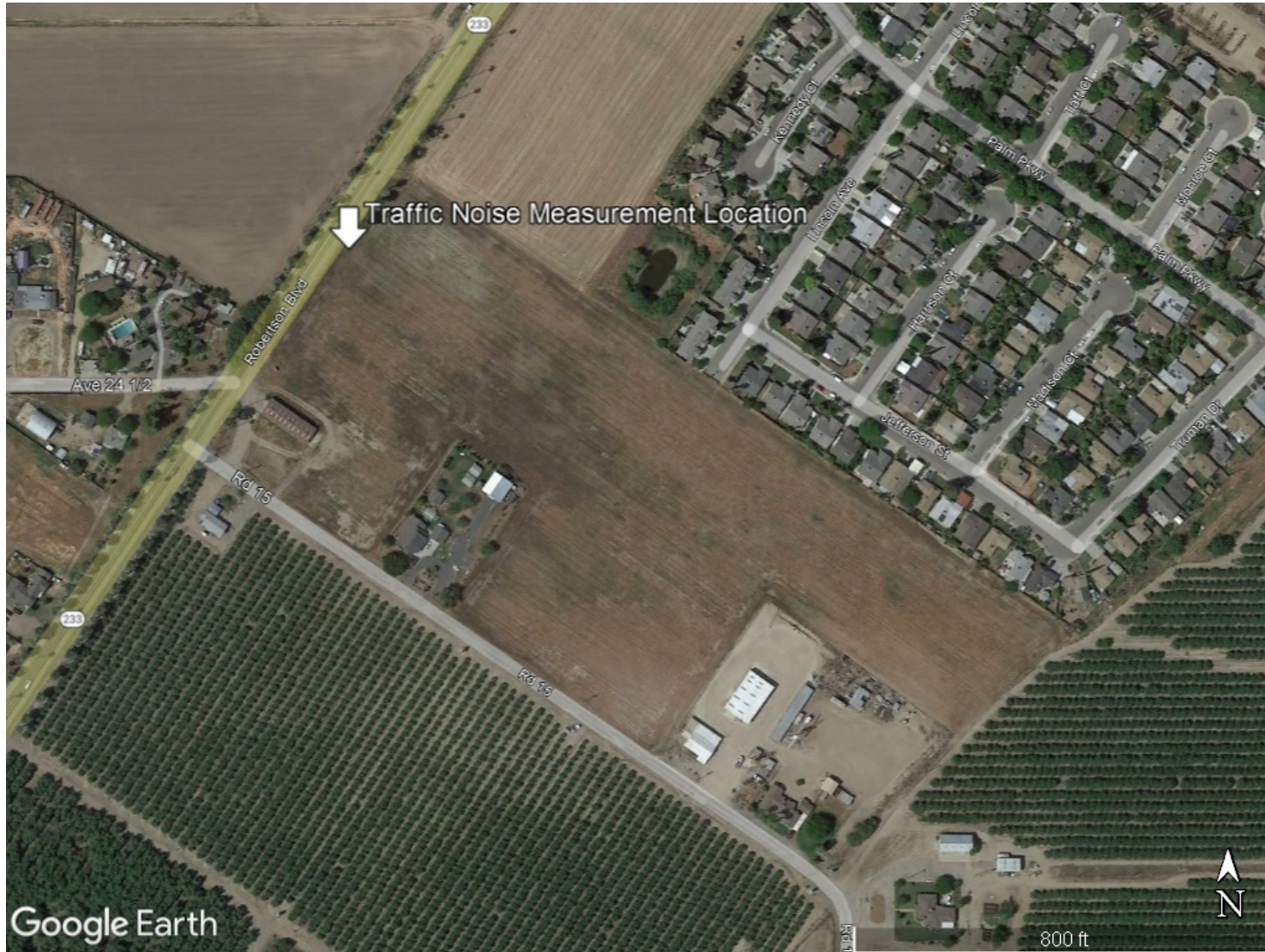


FIGURE 3: NOISE MEASUREMENT SITE ST-1



APPENDIX A

ACOUSTICAL TERMINOLOGY

AMBIENT NOISE LEVEL:	The composite of noise from all sources near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.
CNEL:	Community Noise Equivalent Level. The average equivalent sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night before 7:00 a.m. and after 10:00 p.m.
DECIBEL, dB:	A unit for describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
DNL/L_{dn}:	Day/Night Average Sound Level. The average equivalent sound level during a 24-hour day, obtained after addition of ten decibels to sound levels in the night after 10:00 p.m. and before 7:00 a.m.
L_{eq}:	Equivalent Sound Level. The sound level containing the same total energy as a time varying signal over a given sample period. L _{eq} is typically computed over 1, 8 and 24-hour sample periods.
NOTE:	The CNEL and DNL represent daily levels of noise exposure averaged on an annual basis, while L _{eq} represents the average noise exposure for a shorter time period, typically one hour.
L_{max}:	The maximum noise level recorded during a noise event.
L_n:	The sound level exceeded "n" percent of the time during a sample interval (L ₉₀ , L ₅₀ , L ₁₀ , etc.). For example, L ₁₀ equals the level exceeded 10 percent of the time.

A-2

ACOUSTICAL TERMINOLOGY

NOISE EXPOSURE

CONTOURS:

Lines drawn about a noise source indicating constant levels of noise exposure. CNEL and DNL contours are frequently utilized to describe community exposure to noise.

NOISE LEVEL

REDUCTION (NLR):

The noise reduction between indoor and outdoor environments or between two rooms that is the numerical difference, in decibels, of the average sound pressure levels in those areas or rooms. A measurement of “noise level reduction” combines the effect of the transmission loss performance of the structure plus the effect of acoustic absorption present in the receiving room.

SEL or SENEL:

Sound Exposure Level or Single Event Noise Exposure Level. The level of noise accumulated during a single noise event, such as an aircraft overflight, with reference to a duration of one second. More specifically, it is the time-integrated A-weighted squared sound pressure for a stated time interval or event, based on a reference pressure of 20 micropascals and a reference duration of one second.

SOUND LEVEL:

The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the response of the human ear and gives good correlation with subjective reactions to noise.

SOUND TRANSMISSION

CLASS (STC):

The single-number rating of sound transmission loss for a construction element (window, door, etc.) over a frequency range where speech intelligibility largely occurs.

APPENDIX B
EXAMPLES OF SOUND LEVELS

NOISE SOURCE	SOUND LEVEL	SUBJECTIVE DESCRIPTION
AMPLIFIED ROCK 'N ROLL ▶	120 dB	DEAFENING
JET TAKEOFF @ 200 FT ▶		
	100 dB	VERY LOUD
BUSY URBAN STREET ▶		
	80 dB	LOUD
FREEWAY TRAFFIC @ 50 FT ▶		
	60 dB	MODERATE
CONVERSATION @ 6 FT ▶		
TYPICAL OFFICE INTERIOR ▶		FAINT
SOFT RADIO MUSIC ▶	40 dB	
RESIDENTIAL INTERIOR ▶		VERY FAINT
WHISPER @ 6 FT ▶	20 dB	
HUMAN BREATHING ▶	0 dB	

APPENDIX C
HUD BALCONY POLICY



OFFICE OF COMMUNITY PLANNING
AND DEVELOPMENT

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
WASHINGTON, DC 20410-7000

Special Attention of:

Regional Directors
Field Office Directors
CPD Division Directors
ONAP Administrators
Regional and Field Environmental Officers
Responsible Entities
CPD, Housing, and PIH Staff
Public Housing Agencies
Tribes
Tribally Designated Housing Entities
Indian Housing Authorities
Department of Hawaiian Homelands
Program Environmental Clearance Officers
Multifamily Office Directors
Multifamily Regional Center Directors
Multifamily Satellite Office Directors

Notice: CPD-16-19

Issued: December 22, 2016

Expires: This Notice is effective until amended, superseded, or rescinded.

**SUBJECT: Balcony Policy under 24 CFR 51, Subpart B as it Applies to Parts 50 and 58
Regarding Building Facades Exposed to Noise**

I. Purpose and Background

This Notice reconciles the approach to balconies within the Department's regulatory constraints in 24 CFR Part 51 Subpart B, Noise Abatement and Control, and clarifies compliance.

The noise regulation requires grantees and HUD program staff to consider noise when HUD assistance is proposed. HUD's noise regulation established minimum national standards applicable to HUD programs to protect citizens' health and properties' value from excessive noise in communities. "It is a HUD goal that the interior auditory environment shall not exceed a day-night average sound level of 45 decibels...Emphasis shall be given to noise sensitive interior spaces such as bedrooms" (§51.101(a)(9)). The exterior standard for acceptability is 65 decibels (dB) or below. Noise exposure between that acceptable threshold and 75 dB is normally unacceptable, and noise above 75 dB is unacceptable (§51.103(c)).

HUD assistance for new construction of noise sensitive uses is generally prohibited for projects with unacceptable noise exposure and is discouraged for projects with normally unacceptable noise exposure (§51.100(a)(4) and (§51.101(a)(3)). The regulation further states that "particular emphasis

shall be placed on the importance of compatible land use planning...” (§51.101(a)(1)(i)). “The standards shall also apply at other locations where it is determined that quiet outdoor space is required in an area ancillary to the principal use on the site” (§51.103(c)(1)).

II. Applicability

This Notice applies to HUD activities that are subject to the noise regulation. Those activities include activities subject to environmental reviews at the Categorically Excluded Subject To the related federal laws and authorities (24 CFR 50.20 and 24 CFR 58.35(a)), Environmental Assessment, and Environmental Impact Statement (24 CFR 50.42 and 24 CFR 58.37) levels of review in accordance with both Part 50 for HUD projects and Part 58 for grantees serving as Responsible Entities. Consult Program Environmental Clearance Officers (PECOs)¹ for information on which program activities do not require environmental review.

24 CFR Part 51, Subpart B further defines the activities that are subject to noise regulation requirements. Support for existing construction requires consideration of marketability (24 CFR 51.101(a)(4)). Activities short of new construction (such as modernization or rehabilitation) require actions ranging from encouragement of noise attenuation features to strongly encouraging conversion of a site to a land use that is compatible with high noise levels, depending on the extent of rehabilitation and the level of noise exposure (24 CFR 51.101(a)(5)). New construction requires actions ranging from requiring noise attenuation to denying HUD assistance, depending on the level of noise exposure (24 CFR 51.101(a)(3)).

III. Discussion

Balconies are platforms extending outward from a building façade. For purpose of this Notice, a balcony is a private outdoor space associated with individual dwelling units accessible solely from a single unit and located on an upper-level in a building. This Notice also applies to patios, the equivalent ground-level space, and similar spaces such as porches, decks, and terraces constructed integrally to a building. Such private spaces extend the interior living space, but are ancillary to indoor environments.

Balconies are amenities. Balconies are not required for the full functioning of dwelling units that have reliable, alternative spaces within the structure; therefore, they are ancillary to the principal land use—housing. Because their use is optional, the negative effects of noise exposure are not an important determinant of overall project viability.

A balcony’s usefulness and availability can be limited by weather and manmade environmental conditions such as temperature, precipitation, wind, odors, smoke, and air quality. Noise is such a condition and is a marketability factor. Vulnerability to such conditions can negate its use in extreme circumstances. The inherent sensitivity of such outdoor spaces makes their availability

¹ Contact information for PECO is available on the [HUD Environmental Review](#) website

unreliable. In this context, the construction costs associated with balconies may not support the Department's affordable housing goals.

In addition, balconies can pose a risk to long-term project viability if not properly designed or maintained. Sleep is the most noise-sensitive activity in a HUD-assisted project, and therefore, bedrooms are the most noise-sensitive interior spaces. Excessive interior noise levels (over 45 dB) can impair this most basic use of the dwelling unit. Even with proper mitigation built into a structure, poor or deferred maintenance can impair the effectiveness of some noise attenuation, and maintenance schedules can be vulnerable to budget shortfalls. Inexpensive or low-quality building components combined with deferred maintenance can lead to infiltration of noise into dwelling units. Based on these concerns, it has been an informal Departmental policy for several years to not allow bedrooms or studio apartments in noise-impacted areas that directly access balconies. Through consultation with the Office of Housing and industry representatives concerned about accommodating areas with high market demand for balconies, it has become clear that the risk may be better managed through periodic inspection of door and window seals as an explicit requirement in Operation and Maintenance plans with the provision for repair or replacement as needed.

If the fenestration is designed to be noise mitigation, it must be allowed to function in that role. The dwelling units must not rely on opening windows or doors for ventilation. Mechanical ventilation systems must be provided, and the design of those systems must be such that they do not transmit exterior noise to the interior of the units. Solutions that provide ventilation and quiet are the goal.

IV. Determinations

Balconies are not "locations where it is determined that quiet outdoor space is required in an area ancillary to the principal use on the site" (24 CFR 51.103(c)). Furthermore, balconies are not indicative of an "outdoor noise sensitive activity" for the purpose of eligibility for the discretionary waiver of the Environmental Impact Statement offered in 24 CFR 51.104(b)(2) since spaces inside the dwelling unit can accommodate activities that may occur on balconies.

For new construction projects in Unacceptable and Normally Unacceptable noise areas (in accordance with 24 CFR 51.101(a)(3)) and major or substantial rehabilitation that results in a change of land use, bedrooms and studio apartments may have direct access to balconies if:

1. The interior noise levels have been mitigated to not exceed a day-night average noise level of 45 decibels as documented by the Sound Transmission Classification of the dwelling unit's exterior walls factoring in fenestration.
2. Appropriate ventilation is provided by a mechanical ventilation system and not by opening doors or windows, and
3. An Operations and Maintenance plan is in place that requires periodically inspecting seals and repairing or replacing building components when their performance diminishes.

Bedrooms and studio apartments may not have direct access to balconies if there is no mechanical ventilation and there is no Operations and Maintenance plan requiring periodic inspection and repair or replacement of all window and door seals as needed.

This Notice does not limit the ability of HUD Approving Officials or Part 58 Certifying Officers to require additional mitigation measures not articulated in this Notice, or to deny approval of balconies based on noise or other concerns. In addition, Environmental Assessment or Environmental Impact Statement levels of environmental review must consider potential health effects stemming from issues related to noise sources, such as air quality (24 CFR 50.4(h) and 24 CFR 58.5(g)) and toxic hazard exposure near transportation (24 CFR 50.3(i) and 24 CFR 58.5(i)(2)).

Direct questions about this Notice to your [Regional Environmental Officer](#) or James Potter at 202.402.4610 or james.m.potter@hud.gov.

By: _____
Danielle Schopp, Departmental Environmental Clearance Officer