

**Noise Analysis for
Latitude II
City of Escondido, California**

**Project #560401-0100b
June 23, 2015**

Prepared For:

NCA Developments
14 Corporate Plaza, Suite 100
Laguna Hills, CA 92660

Prepared By:



Matt B. Jones, P.E.
Keith Turner
Landrum & Brown
19700 Fairchild Road, Suite 230
Irvine, CA 92612
949-349-0671

SUMMARY
NOISE ANALYSIS FOR LATITUDE II
CITY OF ESCONDIDO

EXTERIOR NOISE

The City's 60 CNEL exterior noise goal for multi-family projects only applies to recreation areas. The nearest recreation area to the centerline of Centre City Parkway is the pool area. The pool area is approximately 235 feet from the centerline of the roadway. Accounting for the limited angle of sight from Centre City Parkway to the pool area, and the distance from the centerline of roadway to the pool area, the unmitigated traffic noise level would be about 55.5 CNEL. Representative cross-sections in the project (see Appendix for analysis data) were analyzed utilizing the FHWA Model to determine the necessary noise barrier locations and heights. The results of the analysis indicate that noise barriers will not be required.

INTERIOR NOISE MITIGATION

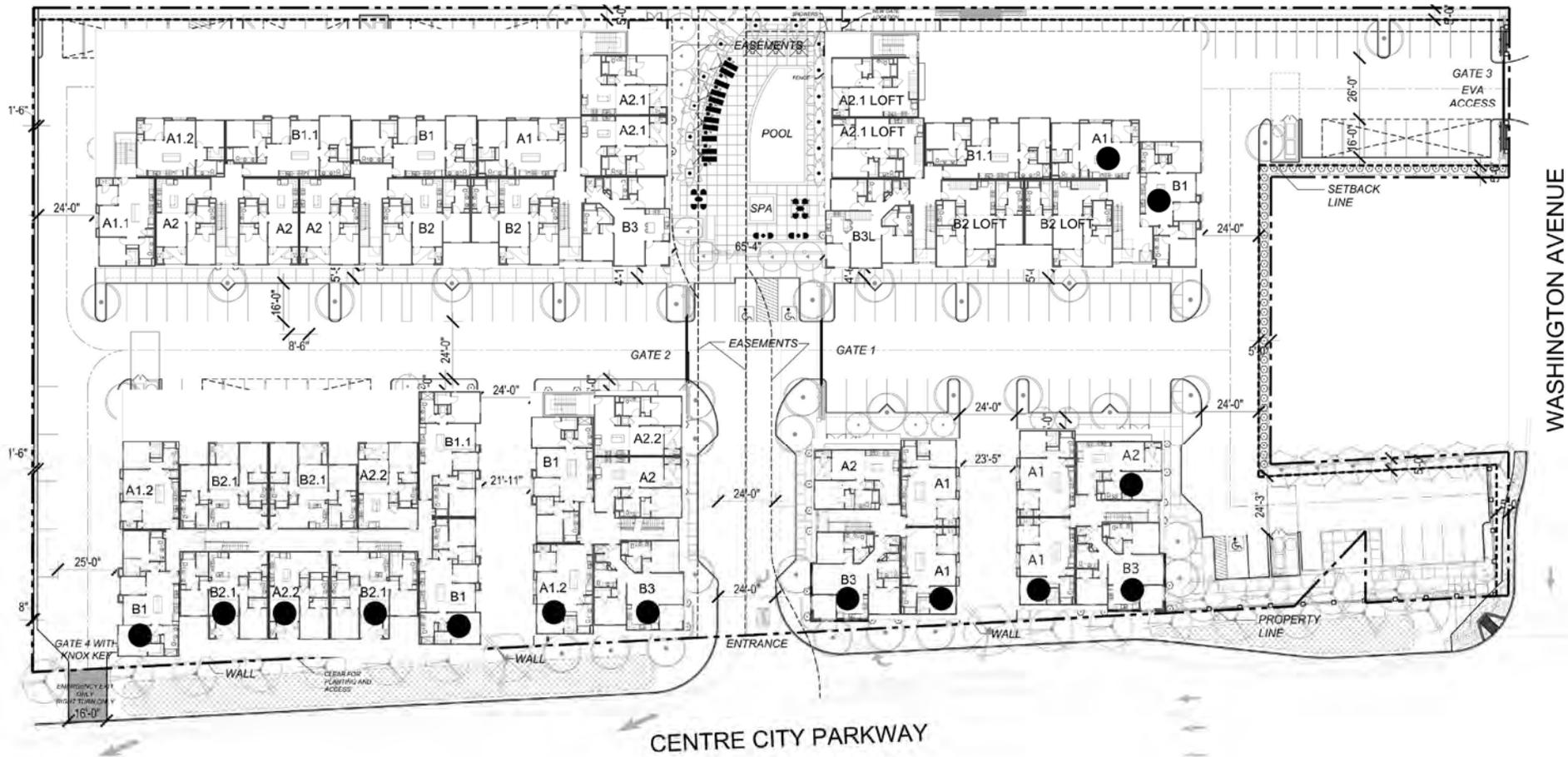
The project must comply with the City of Escondido indoor noise standard of 45 CNEL. To meet the interior noise standard, the buildings must provide sufficient outdoor to indoor building attenuation to reduce the noise to acceptable levels.

Building surfaces in the project will be exposed to a maximum noise level of 69.1 CNEL, and therefore, the rooms will require at least 24.1 dB noise reduction in order to meet the 45 CNEL interior noise standard.

Based upon the construction details and the EWNr values, the exterior to interior noise reduction was calculated for a number of rooms in the project. The data indicates that the worst-case room in the project (kitchen at Unit B3, Building 5) will be exposed to an exterior noise level of 67.6 dB. The room will achieve an outdoor to indoor noise reduction of about 22.7 dB. Therefore, the resulting interior noise level will be 44.9 CNEL. This meets the City's required interior noise level of 45 CNEL or less. Therefore, all rooms within the project are expected to meet the 45 CNEL interior noise standard without building upgrades. Results of the EWNr calculations are presented in the Appendix.

ADEQUATE VENTILATION

Since the noise attenuation of a building falls to about 12 dB with windows open, all buildings exposed to noise levels greater than 57 CNEL will meet the 45 CNEL interior noise standard only with windows closed. In order to assume that windows can remain closed to achieve this required attenuation, adequate ventilation with windows closed must be provided per the applicable California Building Code. Adequate ventilation will be required for the units shown in Exhibit S1.



● Homes Requiring Adequate Ventilation (All Floors)

Exhibit S1 - Adequate Ventilation Requirements

**NOISE ANALYSIS FOR
NOISE ANALYSIS FOR LATITUDE II
CITY OF ESCONDIDO**

1.0 INTRODUCTION

The purpose of this report is to demonstrate compliance of the Latitude II project with the noise related ‘Conditions of Approval’ placed on the project by the City of Escondido. The project calls for the development of multi-family buildings.

The project is located in the City of Escondido, as shown in Exhibit 1. The site plan is shown in Exhibit 2. The project is adjacent to Centre City Parkway and Washington Boulevard. This report specifies any mitigation measures necessary to meet the City’s 60 CNEL exterior noise standard (for the pool area) and the City’s 45 CNEL interior noise standard for the residences.

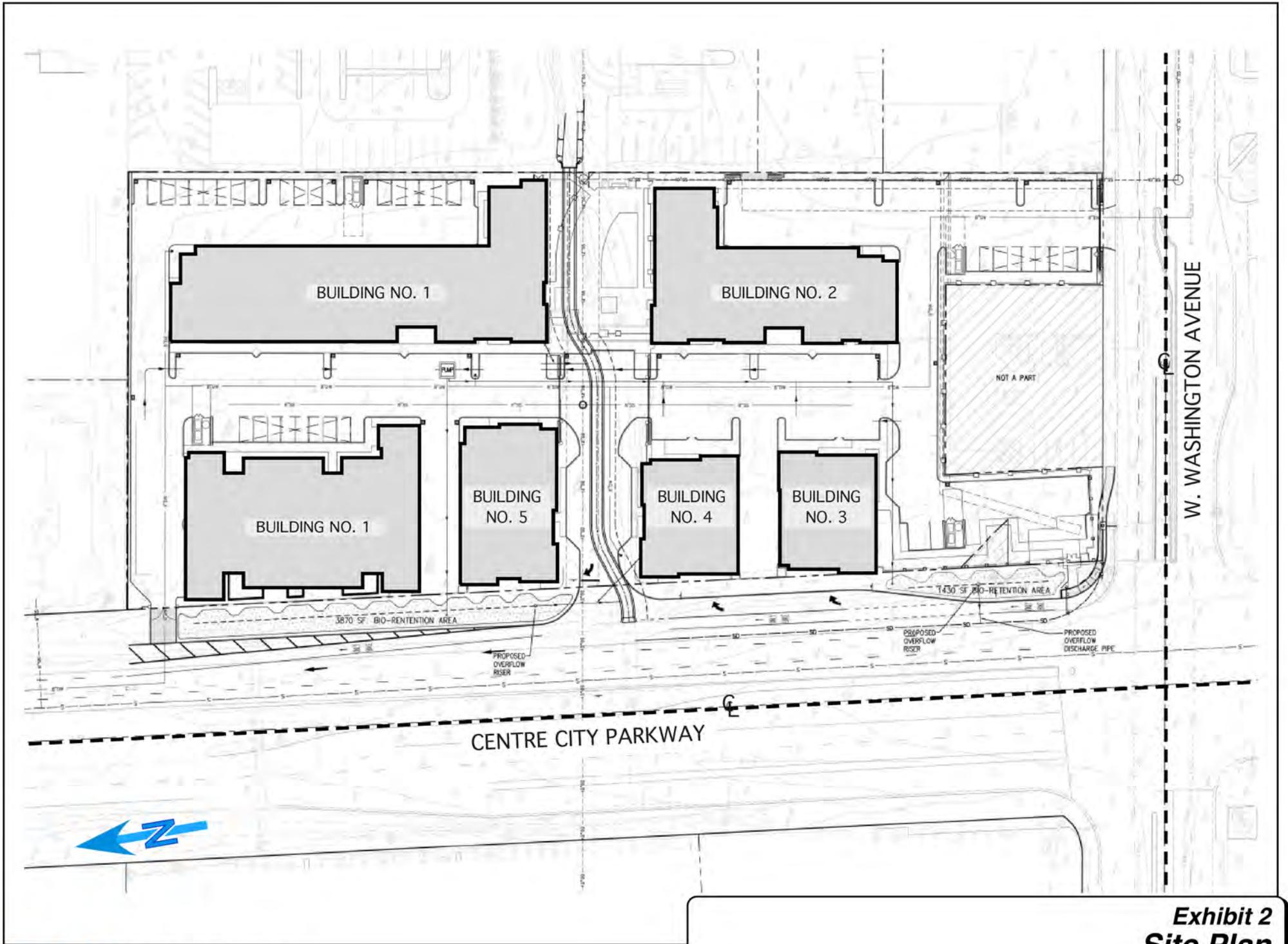
Site plan and grading information was obtained from the “Latitude II Condominiums, Escondido, CA, Preliminary Development Plan, Master Development Plan and Precise Development Plan” by Architects Orange, January 30, 2015. Building construction details were obtained from the architectural drawings for the project provided by Architects Orange.

2.0 CITY OF ESCONDIDO NOISE STANDARDS

The City of Escondido specifies indoor noise limits for residential land uses. The standard is based upon the CNEL index. CNEL (Community Noise Equivalent Level) is a 24-hour time-weighted annual average noise level based on the A-weighted decibel. A weighting is a frequency correction that correlates overall sound pressure levels with the frequency response of the human ear. Time weighting refers to the fact that noise that occurs during certain noise-sensitive time periods is given more significance because it occurs at these times. In the calculation of CNEL, noise occurring in the evening time period (7 p.m. to 10 p.m.) is weighted by 5 dB, while noise occurring in the nighttime period (10 p.m. to 7 a.m.) is weighted by 10 dB. These time periods and weighting factors are used to reflect increased sensitivity to noise while sleeping, eating, and relaxing.

The City’s 60 CNEL exterior noise goal for multi-family projects only applies to recreation areas such as pool areas. The City does not apply any exterior noise standards to patios or balconies at multi-family projects (Noise Policy E1.2). The City uses an interior noise standard of 45 CNEL (Noise Policy E1.3).





3.0 METHODOLOGY

The traffic noise levels projected in this report were computed using the Highway Noise Model published by the Federal Highway Administration (“FHWA Highway Traffic Noise Prediction Model”, FHWA-RD-77-108, December 1978). The FHWA Model uses traffic volume, vehicle mix, vehicle speed, and roadway geometry to compute the “equivalent noise level”. A computer code has been written which computes equivalent noise levels for each of the time periods used in CNEL. Weighting these noise levels and summing them results in the CNEL for the traffic projections used.

4.0 NOISE EXPOSURE

The future (year-2035) traffic volumes for Centre City Parkway and Washington Boulevard were obtained from the SANDAG website on November 20, 2014. The posted speed limit for Washington Boulevard was obtained from Google Maps (maps.google.com) street view. The speed limit for Centre City Parkway was estimated, based upon roadway conditions and the adjacent landuse to the roadway. The traffic volumes, vehicle speeds, and roadway grades used in the CNEL calculations are presented below in Table 1.

Table 1
FUTURE TRAFFIC VOLUMES, SPEEDS, AND ROADWAY GRADES

ROADWAY	TRAFFIC VOLUME	SPEED	GRADE
Centre City Parkway	33,100	45	< 3%
Washington Boulevard	22,200	35	< 3%

The traffic distribution that was used in the CNEL calculations is listed below in Table 2. Arterial traffic distribution estimates can be considered typical for arterials in Southern California.

**Table 2
TRAFFIC DISTRIBUTION PER TIME OF DAY IN PERCENT OF ADT**

VEHICLE TYPE	DAY	EVENING	NIGHT
Automobile	75.51	12.57	9.34
Medium Truck	1.56	0.09	0.19
Heavy Truck	0.64	0.02	0.08

Using the assumptions presented above, the future noise levels were computed. The results are listed in Table 3 in terms of distances to the 60, 65, and 70 CNEL contours. These represent the distances from the centerline of each roadway to the contour value shown. Note that the values given in Table 3 do not take into account the effect of intervening topography that may affect the roadway noise exposure.

**Table 3
DISTANCE TO NOISE CONTOURS FOR FUTURE TRAFFIC CONDITIONS**

ROADWAY	DISTANCE TO CONTOUR (FEET)		
	-70 CNEL-	-65 CNEL-	-60 CNEL-
Centre City Parkway	66	141	304
Washington Boulevard	33	71	154

* - Contour distances in this table are based on the centerline of the roadway representing the noise source.

The pool area is approximately 235 feet from the centerline of Centre City Parkway. Based on distance alone, the traffic noise level at this location would be about 61.5 CNEL. With the shielding provided by Buildings 1, 3, 4, and 5 the traffic noise levels at the pool area will be about 55.5 CNEL. The nearest building face is approximately 80 feet from the centerline of Centre City Parkway. At this distance, buildings would be exposed to traffic noise levels of about 68.7 CNEL. The nearest building face is about 185 feet from the centerline of Washington Boulevard. Based on distance alone, these buildings would be exposed to traffic noise levels of about 58.8 CNEL. Since the buildings are exposed to traffic noise from both roadways, the combined noise level at the nearest building face (Unit B3, Building 3) is 69.1 CNEL.

5.0 EXTERIOR NOISE

The City's 60 CNEL exterior noise goal for multi-family projects only applies to recreation areas. The nearest recreation area to the centerline of Centre City Parkway is the pool area. The pool area is approximately 235 feet from the centerline of the roadway. Accounting for the limited angle of sight from Centre City Parkway to the pool area, and the distance from the centerline of the roadway to the pool area, the unmitigated traffic noise level would be about 55.5 CNEL. Representative cross-sections in the project (see Appendix for analysis data) were analyzed utilizing the FHWA Model to determine the necessary noise barrier locations and heights. The results of the analysis indicate that noise barriers will not be required.

6.0 INTERIOR NOISE MITIGATION

The project must comply with the City of Escondido indoor noise standard of 45 CNEL. To meet the interior noise standard, the buildings must provide sufficient outdoor to indoor building attenuation to reduce the noise to acceptable levels. The outdoor to indoor noise reduction characteristics of a building are determined by combining the transmission loss of each of the building elements that make up the building. Each unique building element has a characteristic transmission loss. For residential units, the critical building elements are the roof, walls, windows, doors, attic configuration and insulation.

The total noise reduction achieved is dependent upon the transmission loss of each element, and the surface area of that element in relation to the total surface area of the room. Room absorption is the final factor used in determining the total noise reduction.

Building surfaces in the project will be exposed to a maximum noise level of 69.1 CNEL, and therefore, the rooms will require at least 24.1 dB noise reduction in order to meet the 45 CNEL interior noise standard. Detailed engineering calculations are needed for building attenuation requirements greater than 20 dB. Construction details presented below were taken from the architectural drawings prepared for the project.

Roofs (Plan 3 Units) – At some areas, where lofts exist (Plan B3), the roofs are vented attic space construction and incorporate concrete tiles on the exterior and minimum 1/2" gypsum drywall on the interior surface of the living area. Attic spaces are insulated with fiberglass insulation, and roofs are sloped. This roof/ceiling assembly was estimated to achieve a noise reduction rating of at least EWNR=36.

Roofs (all other plans, including remaining lofts) – At most areas, the roofs are insulated, flat, built up over plywood, with a minimum 1/2" gypsum drywall on the interior surface of the living area. Parapets are used along the roof perimeter. This roof/ceiling assembly was estimated to achieve a noise reduction rating of at least EWNR=42.

Walls - Exterior walls are wood stud construction with stucco exteriors and minimum 1/2" gypsum drywall on the interior. All exterior walls include fiberglass insulation in the stud cavities. The walls were estimated to achieve a noise reduction rating of at least EWN_R=40.

Windows - The operable windows were estimated to achieve a noise reduction rating of at least EWN_R=24. (This is roughly equivalent to a noise reduction rating of STC=26). The fixed windows were estimated to achieve a noise reduction rating of at least EWN_R=28. (This is roughly equivalent to a noise reduction rating of STC=31).

Based upon the construction details and the EWN_R values, the exterior to interior noise reduction was calculated for a number of rooms in the project. The data indicates that the worst-case room in the project (kitchen at Unit B3, Building 5) will be exposed to an exterior noise level of 67.6 dB. The room will achieve an outdoor to indoor noise reduction of about 22.7 dB. Therefore, the resulting interior noise level will be 44.9 CNEL. This meets the City's required interior noise level of 45 CNEL or less. Therefore, all rooms within the project are expected to meet the 45 CNEL interior noise standard without building upgrades. Results of the EWN_R calculations are presented in the Appendix.

7.0 ADEQUATE VENTILATION

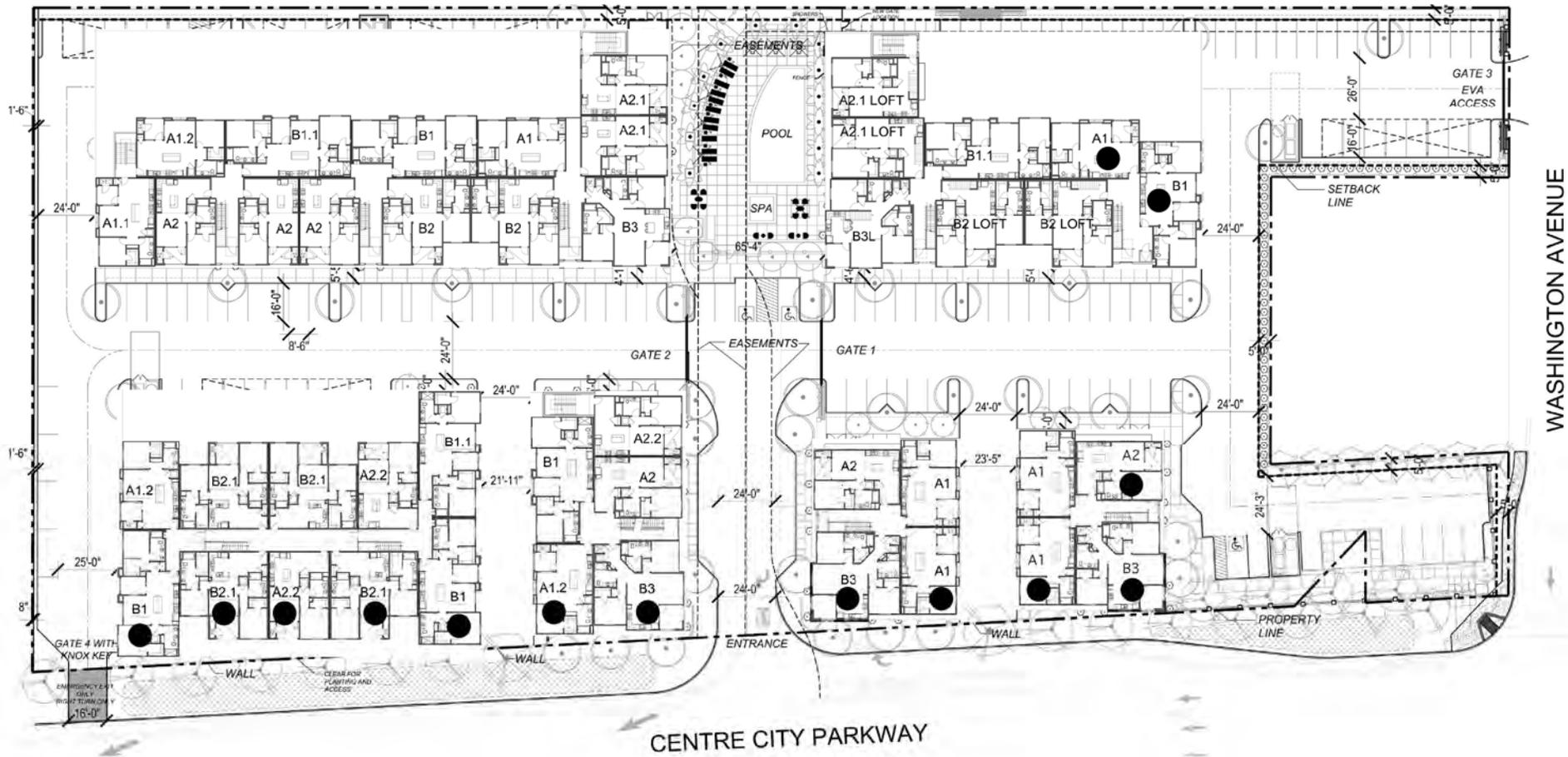
Since the noise attenuation of a building falls to about 12 dB with windows open, all buildings exposed to noise levels greater than 57 CNEL will meet the 45 CNEL interior noise standard only with windows closed. In order to assume that windows can remain closed to achieve this required attenuation, adequate ventilation with windows closed must be provided per the applicable California Building Code. Adequate ventilation will be required for the units shown in Exhibit 3.

8.0 CONSTRUCTION NOISE

Construction short-term noise impacts are addressed in the Escondido General Plan, Downtown Specific Plan EIR, dated April 23, 2012, Section 4.12 Issue 4 on pages 4.12-49 and 4.12-53. The EIR states:

The proposed project would also have the potential to result in a significant impact associated with construction noise. However, required compliance with the City's Noise Ordinance and the proposed General Plan Update policies would reduce the proposed project's impacts related to construction noise to a less than significant level. Therefore, the proposed project would not result in a cumulatively considerable contribution to a potentially significant impact related to temporary construction noise.

'Issue 4: Temporary Increase in Ambient Noise Levels



● Homes Requiring Adequate Ventilation (All Floors)

Exhibit 3 - Adequate Ventilation Requirements

The proposed General Plan Update would not result in a potentially significant impact associated with a temporary increase in ambient noise levels; therefore, no mitigation is required.

Sections 17-234, 17-238, and 17-240 of the Noise Ordinance limit operation of construction equipment to the hours of 7:00 am to 6:00 p.m. Monday through Friday, and 9:00 a.m. to 5:00 p.m. on Saturdays. Grading activities on Saturday may not begin until 10:00 a.m. and must also end by 5:00 p.m. Therefore, construction activities would not occur during nighttime hours and would not disturb sleep. Section 17-234 of the City’s Noise Ordinance prohibits construction noise from exceeding a one-hour average sound level limit of 75 dBA at any time. Noise levels associated with the operation of the construction equipment expected to be used on site range from about 75 to 84 decibels at 50 feet from the source (RCNM 2006). Table 4 below is taken directly from the EIR and identifies noise from typical construction equipment. Not all of this equipment will be used on this site. The nearest noise sensitive land use is located about 120 feet from the project site. At this distance, the noise values listed in the table would be reduced by about 8 dBA

**Table 4
NOISE LEVELS OF TYPICAL CONSTRUCTION EQUIPMENT**

Construction Equipment	Measured Noise Levels in dBA Leq at 50 feet⁽¹⁾
Front Loader	79
Dozer	82
Pickup Trucks	75
Cranes	81
Chainsaws	84
Pneumatic Impact Equipment	85
Jackhammers	89
Pumps	81
Generators	81
Air Compressors	78
Concrete Mixer Truck	79
Concrete Pump Truck	81
Back Hoe	78
Impact Pile Driving	101
Scraper	84
Paver	77

Source: Escondido General Plan, Downtown Specific Plan EIR

⁽¹⁾ Of the equipment listed above, it is expected that only the front loader, pickup trucks, air compressors, concrete mixer truck, and paver will be used on this project site.

Assuming a worst case piece of construction equipment at 79 dBA, construction noise would have the potential to exceed 71 dBA at the nearest noise sensitive land use. Therefore, construction under the proposed project would not have the potential to exceed the 75 dBA hourly average noise level limit. Grading and paving activities are expected to be conducted all over the project site, therefore the equipment will spend a small percentage of the time being nearest to the residential receivers. As a result, the average noise level at the nearest noise sensitive receiver will be less than the 75 dBA hourly average standard.

Construction activities are required to meet the noise level limit established in the City's Noise Ordinance. Therefore, compliance of construction activities with the hourly noise limits listed within the Noise Ordinance would reduce the proposed project's impact to a less than significant level.

The proposed project would result in a less than significant impact associated with a temporary increase in ambient noise levels related to construction noise; therefore, no mitigation is required. However the following optional recommendations are included to reduce noise levels to the extent feasible;

- *All mobile or fixed noise-producing equipment used on the project that is regulated for noise output by a local, state, or federal agency will comply with such regulation while in the course of project activity.*
- *Electrically powered equipment will be used instead of pneumatic or internal combustion powered equipment, where feasible.*
- *Material stockpiles and mobile equipment staging, parking, and maintenance areas will be located as far as practicable from noise-sensitive receptors.*
- *The use of noise-producing signals, including horns, whistles, alarms, and bells, will be for safety warning purposes only.*
- *Surrounding property owners shall be notified at least two weeks in advance of construction commencing onsite. Said notice shall include contact information to register noise complaints.*
- *Construction signs will be posted at the project site identifying a contact name and phone number to register noise complaints.*
- *The onsite construction supervisor will have the responsibility and authority to receive and resolve noise complaints.*

**APPENDIX
CALCULATION SPREADSHEETS**

**DATA USED TO DETERMINE
EXTERIOR AND INTERIOR NOISE LEVELS**

Latitude II, Escondido
 NCA Developments - Riley Paone
 PROJECT #560401-0100
 FRED / KEITH; February 2015

NO MIT				
Roadway:	Centre City Parkway	Washington Blvd.	No Wall	TOTAL
Building 3; Plan B3				
Total Traffic Noise Exposure: at Plan 3, Building 3	68.7	58.8		69.1
Kitchen at Unit B3 / Bldg. 3	67.9	58.8		68.4

Date	11-21-14
Roadway Name	Centre City Pkwy.
Vehicles Per Day	33,100
Speed (mph)	45
Grade Adj. (dB)	0.00 dB
Vehicle Noise Red (dB)	0 dB
Roadway Grade	0.0%

SANDAG Website (http://gis.sandag.org/tficsr12/tficsr_2035.html)
 estimated (no speed on Google Maps)

	Standard Arterial Mix				
	Day	Eve	Night	Equiv	
Auto	75.51%	12.57%	9.34%	208.6%	97.42%
MT	1.56%	0.09%	0.19%	3.7%	1.84%
HT	0.64%	0.02%	0.08%	1.5%	0.74%
	77.71%	12.68%	9.61%		

	This is the CNEL at 15m	
	Soft	Hard
Auto	70.9	72.1
Medium Truck	61.7	62.9
Heavy Truck	62.2	63.4
Total	71.9	73.1

	To get other noise levels (CNEL), put in other distances (ft)				To get other distances (ft), put in other noise levels		
	Dist.	Soft	Hard		CNEL	Soft	Hard
	40	73.2	74.0		57	482	1988
	50	71.8	73.0		58	413	1579
	60	70.6	72.2		59	355	1254
	70	69.6	71.5		60	304	996
bldgs	80	68.7	71.0		61	261	791
bldgs	85	68.3	70.7		62	224	629
	100	67.2	70.0		63	192	499
	125	65.8	69.0	with shielding	64	165	397
	150	64.6	68.2	23°	65	141	315
	200	62.7	67.0	-9 dB	66	121	250
pool area	240	61.5	66.2	use	67	104	199
	300	60.1	65.2	-6 dB	68	89	158
	400	58.2	64.0	52.2	69	76	125
	500	56.8	63.0		70	66	100

CASE	Road Elevation	Distance To Wall	Base Of Wall	Distance To Observer	Pad Elevation	Observer Height	Wall Height	----- Barrier Reduction -----			Traffic Noise		Shielding Adjustment	
								Auto	MT	HT	Soft	Hard		
Building No. 3/Plan B3														
no mit	650	80	647.7	85	647.7	5	0.0	0.0	0.0	0.0	68.3 no mit	70.7		
with wall	650	80	647.7	85	647.7	5	0.0	0.0	0.0	0.0	68.3	70.7		
bldg exposure	650	80	647.7	80	647.7	5	0.0	0.0	0.0	0.0	68.7 bldg exp	71.0		
Building No. 3/Plan B3	Kitchen Set-back													
no mit	650	90	647.7	95	647.7	5	0.0	0.0	0.0	0.0	67.6 no mit	70.2		
with wall	650	90	647.7	95	647.7	5	0.0	0.0	0.0	0.0	67.6	70.2		
bldg exposure	650	90	647.7	90	647.7	5	0.0	0.0	0.0	0.0	67.9 bldg exp	70.4		
Building No. 4/Plan B3														
no mit	649	85	648.5	90	648.5	5	0.0	0.0	0.0	0.0	67.9 no mit	70.4		
with wall	649	85	648.5	90	648.5	5	0.0	0.0	0.0	0.0	67.9	70.4		
bldg exposure	649	85	648.5	85	648.5	5	0.0	0.0	0.0	0.0	68.3 bldg exp	70.7		
Building No. 5/Plan B3														
no mit	648	85	647.2	90	647.2	5	0.0	0.0	0.0	0.0	67.9 no mit	70.4		
with wall	648	85	647.2	90	647.2	5	0.0	0.0	0.0	0.0	67.9	70.4		
bldg exposure	648	85	647.2	85	647.2	5	0.0	0.0	0.0	0.0	68.3 bldg exp	70.7		
Building No. 5/Plan B3	Kitchen Set-back													
no mit	648	95	647.2	100	647.2	5	0.0	0.0	0.0	0.0	67.2 no mit	70.0		
with wall	648	95	647.2	100	647.2	5	0.0	0.0	0.0	0.0	67.2	70.0		
bldg exposure	648	95	647.2	95	647.2	5	0.0	0.0	0.0	0.0	67.6 bldg exp	70.2		
Building No. 6/Plan B2.1														
no mit	648	85	647.7	90	647.7	5	0.0	0.0	0.0	0.0	67.9 no mit	70.4		
with wall	648	85	647.7	90	647.7	5	0.0	0.0	0.0	0.0	67.9	70.4		
bldg exposure	648	85	647.7	85	647.7	5	0.0	0.0	0.0	0.0	68.3 bldg exp	70.7		
Pool Area														
no mit	650	235	647.7	240	647.7	5	0.0	0.0	0.0	0.0	61.5 no mit	66.2	-6dB	55.5
with wall	650	235	647.7	240	647.7	5	5.0	5.0	5.0	0.0	57.5	62.1		51.5

Latitude II, Escondido
 NCA Developments - Riley Paone
 PROJECT #560401-0100
 FRED / KEITH; February 2015

Date	11-21-14
Roadway Name	Washington Blvd.
Vehicles Per Day	22,200
Speed (mph)	35
Grade Adj. (dB)	0.00 dB
Vehicle Noise Red (dB)	0 dB
Roadway Grade	0.0%

SANDAG Website (http://gis.sandag.org/tficsr12/tfic_2035.html)

posted limit

Standard Arterial Mix

	Day	Eve	Night	Equiv	
Auto	75.51%	12.57%	9.34%	208.6%	97.42%
MT	1.56%	0.09%	0.19%	3.7%	1.84%
HT	0.64%	0.02%	0.08%	1.5%	0.74%
	77.71%	12.68%	9.61%		

This is the CNEL at 15m

	Soft	Hard
Auto	66.0	67.2
Medium Truck	58.2	59.4
Heavy Truck	59.5	60.7
Total	67.4	68.6

To get other noise levels (CNEL),
 put in other distances (ft)

Dist.	Soft	Hard
20	73.3	72.5
25	71.8	71.6
30	70.7	70.8
50	67.3	68.6
75	64.7	66.8
100	62.8	65.5
125	61.4	64.6
150	60.2	63.8
160	59.7	63.5
bldgs 185	58.8	62.9
180	59.0	63.0
200	58.3	62.5
225	57.5	62.0
250	56.8	61.6

To get other distances (ft),
 put in other noise levels

CNEL	Soft	Hard
57	244	716
58	209	569
59	179	452
60	154	359
61	132	285
62	113	226
63	97	180
64	83	143
65	71	113
66	61	90
67	53	72
68	45	57
69	39	45
70	33	36

CASE	Road Elevation	Distance To Wall	Base Of Wall	Distance To Observer	Pad Elevation	Observer Height	Wall Height	----- Barrier Reduction -----			Traffic Noise	
								Auto	MT	HT	Soft	Hard
Building No. 3 / Unit B3												
<i>no mit</i>	650	185	312.8	190	647.7	5	0.0	0.0	0.0	0.0	58.6 no mit	62.8
<i>with wall</i>	650	185	312.8	190	647.7	5	0.0	0.0	0.0	0.0	58.6	62.8
<i>bldg exposure</i>	650	185	312.8	185	647.7	5	0.0	0.0	0.0	0.0	58.8 bldg exp	62.9

EXTERIOR NOISE LEVEL : 69.1
 INTERIOR STANDARD : 45.0 noise standard
 REDUCTION REQUIRED : 24.1

Maximum Exposure Buidlings 3 / Unit B3; Living Room (Open Ceiling-Loft)

BUILDING ELEMENT	AREA (ft ²)	EWN	COMMENTS	10 [^] (-EWN/10)	UPGRADED	
					EWN	10 [^] (-EWN/10)
Window (operable)	36.0	24	minimum	0.14332	24	0.14332
Window (fixed)	42.0	28	minimum (assumed fixed in loft area)	0.06657	28	0.06657
Wall	372.0	40	stud / stucco / gyp / insulation	0.03720	40	0.03720
Roof / Ceiling (top floor)	156.0	36	sloped, vented AS, gyp, insul, concrete tiles	0.03919	36	0.03919
TOTAL AREA (ft ²)	606.0			0.28627		0.28627
10 Log S/A	-1	corner				
Calculated Noise Reduction:		28.3			Calculated Noise Reduction:	28.3
TOTAL NOISE REDUCTION:		26.3			TOTAL NOISE REDUCTION:	26.3
PASSES BY 2.2 dB					PASSES BY 2.2 dB	

EXTERIOR NOISE LEVEL : 68.4 *KITCHEN IS SETBACK*
 INTERIOR STANDARD : 45.0 noise standard
 REDUCTION REQUIRED : 23.4

Maximum Exposure : Buidlings 3 / Unit B3; Kitchen

BUILDING ELEMENT	AREA (ft ²)	EWN	COMMENTS	10 [^] (-EWN/10)	UPGRADED	
					EWN	10 [^] (-EWN/10)
Window (operable)	37.0	24	minimum	0.14730	24	0.14730
Window (fixed)		28	minimum		28	
Wall	154.2	40	stud / stucco / gyp / insulation	0.01542	40	0.01542
Roof / Ceiling (top floor)	112.1	36	sloped, vented AS, gyp, insul, concrete tiles	0.02816	36	0.02816
TOTAL AREA (ft ²)	303.3			0.19088		0.19088
10 Log S/A	1	corner				
Calculated Noise Reduction:		25.0			Calculated Noise Reduction:	25.0
TOTAL NOISE REDUCTION:		23.4			TOTAL NOISE REDUCTION:	23.4
PASSES BY 0.0 dB					PASSES BY 0.0 dB	

EXTERIOR NOISE LEVEL : 68.7
 INTERIOR STANDARD : 45.0 noise standard
 REDUCTION REQUIRED : 23.7

CASE 1 : Buidlings 3&4 / Unit B3; Living Room (Open Ceiling-Loft)

BUILDING ELEMENT	AREA (ft ²)	EWN	COMMENTS	10 [^] (-EWN/10)	UPGRADED	
					EWN	10 [^] (-EWN/10)
Window (operable)	36.0	24	minimum	0.14332	24	0.14332
Window (fixed)	42.0	28	minimum (assumed fixed in loft area)	0.06657	28	0.06657
Wall	372.0	40	stud / stucco / gyp / insulation	0.03720	40	0.03720
Roof / Ceiling (top floor)	156.0	36	sloped, vented AS, gyp, insul, concrete tiles	0.03919	36	0.03919
TOTAL AREA (ft ²)	606.0			0.28627		0.28627
10 Log S/A	-1	corner				
Calculated Noise Reduction:	28.3				Calculated Noise Reduction:	28.3
TOTAL NOISE REDUCTION:	26.3				TOTAL NOISE REDUCTION:	26.3
PASSES BY 2.6 dB					PASSES BY 2.6 dB	

EXTERIOR NOISE LEVEL : 68.7
 INTERIOR STANDARD : 45.0 noise standard
 REDUCTION REQUIRED : 23.7

CASE 2 : Buidlings 3&4 / Unit B3; Bedroom #2

BUILDING ELEMENT	AREA (ft ²)	EWN	COMMENTS	10 [^] (-EWN/10)	UPGRADED	
					EWN	10 [^] (-EWN/10)
Window (operable)	25.0	24	minimum	0.09953	24	0.09953
Window (fixed)		28	minimum		28	
Wall	200.0	40	stud / stucco / gyp / insulation	0.02000	40	0.02000
Roof / Ceiling (top floor)	155.3	42	flat, gyp, insul, built-up	0.00980	42	0.00980
TOTAL AREA (ft ²)	380.3			0.12933		0.12933
10 Log S/A	-3	non-corner				
Calculated Noise Reduction:	31.7				Calculated Noise Reduction:	31.7
TOTAL NOISE REDUCTION:	29.7				TOTAL NOISE REDUCTION:	29.7
PASSES BY 6.0 dB					PASSES BY 6.0 dB	

EXTERIOR NOISE LEVEL : 67.9 *KITCHEN IS SETBACK*
 INTERIOR STANDARD : 45.0 noise standard
 REDUCTION REQUIRED : 22.9

CASE 3 : Buidlings 3&4 / Unit B3; Kitchen

BUILDING ELEMENT	AREA (ft ²)	EWN	COMMENTS	10 [^] (-EWN/10)	UPGRADED	
					EWN	10 [^] (-EWN/10)
Window (operable)	37.0	24	minimum	0.14730	24	0.14730
Window (fixed)		28	minimum		28	
Wall	154.2	40	stud / stucco / gyp / insulation	0.01542	40	0.01542
Roof / Ceiling (top floor)	112.1	36	sloped, vented AS, gyp, insul, concrete tiles	0.02816	36	0.02816
TOTAL AREA (ft ²)	303.3			0.19088		0.19088
10 Log S/A	1	corner				
Calculated Noise Reduction:	25.0				Calculated Noise Reduction:	25.0
TOTAL NOISE REDUCTION:	23.4				TOTAL NOISE REDUCTION:	23.4
PASSES BY 0.5 dB					PASSES BY 0.5 dB	

EXTERIOR NOISE LEVEL : 68.3 *5-feet further from CL of Rdwy*
 INTERIOR STANDARD : 45.0 noise standard
 REDUCTION REQUIRED : 23.3

CASE 1 : Buidling 5 / Unit B3; Living Room (Open Ceiling-Loft)

BUILDING ELEMENT	AREA (ft ²)	EWN	COMMENTS	10 [^] (-EWN/10)	UPGRADED	
					EWN	10 [^] (-EWN/10)
Window (operable)	36.0	24	minimum	0.14332	24	0.14332
Window (fixed)	42.0	28	minimum	0.06657	28	0.06657
Wall	372.0	40	stud / stucco / gyp / insulation	0.03720	40	0.03720
Roof / Ceiling (top floor)	156.0	36	sloped, vented AS, gyp, insul, concrete tiles	0.03919	36	0.03919
TOTAL AREA (ft ²)	606.0			0.28627		0.28627
10 Log S/A	-1	corner				
Calculated Noise Reduction:	28.3				Calculated Noise Reduction:	28.3
TOTAL NOISE REDUCTION:	26.3				TOTAL NOISE REDUCTION:	26.3
PASSES BY 3.0 dB					PASSES BY 3.0 dB	

EXTERIOR NOISE LEVEL : 68.3 *5-feet further from CL of Rdwy*
 INTERIOR STANDARD : 45.0 noise standard
 REDUCTION REQUIRED : 23.3

CASE 2 : Buidlings 5 / Unit B3; Bedroom #2

BUILDING ELEMENT	AREA (ft ²)	EWN	COMMENTS	10 [^] (-EWN/10)	UPGRADED	
					EWN	10 [^] (-EWN/10)
Window (operable)	25.0	24	minimum	0.09953	24	0.09953
Window (fixed)		28	minimum		28	
Wall	200.0	40	stud / stucco / gyp / insulation	0.02000	40	0.02000
Roof / Ceiling (top floor)	155.3	42	flat, gyp, insul, built-up	0.00980	42	0.00980
TOTAL AREA (ft ²)	380.3			0.12933		0.12933
10 Log S/A	-3	non-corner				
Calculated Noise Reduction:	31.7				Calculated Noise Reduction:	31.7
TOTAL NOISE REDUCTION:	29.7				TOTAL NOISE REDUCTION:	29.7
PASSES BY 6.4 dB					PASSES BY 6.4 dB	

EXTERIOR NOISE LEVEL : 67.6 *KITCHEN IS SETBACK*
 INTERIOR STANDARD : 45.0 noise standard
 REDUCTION REQUIRED : 22.6

CASE 3 : Buidlings 5 / Unit B3; Kitchen

BUILDING ELEMENT	AREA (ft ²)	EWN	COMMENTS	10 [^] (-EWN/10)	UPGRADED	
					EWN	10 [^] (-EWN/10)
Window (operable)	42.0	24	minimum	0.16721	24	0.16721
Window (fixed)		28	minimum		28	
Wall	154.2	40	stud / stucco / gyp / insulation	0.01542	40	0.01542
Roof / Ceiling (top floor)	112.1	36	sloped, vented AS, gyp, insul, concrete tiles	0.02816	36	0.02816
TOTAL AREA (ft ²)	308.3			0.21078		0.21078
10 Log S/A	1	corner				
Calculated Noise Reduction:	24.7				Calculated Noise Reduction:	24.7
TOTAL NOISE REDUCTION:	22.7				TOTAL NOISE REDUCTION:	22.7
PASSES BY 0.1 dB					PASSES BY 0.1 dB	

EXTERIOR NOISE LEVEL : 68.3
 INTERIOR STANDARD : 45.0 noise standard
 REDUCTION REQUIRED : 23.3

CASE 4 : Buidlings 5 / Unit A1.2; Bedroom

BUILDING ELEMENT	AREA (ft ²)	EWN	COMMENTS	10 [^] (-EWN/10)	UPGRADED	
					EWN	10 [^] (-EWN/10)
Window (operable)	30.0	24	minimum	0.11943	24	0.11943
Window (fixed)		28	minimum		28	
Wall	179.7	40	stud / stucco / gyp / insulation	0.01797	40	0.01797
Roof / Ceiling (top floor)	135.6	42	flat, gyp, insul, built-up	0.00856	42	0.00856
TOTAL AREA (ft ²)	345.3			0.14596		0.14596
10 Log S/A	0	corner				
Calculated Noise Reduction: 27.7					Calculated Noise Reduction: 27.7	
TOTAL NOISE REDUCTION: 25.7					TOTAL NOISE REDUCTION: 25.7	
PASSES BY 2.4 dB					PASSES BY 2.4 dB	

EXTERIOR NOISE LEVEL : 68.3
 INTERIOR STANDARD : 45.0 noise standard
 REDUCTION REQUIRED : 23.3

CASE 5 : Buidlings 5 / Unit A1.2; Living Room

BUILDING ELEMENT	AREA (ft ²)	EWN	COMMENTS	10 [^] (-EWN/10)	UPGRADED	
					EWN	10 [^] (-EWN/10)
Window (operable)	30.0	24	minimum	0.11943	24	0.11943
Window (fixed)		28	minimum		28	
Wall	192.3	40	stud / stucco / gyp / insulation	0.01923	40	0.01923
Roof / Ceiling (top floor)	151.6	42	flat, gyp, insul, built-up	0.00957	42	0.00957
TOTAL AREA (ft ²)	373.9			0.14823		0.14823
10 Log S/A	0	corner				
Calculated Noise Reduction: 28.0					Calculated Noise Reduction: 28.0	
TOTAL NOISE REDUCTION: 26.0					TOTAL NOISE REDUCTION: 26.0	
PASSES BY 2.7 dB					PASSES BY 2.7 dB	

EXTERIOR NOISE LEVEL : 68.3 *5-feet further from CL of Rdwy*
 INTERIOR STANDARD : 45.0 noise standard
 REDUCTION REQUIRED : 23.3

CASE 6 : Buidling 6 / Unit B2.1; Bedroom #2 (Open Ceiling-Loft)

BUILDING ELEMENT	AREA (ft ²)	EWN	COMMENTS	10 [^] (-EWN/10)	UPGRADED	
					EWN	10 [^] (-EWN/10)
Window (operable)	30.0	24	minimum	0.11943	24	0.11943
Window (fixed)	51.0	28	minimum	0.08083	28	0.08083
Wall	347.4	40	stud / stucco / gyp / insulation	0.03474	40	0.03474
Roof / Ceiling (top floor)	141.5	36	sloped, vented AS, gyp, insul, concrete tiles	0.03554	36	0.03554
TOTAL AREA (ft ²)	569.9			0.27054		0.27054
10 Log S/A	-3	non-corner				
Calculated Noise Reduction:	30.2				Calculated Noise Reduction:	30.2
TOTAL NOISE REDUCTION:	28.2				TOTAL NOISE REDUCTION:	28.2
PASSES BY 4.9 dB					PASSES BY 4.9 dB	

EXTERIOR NOISE LEVEL : 68.3 *5-feet further from CL of Rdwy*
 INTERIOR STANDARD : 45.0 noise standard
 REDUCTION REQUIRED : 23.3

CASE 7 : Buidling 6 / Unit B2.1; Bedroom #1

BUILDING ELEMENT	AREA (ft ²)	EWN	COMMENTS	10 [^] (-EWN/10)	UPGRADED	
					EWN	10 [^] (-EWN/10)
Window (operable)	30.0	24	minimum	0.11943	24	0.11943
Window (fixed)		28	minimum		28	
Wall	194.1	40	stud / stucco / gyp / insulation	0.01941	40	0.01941
Roof / Ceiling (top floor)	154.9	42	flat, gyp, insul, built-up	0.00977	42	0.00977
TOTAL AREA (ft ²)	379.0			0.14862		0.14862
10 Log S/A	-3	non-corner				
Calculated Noise Reduction:	31.1				Calculated Noise Reduction:	31.1
TOTAL NOISE REDUCTION:	29.1				TOTAL NOISE REDUCTION:	29.1
PASSES BY 5.8 dB					PASSES BY 5.8 dB	

EXTERIOR NOISE LEVEL : 68.3 *5-feet further from CL of Rdwy*
 INTERIOR STANDARD : 45.0 noise standard
 REDUCTION REQUIRED : 23.3

CASE 8 : Buidling 6 / Unit B1; Bedroom #2

BUILDING ELEMENT	AREA (ft ²)	EWN	COMMENTS	10 [^] (-EWN/10)	UPGRADED	
					EWN	10 [^] (-EWN/10)
Window (operable)	30.0	24	minimum	0.11943	24	0.11943
Window (fixed)	6.0	28	minimum	0.00951	28	0.00951
Wall	190.8	40	stud / stucco / gyp / insulation	0.01908	40	0.01908
Roof / Ceiling (top floor)	158.7	42	flat, gyp, insul, built-up	0.01001	42	0.01001
TOTAL AREA (ft ²)	385.5			0.15803		0.15803
10 Log S/A	0	corner				
Calculated Noise Reduction:	27.9				Calculated Noise Reduction:	27.9
TOTAL NOISE REDUCTION:	25.9				TOTAL NOISE REDUCTION:	25.9
PASSES BY 2.6 dB					PASSES BY 2.6 dB	