Noise Analysis for the Montague (aka Dedeaux) Site City of Milpitas, California

Project #536301-0100
October 25, 2012

Prepared For:

Lyon Apartment Communities
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Summary
Noise Analysis for the Montague (aka Dedeaux) Site
City of Milpitas

EXTERIOR NOISE LEVELS

Conditions of Approval have not been issued for this project. It should be noted that the courtyard areas of the project are surrounded by the buildings. Noise levels in the courtyards are projected to be well below 65 CNEL. Therefore, noise barriers are not required for this project.

INTERIOR NOISE MITIGATION

Building surfaces along E. Capitol Avenue will be exposed to noise levels of less than 65 CNEL. Therefore, rooms at that location will require less than 20 dB exterior to interior noise reduction in order to meet the City's 45 CNEL interior noise standard. With construction practices common in California, residential buildings achieve outdoor to indoor noise reductions of at least 20 dB. Therefore, all rooms along E. Capitol Avenue are projected to meet the City's 45 CNEL interior noise standard without building upgrades.

Building surfaces along the Montague Expressway will be exposed to a maximum noise level of 69.8 CNEL. Therefore, rooms at that location will require at least 24.8 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.

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 analysis shows that all rooms adjacent to the Montague Expressway will require window upgrades. The rooms requiring upgrades are shown in Exhibit S1A and S1B. For rooms identified with a "1" all operable windows will need to be upgraded to a noise rating of EWNR 26 (STC 28), and fixed windows to an EWNR of 30 (STC 33). For the units labeled with a "2" the windows need to be upgraded to an EWNR of 29 (STC 32), and fixed windows to an EWNR of 33 (STC 36). The required upgrades are specified in Table S1.

X - Upgrade Level Required
see text for details

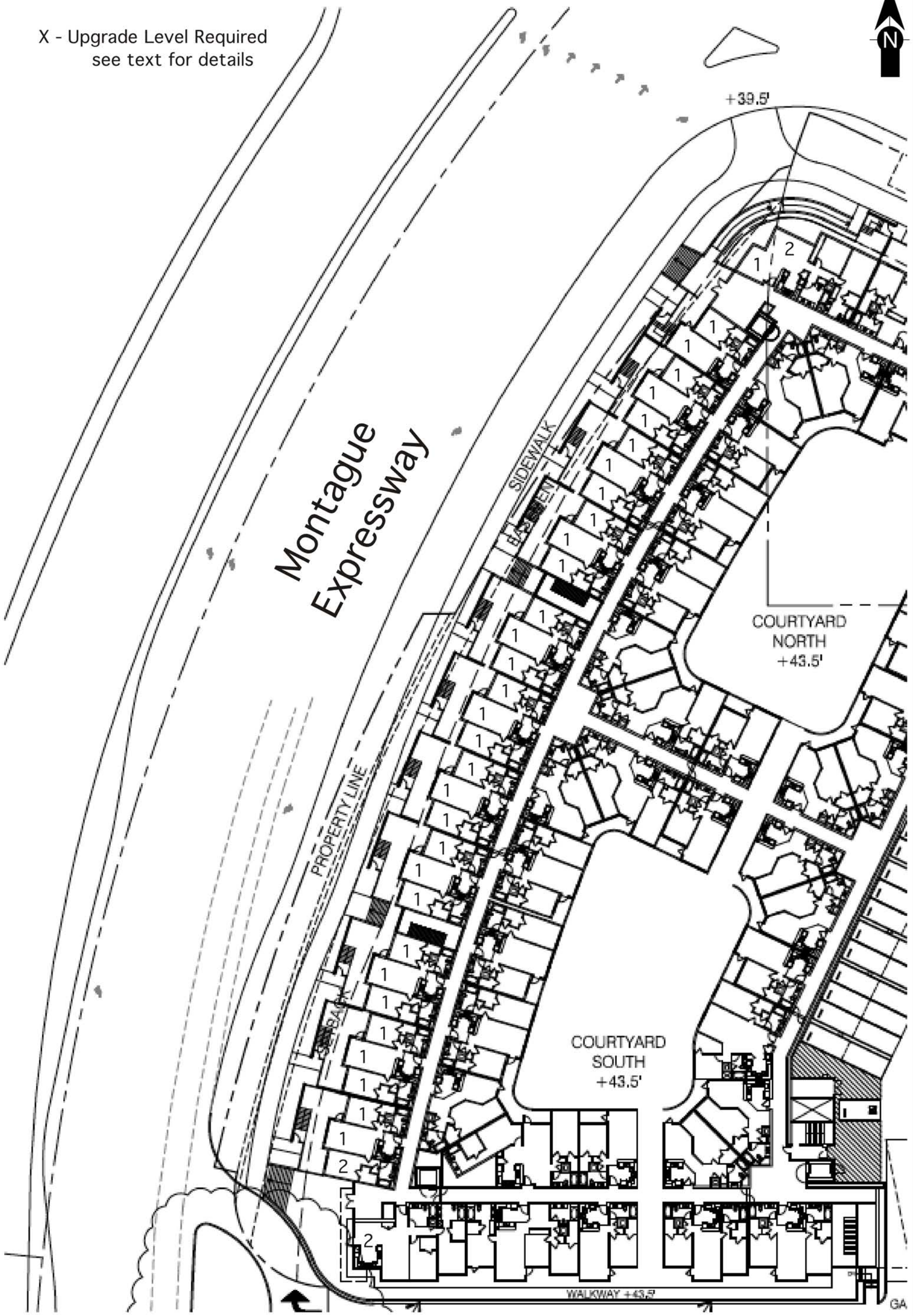

Exhibit S1A
Upgrades Required - Ground Floor

X - Upgrade Level Required
see text for details

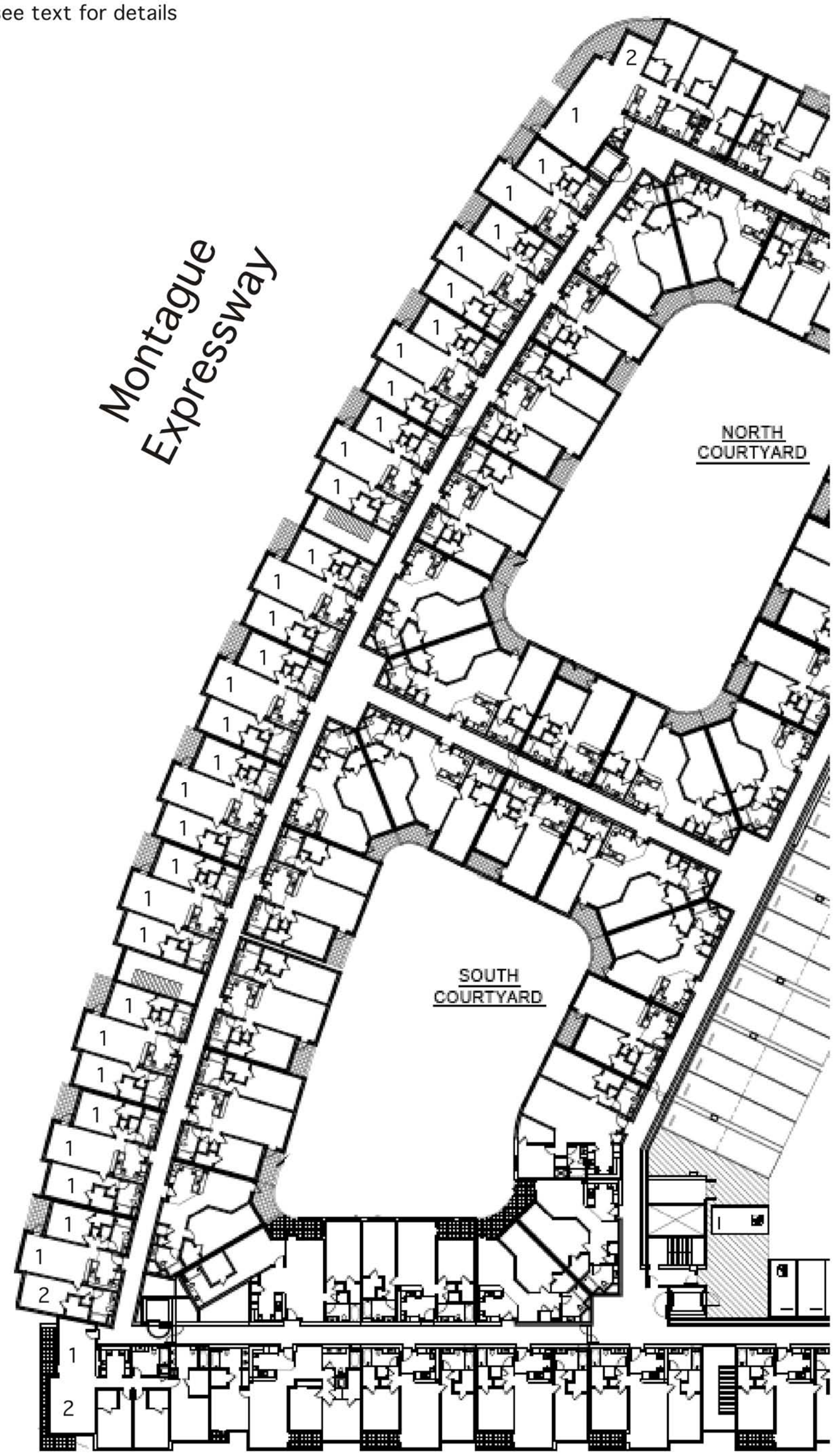

Exhibit S1B
Upgrades Required - Upper Floors

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Table S1
REQUIRED BUILDING UPGRADES

UPGRADE LEVEL SPECIFIED Required window ratings (Typical window configuration)
1 - Upgrade any operable windows to **EWNR=26 or STC=28** Upgrade any fixed windows to **EWNR=30 or STC=33** (typically 1/8" -7/16" airspace – 1/8" dual-glazed)
2 - Upgrade any operable windows to **EWNR=29 or STC=32** Upgrade any fixed windows to **EWNR=33 or STC=36** (typically 7/32" -7/16" airspace – 1/8" dual-glazed)

The window upgrades listed above represent window configurations that can typically meet the specified EWNR/STC ratings, and are given for informational purposes only. Glass thickness and airspace configuration are only a part of the overall noise reduction characteristics of a window. Other factors can include the frame construction and seal type. Therefore, noise reduction ratings for windows of a given configuration can vary from one manufacturer to another. Various window configurations may be available that meet the required noise reduction ratings. The EWNR and STC ratings specified above are the critical parameters, and should be used as the basis for selecting the windows for the project. Consult with the manufacturer to ensure compliance of the planned windows with the noise reduction rating requirements.

After the upgrades specified in Exhibit S1A, S1B, and Table S1, all rooms will exceed the required noise reduction. Therefore, after the upgrades specified above, all rooms are projected to meet the 45 CNEL interior noise standard.

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 all units adjacent to the Montague Expressway, and all units adjacent to E. Capitol Avenue.

NOISE ANALYSIS FOR THE MONTAGUE (aka DEDEAUX) SITE CITY OF MILPITAS

1.0 INTRODUCTION

The purpose of this report is to demonstrate compliance of the 450 Montague (also known as Dedeaux) project with the noise standards that are expected to be placed on the project by the City of Milpitas. The project is located in the City of Milpitas, as shown in Exhibit 1. The site plan is shown in Exhibit 2. The project will be impacted by traffic noise from the Montague Expressway (also known as Country Highway G4) and E. Capitol Avenue. The project is also in proximity to the Valley Transportation Authority (VTA) light rail line along the northeast edge of the project, and the Burlington Northern Santa Fe railroad line farther to the east. This report specifies any mitigation measures necessary to meet the 45 CNEL interior noise standard, and also addresses the 65 CNEL exterior noise level limit typically applied to exterior areas.

Site information and building construction details were obtained from the drawings for the project by COE Architecture International, October 12, 2012.

2.0 CITY OF MILPITAS NOISE STANDARDS

The City of Milpitas specifies outdoor and indoor noise limits for residential land uses. Both standards are 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 of Milpitas has adopted an exterior noise standard of 65 CNEL for exterior areas such as the interior courtyards. In addition, the City has decided upon an interior noise standard of 45 CNEL.

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Exhibit 1
Vicinity Map

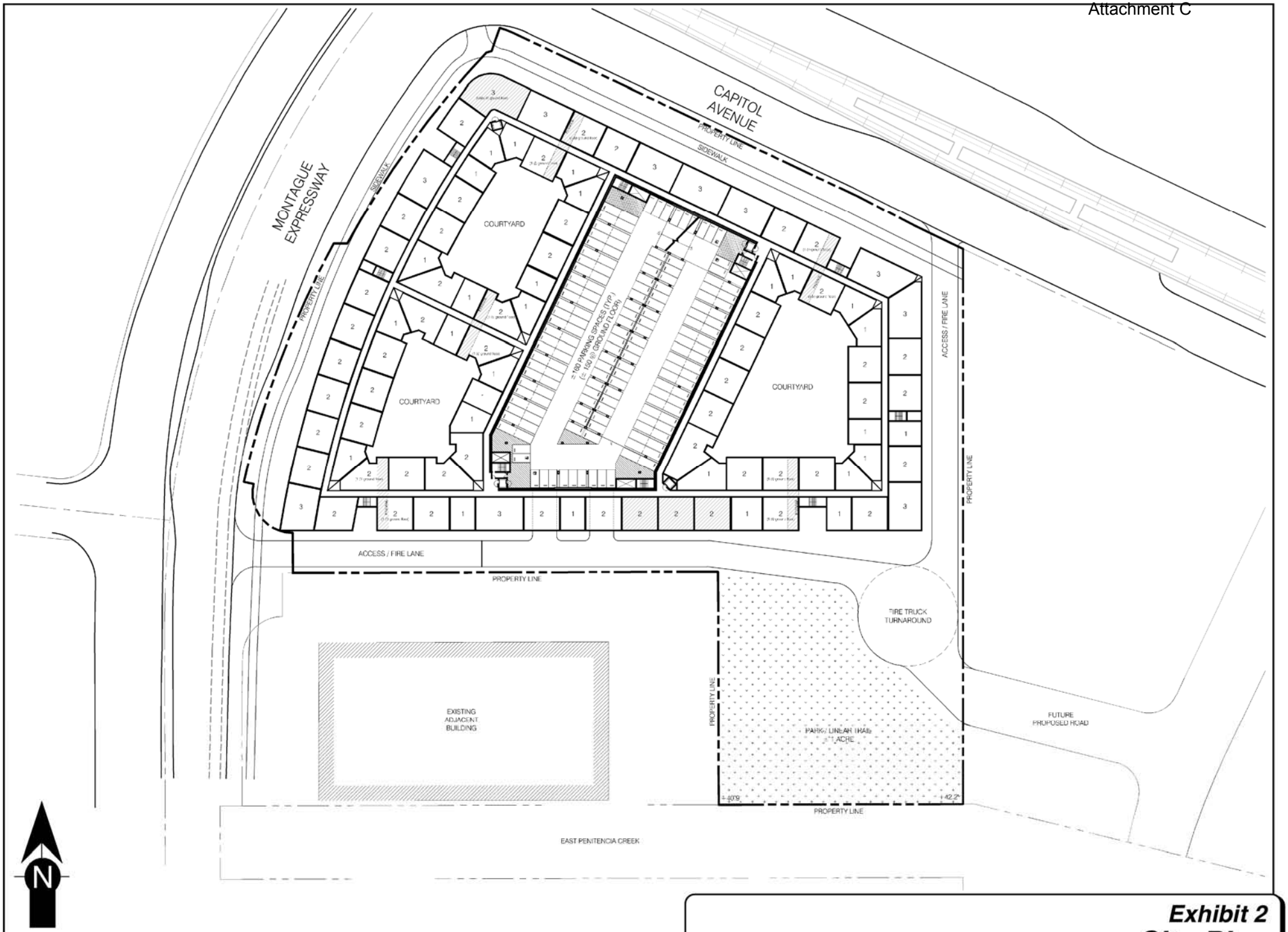

Exhibit 2
Site Plan

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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.

Mitigation through the design and construction of a noise barrier (wall, berm, or combination wall/berm) is the most common way of alleviating traffic noise impacts. The effect of a noise barrier is critically dependent upon the geometry between the noise source, the barrier, and the observer. A noise barrier effect occurs when the "line of sight" between the noise source and the observer is interrupted by the barrier. As the distance that the noise must travel around the noise barrier increases, the amount of noise reduction increases. The FHWA model was also used here in computerized format to determine the required barrier heights.

4.0 NOISE EXPOSURE

4.1 Traffic Noise Exposure

The projected future (year-2035) traffic volumes for the Montague Expressway and E. Capitol Avenue were calculated from the existing (year-2012) traffic counts obtained from Mr. Steve Chan at the City of Milpitas traffic engineering department on October 22, 2012. The Metropolitan Transportation Commission document "Transportation 2035 Change in Motion," (November 2007) was consulted. It shows the anticipated increase between existing traffic levels and year-2035 levels (page 147). The relative increase shown in this document was used to estimate future traffic volumes for the roadways. Per the direction of Mr. Chan, a growth rate of 1.3% per year was used to project the future volumes. 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
Montague Expressway	74,100	45	<3%
E. Capitol Avenue	13,500	35	<3%

The traffic distribution that was used in the CNEL calculations is listed below in Table 2. This arterial traffic distribution estimate was compiled by the Orange County Environmental Management Agency, and is based on traffic counts at 31 intersections throughout the Orange County area. Arterial traffic distribution estimates can be considered typical for arterials in 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.

Table 3
DISTANCE TO NOISE CONTOURS
FOR FUTURE TRAFFIC CONDITIONS

ROADWAY	DISTANCE TO CONTOUR (FT) -70 CNEL-	-65 CNEL-	-60 CNEL-
Montague Expressway	112	242	520
E. Capitol Avenue	RW	51	110

RW – indicates contour falls within roadway right-of-way

The buildings along the Montague Expressway are approximately 115 feet from the centerline of the roadway. At this distance, rooms along the Montague Expressway will be exposed to traffic noise levels of about 69.8 CNEL. The buildings along E. Capitol Avenue are approximately 130 feet from the centerline of the roadway. At this distance, rooms along E. Capitol Avenue will be exposed to traffic noise levels of about 58.9 CNEL.

4.2 Railroad Noise Exposure

The Valley Transportation Authority (VTA) light rail line passes near the northeastern edge of the site. Noise measurements of this railroad line previously performed by this firm ("Noise Analysis for Lyon Milpitas Apartments", November 6, 2009) have demonstrated that the noise levels from this source are insignificant compared to the traffic noise levels. Therefore, the VTA light rail line will not be addressed in subsequent sections of this report.

The Burlington Northern Santa Fe Railway (BNSF) freight line passes near the eastern boundary of the site. However, this is just a spur line serving industrial facilities, and dead-ends south of the project site. CNEL noise levels from this railroad line are not expected to be significant. Therefore, this railroad noise will not be addressed in subsequent sections of this report.

5.0 EXTERIOR NOISE LEVELS

Conditions of Approval have not been issued for this project. It should be noted that the courtyard areas of the project are surrounded by the buildings. Noise levels in the courtyards are projected to be well below 65 CNEL. Therefore, noise barriers are not required for this project.

6.0 INTERIOR NOISE MITIGATION

The project must comply with the City of Milpitas 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 along E. Capitol Avenue will be exposed to noise levels of less than 65 CNEL. Therefore, rooms at that location will require less than 20 dB exterior to interior noise reduction in order to meet the City's 45 CNEL interior noise standard. With construction practices common in California, residential buildings achieve outdoor to indoor noise reductions of at least 20 dB. Therefore, all rooms along E. Capitol Avenue are projected to meet the City's 45 CNEL interior noise standard without building upgrades.

Building surfaces along the Montague Expressway will be exposed to a maximum noise level of 69.8 CNEL. Therefore, rooms at that location will require at least 24.8 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 preliminary architectural drawings prepared for the project by COE Architects.

> ***Roofs –*** *The roofs are vented attic space constructions 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.*
>
> ***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 EWNR=40.*
>
> ***Windows -*** *The operable windows were estimated to achieve a noise reduction rating of at least EWNR=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 EWNR=28. (This is roughly equivalent to a noise reduction rating of STC=31).*
>
> ***Glass Entry Doors -*** *Glass entry doors are assumed to achieve a noise reduction rating of at least EWNR=26 (this is roughly equivalent to a noise reduction rating of STC=28). This can typically be achieved using 3/8" glass entry doors constructed with safety glass).*

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 analysis shows that all rooms adjacent to the Montague Expressway will require window upgrades. The rooms requiring upgrades are shown in Exhibit 3A and 3B. For rooms identified with a "1" all operable windows will need to be upgraded to a noise rating of EWNR 26 (STC 28), and fixed windows to an EWNR of 30 (STC 33). For the units labeled with a "2" the windows need to be upgraded to an EWNR of 29 (STC 32), and fixed windows to an EWNR of 33 (STC 36). The total noise reductions after upgrades are listed in Table 5.

X - Upgrade Level Required
see text for details

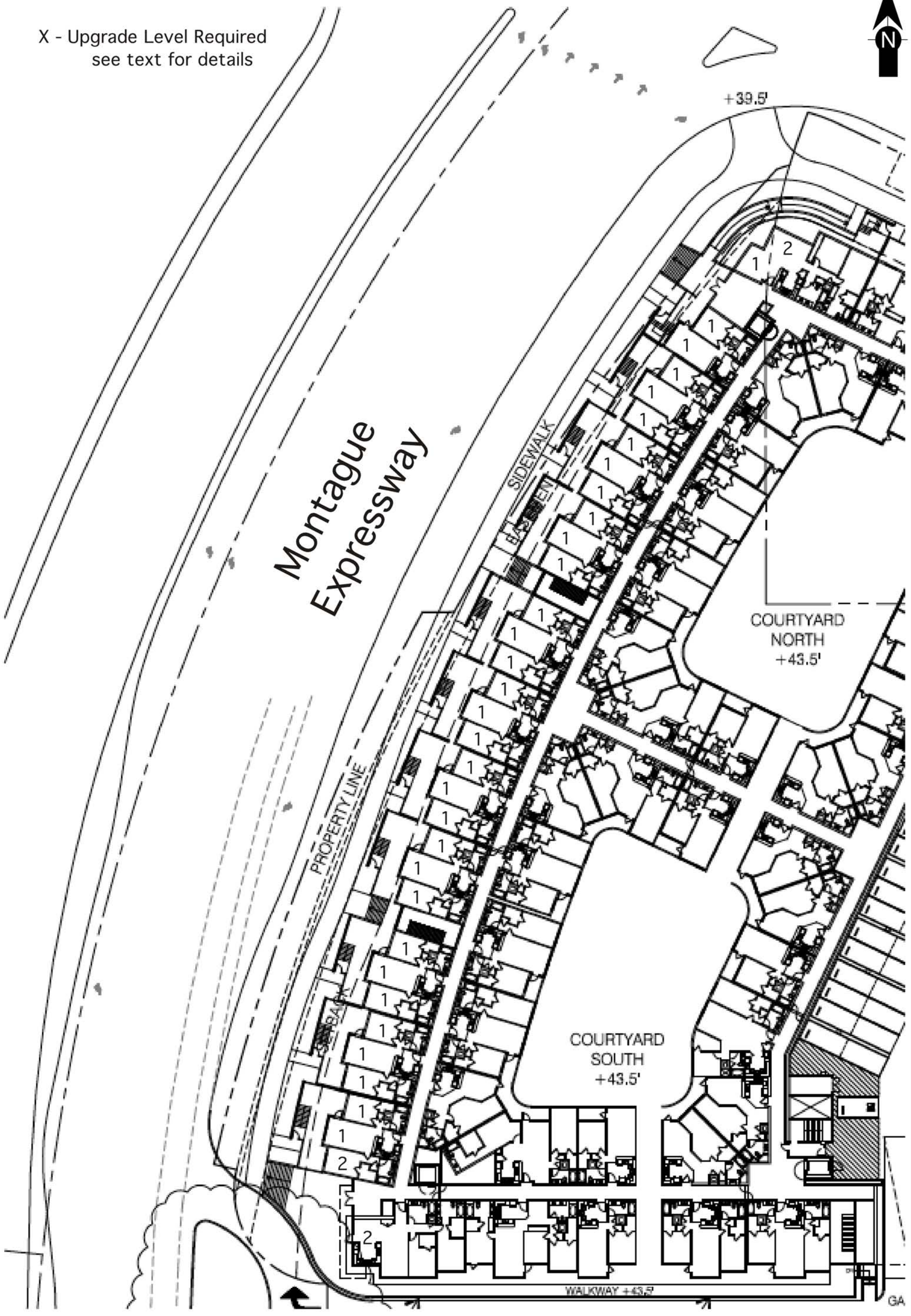

Exhibit 3A
Upgrades Required - Ground Floor

X - Upgrade Level Required
see text for details

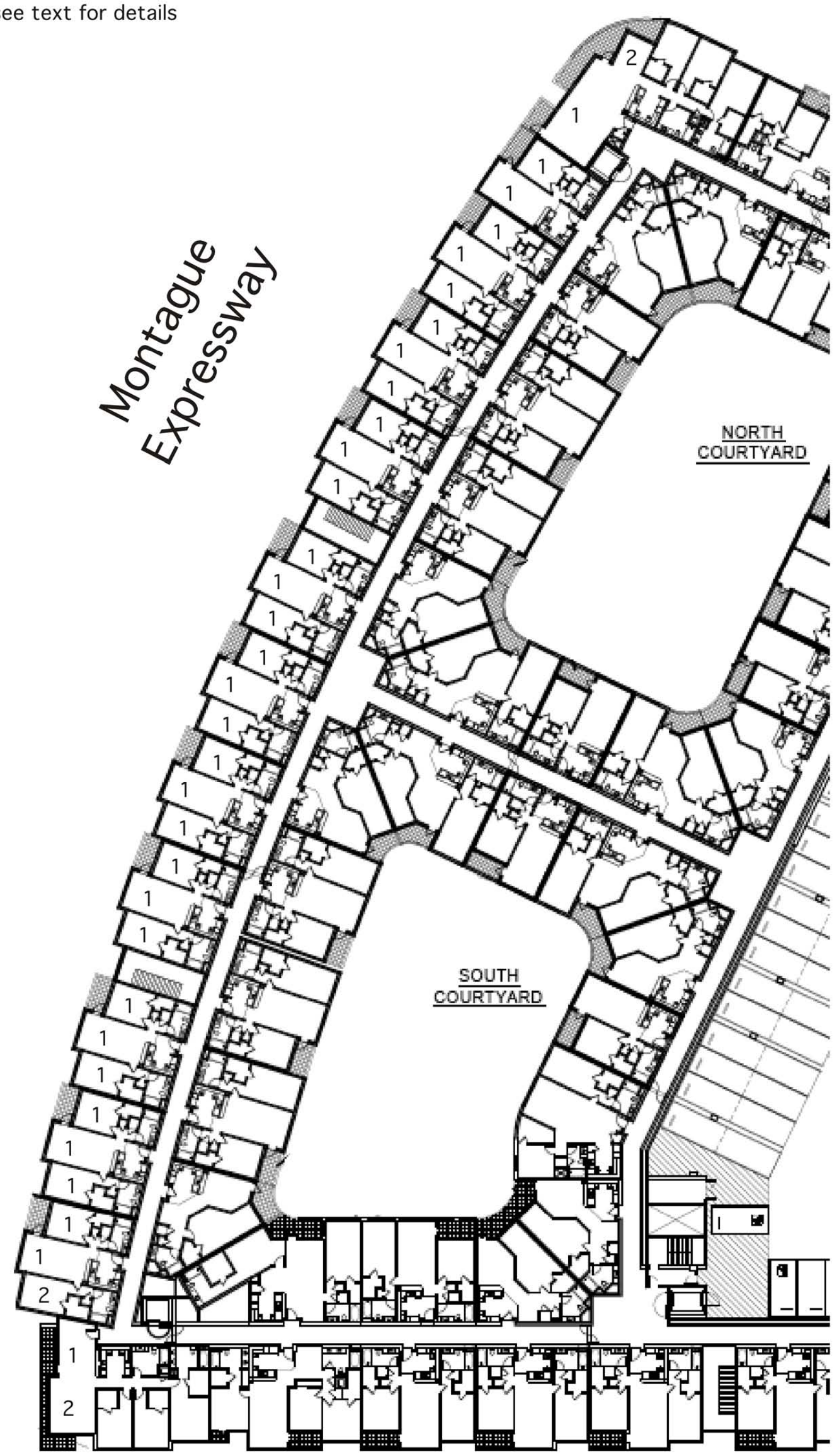

Exhibit 3B
Upgrades Required - Upper Floors

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Table 4
REQUIRED BUILDING UPGRADES

UPGRADE LEVEL SPECIFIED Required window ratings (Typical window configuration)
1 - Upgrade any operable windows to **EWNR=26 or STC=28** Upgrade any fixed windows to **EWNR=30 or STC=33** (typically 1/8" -7/16" airspace – 1/8" dual-glazed)
2 - Upgrade any operable windows to **EWNR=29 or STC=32** Upgrade any fixed windows to **EWNR=33 or STC=36** (typically 7/32" -7/16" airspace – 1/8" dual-glazed)

The window upgrades listed above represent window configurations that can typically meet the specified EWNR/STC ratings, and are given for informational purposes only. Glass thickness and airspace configuration are only a part of the overall noise reduction characteristics of a window. Other factors can include the frame construction and seal type. Therefore, noise reduction ratings for windows of a given configuration can vary from one manufacturer to another. Various window configurations may be available that meet the required noise reduction ratings. The EWNR and STC ratings specified above are the critical parameters, and should be used as the basis for selecting the windows for the project. Consult with the manufacturer to ensure compliance of the planned windows with the noise reduction rating requirements.

Table 5
DATA USED TO COMPUTE
THE EXTERIOR TO INTERIOR NOISE REDUCTION

Room Building Element		AREA (SQ. FT.)	EWNR (dB)
Top Floor, Plan C1, Bedroom #1, Corner **with Upgrade Level 2**			
Window (operable)		68.0	**29**
Wall		188.0	40
Roof/Ceiling		159.0	36
Room Absorption	0		
		Total Noise Reduction:	**26.6 dB**
Top Floor, Plan C1, Living Room, Non-corner **with Upgrade Level 1**			
Window (operable)		92.0	**26**
Glass Entry Door		24.0	26
Wall		75.0	40
Roof/Ceiling		151.3	36
Room Absorption	-4		
		Total Noise Reduction:	**26.1 dB**

continued next page ….

Table 5 (continued)
DATA USED TO COMPUTE
THE EXTERIOR TO INTERIOR NOISE REDUCTION

Room Building Element		AREA (SQ. FT.)	EWNR (dB)
Top Floor, Plan C1, Bedroom #1, Non-corner **with Upgrade Level 1**			
Window (operable)		76.0	**26**
Wall		42.0	40
Roof/Ceiling		159.3	36
Room Absorption	-3		
		Total Noise Reduction:	**25.7 dB**
Top Floor, Plan D5, Kitchen, Corner **with Upgrade Level 2**			
Window (operable)		50.0	**29**
Wall		165.0	40
Roof/Ceiling		115.0	36
Room Absorption	1		
		Total Noise Reduction:	**25.8 dB**
Top Floor, Plan D5, Dining Room, Non-corner **with Upgrade Level 1**			
Window (operable)		40.0	**26**
Glass Entry Door		24.0	26
Wall		56.0	40
Roof/Ceiling		120.0	36
Room Absorption	-2		
		Total Noise Reduction:	**24.9 dB**

The data in Table 5 indicate that after the upgrades specified in Exhibit 3A, Exhibit 3B, and Table 4, all rooms will exceed the required noise reduction. Therefore, after the upgrades specified above, all rooms are projected to meet the 45 CNEL interior noise standard.

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 all units adjacent to the Montague Expressway, and all units adjacent to E. Capitol Avenue.

APPENDIX
CALCULATION SPREADSHEETS

DATA USED TO DETERMINE EXTERIOR NOISE LEVELS

"Montague" (aka "Dedeaux"), Milpitas
Lyon Homes - Neil Buttermore (was Bill McKibbin)
PROJECT #536301-0100
FRED / MIKE; October 2012

		calculated using existing 2012 ADT from
Date	*10-24-12*	Steve Chan
Roadway Name	*Montague Expressway*	City of Miltitas
Vehicles Per Day	*74,100*	10-22-12
Speed (mph)	*45*	posted limit
Grade Adj. (dB)	0.00 dB	
Vehicle Noise Red (dB)	*0 dB*	
Roadway Grade	*0.0%*	

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	74.4	75.6
Medium Truck	65.2	66.4
Heavy Truck	65.7	66.9
Total	75.4	76.6

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

	Dist.	Soft	Hard
	40	76.7	~~77.5~~
	50	75.3	~~76.5~~
	60	74.1	~~75.7~~
	70	73.1	~~75.0~~
	80	72.2	~~74.5~~
	90	71.4	~~73.9~~
	100	70.7	~~73.5~~
	110	70.1	~~73.1~~
nearest bldg face	115	69.8	~~72.9~~
	120	69.6	~~72.7~~
	131	69.0	~~72.3~~
	300	63.6	~~68.7~~
	350	62.6	~~68.0~~
	1000	55.7	~~63.5~~

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

CNEL	Soft	Hard
57	825	~~4,451~~
58	707	~~3,535~~
59	607	~~2,808~~
60	**520**	~~**2,231**~~
61	446	~~1,772~~
62	383	~~1,407~~
63	328	~~1,118~~
64	282	~~888~~
65	**242**	~~**705**~~
66	207	~~560~~
67	178	~~445~~
68	152	~~354~~
69	131	~~281~~
70	**112**	~~**223**~~

"Montague" (aka "Dedeaux"), Milpitas
Lyon Homes - Neil Buttermore (was Bill McKibbin)
PROJECT #536301-0100
FRED / MIKE; October 2012

		calculated using existing 2012 ADT from
Date	*10-24-12*	Steve Chan
Roadway Name	*E. Capitol Ave.*	City of Miltitas
Vehicles Per Day	*13,500*	10-22-12
Speed (mph)	*35*	posted limit
Grade Adj. (dB)	0.00 dB	
Vehicle Noise Red (dB)	*0 dB*	
Roadway Grade	*0.0%*	

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	63.8	65.0
Medium Truck	56.1	57.3
Heavy Truck	57.3	58.5
Total	65.3	66.5

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

	Dist.	Soft	Hard
	40	66.6	~~67.4~~
	50	65.2	~~66.4~~
	60	64.0	~~65.6~~
	70	63.0	~~64.9~~
	80	62.1	~~64.4~~
	90	61.3	~~63.8~~
	100	60.6	~~63.4~~
	110	60.0	~~63.0~~
typical bldg face	130	58.9	~~62.2~~
	140	58.5	~~61.9~~
	205	56.0	~~60.3~~
	300	53.5	~~58.6~~
	350	52.5	~~57.9~~
	1000	45.6	~~53.4~~

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

CNEL	Soft	Hard
57	175	~~435~~
58	150	~~346~~
59	129	~~275~~
60	**110**	**~~218~~**
61	95	~~173~~
62	81	~~138~~
63	70	~~109~~
64	60	~~87~~
65	**51**	**~~69~~**
66	44	~~55~~
67	38	~~44~~
68	32	~~35~~
69	28	~~27~~
70	**24**	**~~22~~**