



January 18, 2005

Ms. Carole Wedl  
Environmental Compliance Officer  
Oakland International Airport  
#1 Airport Drive Box 45  
Oakland, CA 94621

RE: Noise level reduction achieved by homes in the area of the Oakland International Airport  
Residential Sound Insulation Program in Alameda, CA

Dear Ms. Wedl:

As you requested, Brown-Buntin Associates, Inc. (BBA) has compiled a listing of the Aircraft Noise Level Reduction (NLR)<sup>1</sup> values measured at representative homes in the area of Alameda, California that is the subject of the Aircraft Sound Insulation Program (OASI) for Oakland International Airport (OIA).

The acoustical testing program for the OASI has been performed to satisfy the requirements of the Federal Aviation Administration (FAA), which mandate acoustical testing of at least 10 percent of the homes in an FAA-funded residential sound insulation program. The purpose of the testing is to demonstrate that the acoustical treatments have provided a noticeable benefit to the residents.

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<sup>1</sup> For an explanation of the acoustical terms used in this report, refer to Appendix A.

According to the aircraft noise exposure map contained in the 1991 Federal Aviation Regulation (FAR) Part 150 study for Oakland International Airport, the OASI project area lies within the 65-70 dB Community Noise Equivalent Level (CNEL) contours. For the purposes of the OASI, the exterior aircraft noise exposure throughout the project area has been assumed to be 68 dB CNEL, which was the worst-case predicted noise exposure. However, the size of the 65 dB CNEL contour has decreased in recent years so that, in the past year, no more than 23 homes have been included inside the 65 dB CNEL contour.

The California Airport Noise Regulation states that residences will be compatible with the aircraft noise environment if the interior noise level is 45 dB CNEL or less. Assuming an exterior aircraft noise level of 68 dB CNEL, homes in the project area must provide an NLR of 23 dB. That is, the aircraft noise level inside affected rooms of the homes must be at least 23 dB lower than the aircraft noise level outside the homes (68 dB - 23 dB = 45 dB).

The aircraft NLR performance provided by the homes was assessed by simultaneously measuring the noise produced inside and outside each home during aircraft departures. Aircraft departure noise exposure was used exclusively since the primary air traffic flow direction at Oakland International Airport is to the west, and departures tend to produce the highest noise levels in Alameda.

The acoustical audit program and procedures were designed and implemented to be consistent with the methods described by the FAA's *Guidelines for the Sound Insulation of Residences Exposed to Aircraft Operations* and with the American Society of Testing and Materials (ASTM) *Standard Guide for Field Measurement of Airborne Sound Insulation of Building Facades and Facade Elements*. Noise measurements were performed using ANSI Type 1 precision integrating sound level meters, which were calibrated in the field before use.

The metrics selected for the sound level measurements were the Sound Exposure Level (SEL) and the maximum A-weighted sound pressure level (Lmax) resulting from individual aircraft departure events. The SEL is a measure of the total sound energy resulting from an aircraft event, normalized to a duration of one second. The Lmax is the highest instantaneous noise level measured during an aircraft overflight.

The SEL accounts for the total intensity and duration of each noise event, and is the acoustical “building block” used to calculate cumulative noise exposure during a 24-hour day using the CNEL metric. Since the CNEL is derived from the sum of SEL values in a given day, the NLR calculated from SEL values is the same as the NLR in terms of CNEL. Therefore the SEL values measured inside and outside the homes were used to calculate the NLR values of the homes in the project area. The NLR for a given room may be subtracted directly from the assumed exterior aircraft noise exposure to determine the interior aircraft noise exposure in terms of CNEL.

The noise level measurements were accomplished by placing one sound level meter outside the test home in an open area and a sound level meter inside each of up to three noise-sensitive rooms of the test home. The rooms tested included living/family rooms, kitchens, and bedrooms. The exterior and interior noise measurements were correlated using proprietary software to determine NLR values for individual aircraft noise events. Typically, no fewer than twelve aircraft noise events were recorded at each test home to provide a statistically valid measurement sample.

All recorded aircraft noise event data were tested for statistical validity using a standard "confidence interval" analysis, which predicts the likelihood that another set of aircraft noise event samples collected under similar conditions would yield the same mean value. For example, achieving a 90 percent confidence interval of +/-1.5 dB for the average measured NLR is interpreted as a 90 percent likelihood that the average NLR of the sample is within +/-1.5 dB of the average NLR that would be measured for all possible aircraft departure events.

#### **Acoustical Performance of Untreated Homes:**

The OASI began in 1997 with a pilot program involving four homes. Testing for the overall OASI program, which will consist of six phases, began in the year 2000. Appendix B reports the average measured NLR values for each of the 220 rooms in 74 homes tested in the pilot program and OASI Phases 1 through 5, before any acoustical treatment had been applied to the homes.

The average measured NLR in the tested rooms in the pilot program and OASI Phases 1 through 5 was 25.8 dBA, in terms of SEL. The average measured NLR in terms of the Lmax was 26.0 dBA. The range of measured NLR values in terms of SEL was from 15 dBA to 36 dBA. The data indicate that, in about 84 percent of the rooms tested, the measured NLR values for SEL

were 23 dBA or greater; the most frequently occurring NLR value was 25 dBA. The average NLR values for SEL for each of the homes (averaging all tested rooms for a given house) ranged from 19.3 dBA to 33.1 dBA, with an average value of 25.7 dBA. Figure 1 presents the measured NLR values for SEL measurements, showing the distribution of the values for the tested rooms.

In addition, in 1993, BBA performed an acoustical survey of the existing aircraft NLR performance of 28 homes in the neighborhoods that later became the OASI project area. For this survey, 75 rooms were tested. The average NLR for the tested rooms in terms of SEL was 26.8 dBA. About 82 percent of the 75 rooms provided an NLR of 23 dBA or greater.

As noted above, the design assumption for the OASI has been that the aircraft noise level outside the homes is 68 dB CNEL or less. The highest required NLR value to achieve the 45 dB CNEL interior aircraft noise standard is 23 dBA. The acoustical testing that has been performed for the OASI has shown that over 80 percent of the rooms tested provided NLR values of 23 dBA or greater, before acoustical treatment was provided. Therefore, assuming a worst-case noise exposure, over 80 percent of the homes in the OASI project area would be expected to provide an acceptable interior aircraft noise level without acoustical treatment.

### **Homes Not Participating in the OASI:**

The owners of sixty-nine homes in the project area have failed to respond to invitations to participate in the OASI. The owners of an additional twenty homes have responded and chosen not to participate. The non-participating homes are listed in Appendix C, along with the NLR values measured at homes located nearby. In Appendix C, numbers 1-69 are assigned to non-responsive addresses; numbers 492-511 apply to addresses that have declined to participate.

The data in Appendix C may be used to prepare a reasonable estimate of the NLR values that could be expected for the non-participating homes. For example, since the homes in a given homeowners association were built within the same time frame by the same builder, using the same floor plans and construction methods, it may be assumed that the NLR values of non-participating homes would be in the same range as those measured in neighboring homes with similar orientations to the Airport. (Exceptions could occur where a homeowner failed to properly maintain windows and doors to prevent significant leakage of air, water and, consequently, noise.)

In two cases, for homes on Via Alamosa (home number 2), on Admiralty Lane (homes 35, 36, 37 and 498), and on Leeward Lane (home number 497), no NLR measurement data are available for the homes on the same street as the non-participating homes, but similar units are located on an adjacent street.

In three instances (homes 13, 15 and 28), the homes were actually tested prior to treatment, but the homeowners later withdrew from that phase of the project, and failed to respond to later invitations.

Appendix C also shows whether double-pane windows have been installed by the homeowners in the non-participating homes. The presence of double-pane windows indicates that the homeowners have upgraded the windows of those homes from the original single-pane units, and that the NLR performance of those homes is expected to be better than that of other similar units.

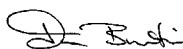
Assuming the exterior aircraft noise levels used for the project design, Appendix C lists the NLR value required to achieve the 45 dB CNEL interior noise level criterion. A comparison of the required NLR values to the measured NLR values for nearby homes shows that the interior noise level criterion would clearly be satisfied prior to treatment in all but one set of homes.

The exception to the above conclusion is the set of two homes on Tonga Lane (homes 62 and 63), where the measured NLR of one adjacent home was 22.8 dB, compared to the required NLR of 23 dB. The difference of 0.2 dB is insignificant, and is well within the presumed limits of the accuracy of the noise measurement program of +/-1.5 dB. The measured NLR at the other adjacent home was 24.6 dB. The average NLR value for the two adjacent homes was 23.7 dB, which exceeds the required value of 23 dB at that location.

Based upon the data presented by this report, the construction of the non-participating homes listed in Appendix C would be expected to provide sufficient aircraft noise level reduction to achieve the interior aircraft noise level criterion of 45 dB CNEL, without acoustical treatment.

Respectfully submitted,

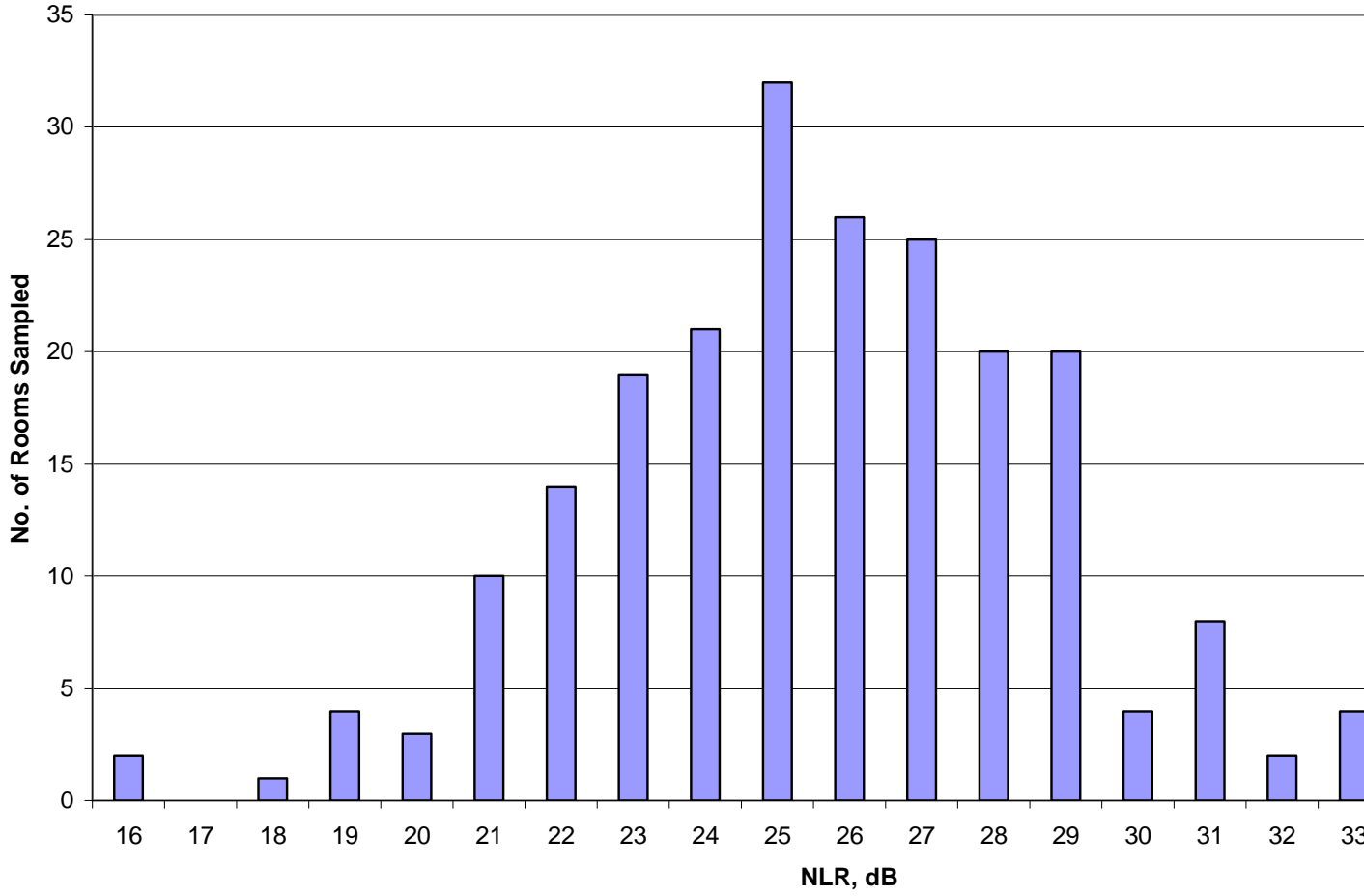
Brown-Buntin Associates, Inc.



Jim Buntin

Vice President

**Figure 1**  
**Oakland International Airport Residential Sound Insulation Program**  
**Range of Average Measured NLR Values Before Treatment: SEL**



## **APPENDIX A**

### **ACOUSTICAL TERMINOLOGY**

<b>CNEL:</b>	Community Noise Equivalent Level. The average equivalent sound level during a 24-hour day, obtained after addition of 4.8 decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m., and the addition of ten decibels to sound levels in the night before 7:00 a.m. and after 10:00 p.m.
<b>DECIBEL, dB:</b>	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.
<b>Lmax:</b>	The maximum sound level recorded during a noise event.
<b>NOISE CONTOURS:</b>	Lines drawn about a noise source indicating constant levels of noise exposure. CNEL contours are frequently utilized to describe community exposure to noise.
<b>NOISE LEVEL REDUCTION (NLR):</b>	The noise reduction between indoor and outdoor environments or between two rooms that is the numerical difference, in decibels, of the 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 the acoustic absorption present in the receiving room.
<b>SEL or SENEL:</b>	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.
<b>SOUND LEVEL:</b>	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. The term “sound level” may be used interchangeably with “noise level”.

**Appendix B**  
**Oakland International Airport Residential Sound Insulation Program**  
**Average Aircraft Noise Level Reduction (NLR) Values, dBA**

Phase	Test Dates	Address		Rooms Tested	Before Treatment			
		Number	Street		Avg. NLR, dBA		90% c.i.*	
					SEL	Lmax	SEL	Lmax
Pilot	7/29/1997	364	Oleander	Living Room	27.1	27.3	0.7	1.5
				Dining	23.7	21.7	0.7	1.8
				Master	27.3	29.0	0.4	0.6
				Bedroom 2	22.3	24.0	0.5	0.6
	7/29/1997	3179	Phoenix Lane	Living Room	33.4	34.9	0.6	0.7
				Family Room	24.9	23.5	1.0	1.5
				Master	28.9	30.1	0.9	0.8
				Bedroom 2	23.2	23.3	0.9	1.0
	7/30/1997	3421	Catalina	Living Room	26.9	27.8	0.6	0.7
				Master -1	28.2	29.2	0.6	0.6
				Master -2	28.7	29.1	0.5	0.4
	7/30/1997	3022	Linda Vista	Living Room	33.4	32.8	0.5	1.2
				Master	36.1	37.9	0.5	0.5
				Bedroom 3	25.1	25.2	0.1	0.5
				Bedroom 4	24.3	24.3	0.2	0.5
	1	5/10/2000	3100	El Paseo	Bedroom 1	26.7	26.9	0.4
Bedroom 2					28.5	28.5	0.4	1.0
Living Room					24.9	24.8	0.4	0.4
5/11/2000		3156	Fiji Lane	Bedroom 1	25.5	26.1	0.4	0.5
				Living Room	27.1	28.1	0.5	1.0
5/10/2000		3012	Linda Vista	Family Room	23.0	23.7	0.4	0.7
				Bedroom 2	26.1	27.0	0.3	0.9
				Bedroom 3	23.4	23.4	0.3	0.6
5/9/2000		3031	Linda Vista	Bedroom 2	26.3	27.0	0.4	0.7
				Bedroom 3	26.3	26.3	0.4	0.7
				Living Room	28.3	29.0	0.3	0.6
5/11/2000		3423	Catalina	Living Room	28.5	29.2	0.3	0.4
				Bedroom 1	27.4	28.2	0.2	0.4
				Bedroom 2	24.1	24.2	0.3	0.4
5/10/2000		1144	Fontana	Bedroom 3	27.6	26.4	0.4	0.7
				Bedroom 4	28.1	28.5	0.3	0.6
	Living Room			23.5	22.6	0.5	1.0	
5/11/2000	3128	El Sereno	Bedroom 3	27.6	29.0	0.2	0.7	
			Bedroom 4	25.6	26.3	0.3	0.5	
			Living Room	27.5	28.7	0.2	0.8	

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		Number	Street		Avg. NLR, dBA		90% c.i.*	
					SEL	Lmax	SEL	Lmax
2	5/10/2000	1000	Magnolia	Bedroom 2	35.4	34.9	1.3	1.4
				Master	35.2	33.3	1.1	1.1
				Living Room	28.6	28.4	0.6	0.9
	10/18/2001	3204	Fir	Living Room	29.6	30.9	1.4	1.5
				Master	26.1	26.8	2.1	3.3
				Bedroom 2	26.6	27.6	1.1	1.7
	10/18/2001	3029	Linda Vista	Living Room	29.3	30.4	0.4	0.6
				Bedroom 1	27.1	28.0	0.5	0.6
				Bedroom 2	35.9	37.6	0.4	0.7
	10/16/2001	1171	Camino Del Valle	Bedroom 2	29.1	28.8	0.3	0.4
				Bedroom 3	28.5	27.9	0.2	0.4
				Living Room	28.9	31.4	0.4	0.5
	10/16/2001	1164	Bismarck	Bedroom 2	22.3	22.3	0.2	0.5
				Living Room	25.2	26.3	0.4	0.6
				Kitchen	24.9	25.4	1.2	1.1
	10/18/2001	368	Oleander	Bedroom 2	26.6	26.8	0.4	0.6
				Bedroom 3	23.5	24.1	0.8	1.0
				Family Room	23.0	24.5	0.7	0.8
	11/14/2001	3220	Phoenix Lane	Living Room	26.6	26.8	0.2	0.3
				Bedroom 1 So.	26.7	27.3	0.3	0.5
				Bedroom 1 No.	26.7	27.3	0.3	0.5
	11/14/2001	3162	Fiji Lane	Living Room	32.7	34.0	0.6	0.5
				Bedroom 2	23.3	23.3	0.2	0.2
				Bedroom 3	25.0	24.1	0.2	0.3
	11/14/2001	400	Fairway Place	Living Room	30.9	31.3	0.7	0.5
				Bedroom 1	25.7	26.4	1.3	1.5
Bedroom 3				24.3	24.8	0.9	0.9	
11/27/2001	3101	El Paseo	Living Room	31.2	25.0	0.6	0.6	
			Bedroom 1	24.6	18.4	1.7	1.8	
			Bedroom 3	33.3	27.1	0.9	1.0	
10/16/2001	3110	El Paseo	Living Room	31.8	31.9	0.4	0.9	
			Bedroom 1	26.4	25.9	0.4	0.8	
			Bedroom 3	34.8	35.7	0.5	0.7	
10/16/2001	3027	Linda Vista	Family Room	22.5	24.7	2.2	2.3	
			Hallway	26.2	26.0	1.8	1.9	
			Master	25.0	25.4	1.1	1.3	

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Phase	Test Dates	Address		Rooms Tested	Before Treatment			
		Number	Street		Avg. NLR, dBA		90% c.i.*	
					SEL	Lmax	SEL	Lmax
	10/17/2001	1119	Fontana	Living Room	28.3	28.9	0.5	0.7
				Bedroom 2	29.7	29.3	0.6	1.3
				Bedroom 3	29.4	30.6	0.7	1.0
	10/16/2001	3407	Catalina	Living Room	28.3	29.0	0.2	0.3
				Master	26.4	27.6	0.2	0.5
	10/18/2001	3155	Santa Cruz Lane	Living Room	21.5	21.2	0.3	0.4
				Bedroom 1	22.4	23.0	0.3	0.5
				Bedroom 2	18.9	18.4	0.2	0.5
	10/18/2001	3181	Phoenix Lane	Living Room	24.4	25.0	0.5	0.7
				Bedroom 1	24.4	25.0	0.5	0.7
				Bedroom 3	24.4	25.5	3.7	4.2
	3	8/14/2003	3405	Catalina	Living Room	25.9	26.0	0.4
Bedroom 1					26.5	26.4	0.4	0.6
Bedroom 2					27.9	27.2	0.2	0.5
8/12/2003		1144	Verdemar	Living Room	25.2	24.7	0.3	0.7
				Bedroom 2	28.8	28.0	0.2	0.5
				Bedroom 3	28.7	28.5	0.4	1.0
8/21/2003		920	Magnolia	Living Room	24.6	24.9	1.1	1.5
				Bedroom 3	31.1	31.1	2.2	2.8
				Master	29.7	30.0	1.8	2.3
8/13/2003		1155	Holly	Living Room	23.6	23.9	0.6	0.6
				Bedroom 1	25.4	24.7	0.9	0.9
				Bedroom 2	24.9	25.1	0.8	0.6
8/21/2003		3212	Phoenix Lane	Living Room	28.5	29.4	0.4	0.6
				Bedroom 2	21.0	21.4	0.3	0.4
8/13/2003		3168	Fiji Lane	Living Room	24.2	24.3	0.4	0.8
				Bedroom 2	20.9	20.7	0.5	0.6
				Bedroom 3	26.3	25.6	0.7	1.3
8/14/2003		3352	Solomon	Living Room	21.2	20.7	1.0	1.5
				Bedroom 1	21.3	22.0	0.4	0.8
				Bedroom 2	30.6	32.3	0.9	1.3
8/14/2003		3020	Flora Vista	Living Room	24.6	24.1	0.7	0.7
				Bedroom 2	26.5	26.6	0.4	0.5
				Bedroom 3	27.4	27.9	0.5	0.4

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		Number	Street		Avg. NLR, dBA		90% c.i.*	
					SEL	Lmax	SEL	Lmax
	8/15/2003	1112	Marianas	Living Room	28.5	29.7	1.7	1.7
				Bedroom 1	26.4	26.6	1.4	1.4
				Bedroom 2	30.8	30.8	1.5	1.6
	8/15/2003	3364	Tonga Lane	Living Room	28.5	28.8	0.3	0.5
				Bedroom 1 R	24.7	25.3	0.4	0.5
				Bedroom 1 L	25.8	26.4	0.4	0.6
	8/20/2003	1174	Island	Living Room	25.4	26.4	0.6	0.9
				Bedroom 1	23.1	23.2	0.5	0.8
	8/19/2003	1130	Marianas	Living Room	27.8	29.7	2.2	2.7
				Bedroom 1	28.6	29.8	2.3	2.4
				Bedroom 2	31.1	32.1	2.1	2.5
	8/20/2003	3233	Santa Cruz Lane	Living Room	21.8	20.7	0.4	0.5
				Bedroom 2	15.6	15.3	0.8	0.8
				Bedroom 3	20.4	20.0	0.4	0.6
	8/20/2003	3307	Willis Lane	Living Room	25.6	26.9	0.4	0.5
				Bedroom 1 R	26.5	27.6	0.5	1.0
				Bedroom 1 L	27.0	28.2	0.4	0.8
	8/21/2003	3202	Fiji Lane	Living Room	26.4	26.1	2.2	2.6
Master				26.3	26.4	1.0	1.0	
	4/27/2004	3203	Fiji Lane	Living Room	23.4	23.1	0.5	0.6
				Master	20.9	21.1	0.3	0.3
				Bedroom 2	24.7	24.8	0.5	0.6
	4/28/2004	3214	Fiji Lane	Living Room	27.6	27.9	0.3	0.5
				Bedroom 1a	23.4	23.3	0.2	0.4
				Bedroom 1b	23.1	23.5	0.2	0.4
	4/28/2004	3220	Fir Avenue	Family Room	22.6	22.4	0.3	0.7
				Bedroom 2	21.3	21.2	0.4	0.4
				Bedroom 3	25.9	25.8	0.3	0.6
	4/27/2004	3318	Cook Lane	Living Room	24.2	24.3	0.5	0.9
				Bedroom 1	24.5	24.9	0.2	0.4
				Bedroom 2	22.1	21.7	0.3	0.7
	4/28/2004	3411	Catalina	Living Room	26.8	27.9	0.2	0.5
				So. Bedroom A	25.6	26.2	0.2	0.4
				So. Bedroom B	28.1	29.0	0.2	0.4

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Phase	Test Dates	Address		Rooms Tested	Before Treatment			
		Number	Street		Avg. NLR, dBA		90% c.i.*	
					SEL	Lmax	SEL	Lmax
4	4/27/2004	3229	Santa Cruz Lane	Kitchen	22.4	21.8	0.1	0.4
				Bedroom 2	20.9	21.3	0.3	0.8
				Bedroom 3	25.3	25.3	0.4	0.7
	4/26/2004	3328	Cook Lane	Kitchen	25.4	26.2	1.2	1.0
				Bedroom 2	26.6	26.5	0.3	0.6
				Bedroom 3	28.5	28.1	0.4	0.6
	4/26/2004	3122	La Campania	Living Room	27.8	28.1	0.3	0.8
				Bedroom 3	30.1	30.8	0.2	0.7
				Bedroom 4	29.1	29.9	0.2	0.7
	4/26/2004	1112	Verdemar	Family Room	24.6	23.9	0.3	0.4
				Bedroom 2	28.1	27.4	0.2	0.3
				Bedroom 3	29.3	29.0	0.3	0.4
	4/29/2004	3356	Tonga Lane	Living Room	21.8	21.3	0.2	0.5
				Bedroom 1 Rt	21.7	21.5	0.4	0.6
				Bedroom 1 Lt	24.9	25.4	0.3	0.6
	4/28/2004	3600	Oleander	Family Room	27.3	27.9	0.4	0.8
				Master	26.8	26.5	0.4	0.6
				Living Room	24.9	25.2	0.5	0.8
	4/27/2004	3028	Flora Vista	Living Room	22.7	23.0	0.5	0.6
				Bedroom 1	18.2	22.4	0.8	1.1
Bedroom 2				26.3	26.3	0.4	0.7	
5/17/2004	3210	Fiji Lane	Living Room	25.8	25.9	0.2	0.3	
			MBR left	20.4	20.5	0.1	0.3	
			MBR right	20.4	20.1	0.2	0.4	
5/17/2004	3155	Fiji Lane	Master	27.2	28.0	0.3	0.5	
			Bedroom 2	27.6	27.8	0.3	0.8	
			Living Room	28.0	28.9	0.3	0.7	
5/17/2004	3224	Phoenix Lane	Living Room	26.3	25.5	0.3	0.7	
			Master	22.9	23.4	0.3	0.7	
			Bedroom 2	31.4	33.0	0.3	0.8	
11/17/2004	3346	Fir Avenue	Living Room	27.3	28.0	0.3	0.3	
			Master	22.2	22.3	0.3	0.5	
			Hallway	26.1	26.5	0.3	0.6	
11/17/2004	3340	Fir Avenue	Living Room	28.4	29.2	0.4	0.6	
			Bedroom 3	21.2	21.7	0.3	0.6	
			Master	27.8	28.8	0.4	0.5	
11/19/2004	3305	Willis Lane	Kitchen	24.3	24.6	0.4	0.6	
			Master	24.1	24.4	0.4	0.5	

**Appendix B**  
**Oakland International Airport Residential Sound Insulation Program**  
**Average Aircraft Noise Level Reduction (NLR) Values, dBA**

Phase	Test Dates	Address		Rooms Tested	Before Treatment			
		Number	Street		Avg. NLR, dBA		90% c.i.*	
					SEL	Lmax	SEL	Lmax
5				Bedroom 2	31.6	32.9	2.1	1.7
	11/16/2004	3162	Fir Avenue	Living Room	26.1	26.5	0.5	0.6
				Bedroom 1	25.0	25.1	0.5	0.7
				Bedroom 2	23.4	24.2	1.1	1.6
	11/18/2004	3161	Santa Cruz Lane	Family Room	25.4	25.5	0.4	0.5
				Bedroom 2	25.9	26.4	0.3	0.6
				Bedroom 3	26.8	26.4	0.4	0.6
	11/18/2004	3154	Phoenix Lane	Living Room	24.7	25.4	0.3	0.5
				Bedroom 1A	24.6	25.7	0.3	0.5
				Bedroom 1B	24.0	25.2	0.2	0.4
	11/18/2004	1133	Island	Living Room	21.7	22.1	1.0	1.2
				Bedroom 1	31.0	31.5	0.4	0.6
				Bedroom 3	28.4	28.4	0.3	0.6
	11/17/2004	1163	Verdemar	Living Room	24.7	23.4	0.6	0.5
				Master	26.9	25.4	0.4	0.8
				Bedroom 3	24.9	24.0	0.7	0.8
	11/16/2004	3338	Fir Avenue	Living Room	22.5	22.4	0.4	1.0
				Bedroom 2	16.1	15.9	0.8	1.4
				Bedroom 3	21.9	22.0	0.4	0.7
	11/16/2004	800	Fitchburg	Family Room	23.7	24.1	0.5	1.2
				Bedroom 2	24.6	25.4	0.9	1.6
				Bedroom 3	26.2	26.6	1.0	1.6
	11/16/2004	1131	Island	Living Room	24.3	23.7	0.7	0.5
				Bedroom 1	28.1	28.0	0.5	1.3
				Bedroom 2	29.0	29.1	0.7	1.3
	11/17/2004	1144	Marianas	Living Room	25.1	24.0	0.6	1.1
				Master	18.6	17.3	0.7	1.0
				Bedroom 3	25.2	25.7	0.2	0.5
	11/17/2004	3105	El Paseo	Family Room	22.9	23.2	0.2	0.4
				Master Left	22.6	23.2	0.3	0.5
Master Right				22.2	22.8	0.3	0.5	
11/19/2004	1129	Island	Living Room	24.5	24.1	0.6	0.7	
			Master	23.8	24.2	0.4	0.8	
			Bedroom 2	21.8	21.3	0.8	1.0	

**Appendix B**  
**Oakland International Airport Residential Sound Insulation Program**  
**Average Aircraft Noise Level Reduction (NLR) Values, dBA**

Phase	Test Dates	Address		Rooms Tested	Before Treatment			
		Number	Street		Avg. NLR, dBA		90% c.i.*	
					SEL	Lmax	SEL	Lmax
	11/18/2004	3160	Fir Avenue	Living Room	23.4	22.9	0.8	0.9
				Master	19.4	19.5	0.8	0.8
				Bedroom 2	21.1	22.2	1.3	1.4
	11/19/2004	3351	Solomon	Living Room	23.5	24.2	0.4	0.8
				Master Bdrm	23.7	24.6	0.4	0.5
				Bedroom 2	18.6	19.2	0.4	0.7
	11/19/2004	3347	Solomon	Living Room	21.4	22.8	0.4	0.8
				Bedroom 1	24.1	23.7	0.3	0.8
				Bedroom 3	22.8	23.2	0.4	0.7
* c.i. = confidence interval				Average:	25.8	26.0		
				Minimum:	15.6	15.3		
				Maximum:	36.1	37.9		
				Count:	220	220		

**Appendix C**  
**Average Tested NLR Values Before Treatment For Homes Near Non-Participating Eligible Homes**  
**Oakland International Airport**

NON-PARTICIPATING HOMES								TESTED HOMES	
NUMBER	H.O. ASSOCIATION	ADDRESS	STREET	STATUS	DOUBLE PANE WINDOWS INSTALLED?	EST. CNEL, dB, 1992	REQUIRED NLR, dB	ADDRESS ON STREET	AVG. NLR, dB
1	CASITAS	3001	FLORA VISTA	NR <sup>1</sup>	YES <sup>2</sup>	64	19	3020	26.2
495	CASITAS	3021	FLORA VISTA	D		64	19	3024	30.0
								3028	22.4
								3043	23.7
2	CASITAS	1125	VIA ALAMOSA	NR	YES	65	20	1119 <sup>3</sup>	29.1
494	CASITAS	1119	VIA ALAMOSA	D		65	20	1144 <sup>3</sup>	26.4
3	CASITAS	3016	LINDA VISTA	NR		67	22	3012	24.2
4	CASITAS	3020	LINDA VISTA	NR		67	22	3022	29.7
5	CASITAS	3032	LINDA VISTA	NR		67	22	3025	25.2
6	CASITAS	3034	LINDA VISTA	NR		67	22	3027	24.6
								3029	30.8
								3031	27.0
								3036	27.9
7	CASITAS	1136	VERDEMAR DRIVE	NR	YES	65	20	1112	27.3
496	CASITAS	1159	VERDEMAR DRIVE	D	YES	68	23	1144	27.6
								1163	25.5
8	CASITAS	3116	LA CAMPANIA	NR		64	19	3122	29.0
9	CASITAS	1145	CAMINO DEL VALLE	NR	YES	65	20	1171	28.8
10	CASITAS	1149	CAMINO DEL VALLE	NR		65	20		
493	CASITAS	1165	CAMINO DEL VALLE	D		67	22		
492	CASITAS	1167	CAMINO DEL VALLE	D		67	22		
11	ISLANDIA	1124	MARIANAS LN.	NR		64	19	1112	28.6
12	ISLANDIA	1138	MARIANAS LN.	NR		66	21	1130	29.2
13	ISLANDIA	1140 <sup>4</sup>	MARIANAS LN.	NR		66	21	1140	29.4
14	ISLANDIA	1146	MARIANAS LN.	NR		66	21	1144	23.0
15	ISLANDIA	1148 <sup>4</sup>	MARIANAS LN.	NR		66	21	1148	26.8
16	ISLANDIA	1156	MARIANAS LN.	NR		67	22	1034	25.9
17	ISLANDIA	1160	MARIANAS LN.	NR	YES	67	22		
502	ISLANDIA	1168	MARIANAS LN.	D		68	23		

**Appendix C**  
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**Oakland International Airport**

NON-PARTICIPATING HOMES								TESTED HOMES	
NUMBER	H.O. ASSOCIATION	ADDRESS	STREET	STATUS	DOUBLE PANE WINDOWS INSTALLED?	EST. CNEL, dB, 1992	REQUIRED NLR, dB	ADDRESS ON STREET	AVG. NLR, dB
18	ISLANDIA	3168	FIR AVE.	NR	YES	64	19	3160	21.3
507	ISLANDIA	3150	FIR AVE.	D		64	19	3162	24.8
511	ISLANDIA	3324	FIR AVE.	D		64	19		
506	ISLANDIA	3151	SANTA CRUZ LN.	D		64	19	3155	20.9
19	ISLANDIA	3157	SANTA CRUZ LN.	NR		64	19	3161	26.0
509	ISLANDIA	3159	SANTA CRUZ LN.	D		64	19	3229	22.9
20	ISLANDIA	3167	SANTA CRUZ LN.	NR		64	19	3233	19.3
21	ISLANDIA	3169	SANTA CRUZ LN.	NR		64	19		
22	ISLANDIA	3173	PHOENIX LN.	NR		65	20	3150	23.8
								3154	24.4
								3179	27.6
								3181	24.4
23	ISLANDIA	3213	PHOENIX LN.	NR		65	20	3212	24.8
24	ISLANDIA	3210	PHOENIX LN.	NR		66	21	3220	26.7
25	ISLANDIA	3216	PHOENIX LN.	NR		66	21	3224	26.9
26	ISLANDIA	3150	FIJI LN.	NR		68	23	3155	27.6
505	ISLANDIA	3151	FIJI LN.	D		68	23	3156	26.3
27	ISLANDIA	3154	FIJI LN.	NR		68	23	3161	28.0
28	ISLANDIA	3161 <sup>4</sup>	FIJI LN.	NR		67	22	3162	27.0
29	ISLANDIA	3163	FIJI LN.	NR		67	22	3168	23.8
503	ISLANDIA	3166	FIJI LN.	D		68	23	3170	25.9
30	ISLANDIA	3170	FIJI LN.	NR		68	23	3202	26.3
31	ISLANDIA	3172	FIJI LN.	NR		68	23	3203	23.0
32	ISLANDIA	3204	FIJI LN.	NR		68	23	3210	23.1
33	ISLANDIA	3205	FIJI LN.	NR		67	22	3214	24.7
504	ISLANDIA	3206	FIJI LN.	D		67	22		
34	ISLANDIA	3207	FIJI LN.	NR		67	22		
510	ISLANDIA	3218	FIJI LN.	D		67	22		
35	ISLANDIA	1124	ADMIRALTY LN.	NR		65	20	NONE <sup>5</sup>	(see Island Drive below)
36	ISLANDIA	1130	ADMIRALTY LN.	NR		65	20		
37	ISLANDIA	1123	ADMIRALTY LN.	NR		65	20		
498	ISLANDIA	1118	ADMIRALTY LN.	D		65	20		

**Appendix C**  
**Average Tested NLR Values Before Treatment For Homes Near Non-Participating Eligible Homes**  
**Oakland International Airport**

NON-PARTICIPATING HOMES								TESTED HOMES	
NUMBER	H.O. ASSOCIATION	ADDRESS	STREET	STATUS	DOUBLE PANE WINDOWS INSTALLED?	EST. CNEL, dB, 1992	REQUIRED NLR, dB	ADDRESS ON STREET	AVG. NLR, dB
38	ISLANDIA	1108	ISLAND DR.	NR		64	19	1129	23.4
39	ISLANDIA	1114	ISLAND DR.	NR		64	19	1131	27.1
40	ISLANDIA	1156	ISLAND DR.	NR		66	21	1133	27.0
41	ISLANDIA	1163	ISLAND DR.	NR		66	21	1174	26.9
42	ISLANDIA	1166	ISLAND DR.	NR		66	21	1179	25.9
43	ISLANDIA	1171	ISLAND DR.	NR		67	22		
44	ISLANDIA	1175	ISLAND DR.	NR		67	22		
45	ISLANDIA	1177	ISLAND DR.	NR		67	22		
46	ISLANDIA	3308	FIR AVE.	NR		64	19	3204	27.0
47	ISLANDIA	3316	FIR AVE.	NR		64	19	3220	27.4
48	ISLANDIA	3320	FIR AVE.	NR		64	19	3324	24.6
49	ISLANDIA	3326	FIR AVE.	NR		64	19	3338	20.2
50	ISLANDIA	3344	FIR AVE.	NR		64	19	3340	25.8
								3346	25.2
51	ISLANDIA	3303	WILLIS LN.	NR		64	19	3305	26.7
52	ISLANDIA	3311	WILLIS LN.	NR		64	19	3307	26.4
53	ISLANDIA	3313	WILLIS LN.	NR		64	19		
54	ISLANDIA	3321	COOK LN.	NR		67	22	3318	23.6
499	ISLANDIA	3322	COOK LN.	D		67	22	3328	26.8
55	ISLANDIA	3325	COOK LN.	NR		67	22		
500	ISLANDIA	3326	COOK LN.	D		67	22		
501	ISLANDIA	3334	COOK LN.	D		68	23		
497	ISLANDIA	1141	LEEWARD LANE	D	YES	67	22	NONE <sup>6</sup>	(See below)
56	ISLANDIA	1125	BISMARCK LANE	NR	YES	65	20	1164	24.1
508	ISLANDIA	1131	BISMARCK LANE	D	YES	65	20		
57	ISLANDIA	1135	BISMARCK LANE	NR	YES	65	20		
58	ISLANDIA	1139	BISMARCK LANE	NR		65	20		
59	ISLANDIA	1145	BISMARCK LANE	NR	YES	66	21		
60	ISLANDIA	1148	BISMARCK LANE	NR		66	21		
61	ISLANDIA	3332	SOLOMON LN.	NR		65	20	3347	22.8
								3351	21.9
								3352	26.2
								3354	27.1

**Appendix C**  
**Average Tested NLR Values Before Treatment For Homes Near Non-Participating Eligible Homes**  
**Oakland International Airport**

NON-PARTICIPATING HOMES								TESTED HOMES	
NUMBER	H.O. ASSOCIATION	ADDRESS	STREET	STATUS	DOUBLE PANE WINDOWS INSTALLED?	EST. CNEL, dB, 1992	REQUIRED NLR, dB	ADDRESS ON STREET	AVG. NLR, dB
62	ISLANDIA	3366	TONGA LN.	NR	YES	68	23	3356	22.8
63	ISLANDIA	3368	TONGA LN.	NR		68	23	3364	24.6
64	ISLANDIA	1117	HOLLY ST.	NR		64	19	1155	24.6
65	ISLANDIA	1121	HOLLY ST.	NR		64	19		
66	ISLANDIA	1123	HOLLY ST.	NR		64	19		
67	GARDEN	1140	HOLLY ST.	NR		66	21		
68	SINGLE	904	MAGNOLIA DRIVE	NR		64	19	920	28.5
								1000	33.1
69	SINGLE	405	MAITLAND DRIVE	NR		64	19	NONE <sup>7</sup>	

1 - NR = No Response (nos. 1-69); D = Declined to participate in OASI (nos. 492-511).  
2 - Where homes have double-pane windows installed by the owners, the NLR is expected to be 25 or better.  
3 - The addresses cited are nearby on Fontana Drive; the homes have the same orientation to the airport, and are of similar construction.  
4 - These homes were tested prior to treatment, but did not complete the program.  
5 - These homes have the same orientation to the airport as the nearby homes on Island Drive (below), and are of similar construction.  
6 - This home has the same orientation to the airport as the nearby homes on Bismark Lane (below), and is of similar construction.  
7 - Standard residential construction is expected to provide an aircraft NLR of at least 20 dB.