

**QUARTERLY  
NOISE MONITORING REPORT  
Metropolitan Oakland International Airport  
Oakland, California  
  
JULY - SEPTEMBER 2006**

Prepared For

Port of Oakland  
Oakland International Airport  
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Revised  
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**EXECUTIVE SUMMARY**  
**OAKLAND INTERNATIONAL AIRPORT**  
**QUARTERLY NOISE MONITORING REPORT**  
**July 1 to September 30, 2006**

Brown-Buntin Associates, Inc. (BBA) has prepared the quarterly noise monitoring report for Oakland International Airport for the period from July 1, 2006 to September 30, 2006, in accordance with the California Airport Noise Regulation (California Code of Regulations, Title 21, Section 5025). The following items summarize the pertinent findings of that report, revised March 9, 2007.

1. Total quarterly airport operations increased by about 7% compared to the previous quarter. Air carrier operations increased by 4% and general aviation operations increased by about 22%.
2. Operations by B727 Stage 3 cargo aircraft were reduced from 11.4 per day in the previous quarter to 9.8 per day in this quarter.
3. There are no longer any regularly scheduled operations by B737-200 Stage 3 aircraft, which had produced the highest takeoff noise levels of the commercial fleet at Oakland. As a result, the B727 is now listed in Appendix B as producing the highest takeoff noise levels of the commercial fleet at Oakland.
4. The aircraft noise measurements indicate that the annual average cumulative aircraft noise levels (in terms of the Community Noise Equivalent Level, or CNEL) at the remote monitoring terminals have remained about the same as reported for the previous quarter.
5. The annual average CNEL contour map for this twelve-month period indicates that there are no incompatible residences located within the Noise Impact Boundary.
6. The noise level data collected at RMTs 5 and 6 between May 19, 2006 and September 29, 2006 were disregarded, since it was discovered that the meter settings were incorrect. This issue has been resolved.

## **INTRODUCTION**

Brown-Buntin Associates, Inc. (BBA) has prepared this quarterly evaluation of aircraft noise levels and airport operational factors at Oakland International Airport (OIA) for the period from July 1, 2006 to September 30, 2006. The intent of this and subsequent quarterly noise reports is to satisfy the requirements of the California Airport Noise Regulation (California Code of Regulations, Title 21, Section 5025) for quarterly noise monitoring reports to be submitted to Alameda County.

## **AIRCRAFT NOISE AND OPERATIONS MEASUREMENTS**

The Port of Oakland has installed an automated aircraft noise and operations monitoring system (called ANOMS), which became operational September 14, 1990. The system is currently configured with fifteen (15) Remote Monitoring Terminals (RMTs). Fourteen of the RMT locations were selected to assist in the accurate location of the current annual 65 dB CNEL contour in residential areas affected by noise from aircraft operating at OIA, and to evaluate compliance with established aircraft noise abatement procedures. The locations of these noise monitoring sites are shown on the current CNEL noise exposure map, which is Figure 3. RMT No. 15, intended to document aircraft engine run-up noise levels in Alameda, was placed in service in September 2002.

The noise monitoring system consists of fifteen (15) Larson Davis Laboratories (LDL) Model 870 Precision Integrating Sound Level Meters fitted with LDL Model 2100 outdoor microphone assemblies. The meters are housed in weatherproof cabinets, and the microphones are placed on booms at least 20 feet above the ground surface, well removed from reflective surfaces. The meters have the capability of reporting the maximum A-weighted sound level ( $L_{max}$ ), the duration of a noise event above a programmable measurement threshold level, and the Single Event Noise Exposure Level (SENEL) for single noise events. The ANOMS is capable of reporting the Hourly Noise Level (HNL) and Community Noise Equivalent Level (CNEL) based upon both overall noise levels and events exceeding the selected measurement threshold levels.

The sound level meters are automatically checked for calibration each day by an internal calibration system. The meters may also be calibrated using an acoustical calibrator certified to be consistent with National Bureau of Standards (NBS) reference levels. The measurement systems meet all pertinent specifications of the American National Standards Institute (ANSI) and the International Electrotechnical Commission (IEC) for Type 1 and Precision sound level meters and microphones, and comply with all applicable requirements of the California Airport Noise Regulation.

System program parameters for the automated aircraft noise level measurements have been determined by observations of aircraft and background noise levels at each measurement site. These thresholds exclude most community noise sources.

The ANOMS matches the recorded noise events with aircraft flight track records obtained from an ARTS Gateway System, which collects FAA ARTS radar-acquired flight data. These data are used to separate aircraft and non-aircraft noise events. The system software also allows the exclusion of noise events due to over flights by aircraft from other airports (such as San Francisco International) on the basis of recorded aircraft flight tracks.

## QUARTERLY AIRPORT OPERATIONS

Airport operational factors which can significantly affect overall noise levels as described by the CNEL include the total number of aircraft operations, aircraft fleet mix, the time of day in which operations occur and runway utilization. Table I is a summary of the OIA monthly activity reports for July through September 2006 as provided by the Port of Oakland.

<p style="text-align: center;"><b>TABLE I</b>  <b>OAKLAND INTERNATIONAL AIRPORT</b>  <b>MONTHLY ACTIVITY REPORTS SUMMARY</b>  <b>JULY – SEPTEMBER 2006</b></p>						
<b>Aircraft Movements</b>	<b>July</b>	<b>August</b>	<b>September</b>	<b>Total</b>	<b>Previous Quarter Total</b>	<b>Percent Change (%)</b>
Air Carriers	14,850	15,427	14,320	44,597	42,971	4
Civilian Transient	5,366	5,915	5,400	16,681	15,750	6
Military Transient	22	2	25	49	50	-2
Civilian Local	6,440	7,815	6,336	20,591	16,875	22
Military Local	0	0	0	0	104	-100
Air Taxi Transient	2,476	2,685	2,442	7,603	7,980	-5
<b>Total:</b>	<b>29,154</b>	<b>31,844</b>	<b>28,523</b>	<b>89,521</b>	<b>83,730</b>	<b>7</b>
Source: Port of Oakland						

The number of daily operations by air carrier aircraft can be determined from the monthly landing reports filed with the Port of Oakland by the airlines. Table II lists the reported numbers of daily departures (or landings) for each of the last four quarters. Figure 1 illustrates typical daily numbers of air carrier and cargo takeoffs or landings in the current period.

**TABLE II**  
**TYPICAL DAILY DEPARTURES OR LANDINGS**  
**AIR CARRIER AND AIR CARGO AIRCRAFT TYPES**

Aircraft Type	First Quarter 2006		Second Quarter 2006		Third Quarter 2006		Fourth Quarter 2005	
	Total No.	%	Total No.	%	Total No.	%	Total No.	%
A300	5.3	2.3%	6.1	2.5%	5.7	2.3%	4.9	2.0%
A310	1.4	0.6%	1.5	0.6%	1.3	0.5%	1.5	0.6%
A319	4.8	2.1%	4.7	1.9%	5.6	2.3%	4.0	1.7%
A320	21.2	9.2%	24.7	10.1%	24.0	9.8%	23.8	9.9%
B727Q	6.0	2.6%	5.7	2.3%	4.9	2.0%	6.8	2.9%
B733	151.6	65.5%	161.2	65.9%	164.0	66.8%	152.0	63.4%
B737Q	0.0	0.0%	0.1	0.0%	0.1	0.0%	0.1	0.0%
B747	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.9	0.4%
B757	4.5	1.9%	4.5	1.8%	4.5	1.8%	5.4	2.2%
B767	4.0	1.7%	4.0	1.6%	4.1	1.7%	4.0	1.7%
ATR 42	0.7	0.3%	0.7	0.3%	0.5	0.2%	0.7	0.3%
DC10	10.3	4.5%	10.3	4.2%	10.0	4.1%	11.5	4.8%
DC8Q	0.0	0.0%	0.0	0.0%	0.0	0.0%	0.1	0.0%
DHC8-400	1.0	0.4%	0.0	0.0%	0.0	0.0%	0.2	0.1%
MD80	7.7	3.3%	7.8	3.2%	6.8	2.8%	7.5	3.1%
MD90	2.0	0.9%	1.1	0.4%	0.2	0.1%	0.9	0.4%
MD11	2.2	1.0%	1.9	0.8%	2.6	1.1%	2.6	1.1%
Regional Jets	8.8	3.8%	10.5	4.3%	11.2	4.5%	12.9	5.4%

Source: Airline Landing Reports

To describe the typical distribution of aircraft operations over the 24-hour day, Port staff collected one-week samples of operations recorded by the ANOMS in each month. BBA calculated the day-evening-night distributions of operations for each quarter from these data.

The ANOMS is capable of extracting data for single event aircraft noise levels and operations for each aircraft type operated at OIA. Single event noise levels obtained in the past twelve months were used with the observed temporal distribution of aircraft operations in this quarter to estimate the CNEL contribution of each major aircraft type at RMT No. 5. Table III provides the average single event aircraft noise levels and estimated CNEL contributions for reported air carrier and air cargo operations of each aircraft type. The numbers of operations were derived from the landing reports for the period from October 2005 through September 2006.

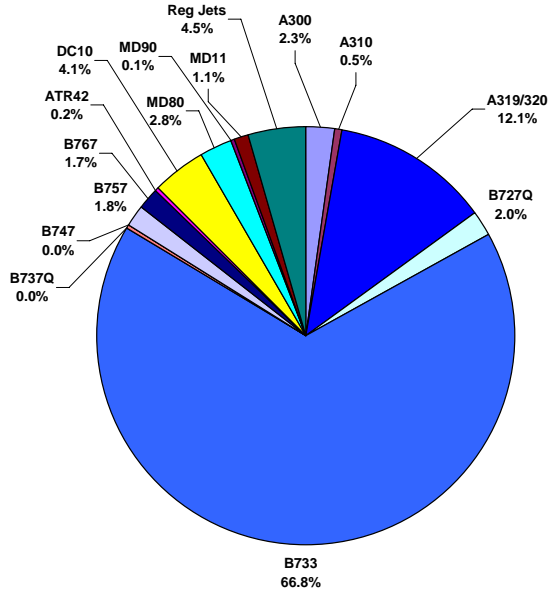
Of the listed aircraft, operations by the Boeing 737-300 (series) aircraft were the most significant in terms of cumulative noise levels. Figure 2 shows the estimated CNEL contributions at RMT No. 5 in graphic form. Because the CNEL is determined by the single event noise level and the number and time of day of operations, it is possible for an aircraft type producing relatively low single event noise levels to make a significant contribution to the total CNEL.

**TABLE III****MEASURED SINGLE EVENT NOISE LEVELS AND  
ANNUAL CNEL CONTRIBUTIONS AT RMT NO. 5  
OAKLAND INTERNATIONAL AIRPORT****October 1, 2005 – September 30, 2006**

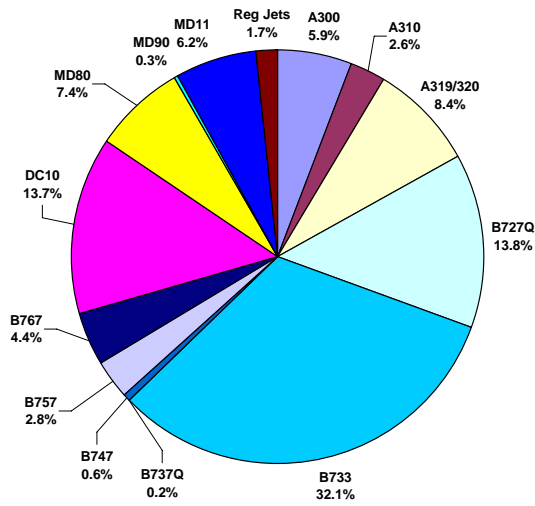
<b>Aircraft Type</b>	<b>Mean Takeoff SEL, dB</b>	<b>Average Daily Takeoffs at Site</b>	<b>Estimated CNEL Contribution, dB</b>	<b>Percent Total CNEL</b>
A300	82.7	4.9	47.1	5.9
A310	82.6	1.3	43.6	2.6
A319	76.8	4.3	39.4	1.0
A320	78.3	21.0	48.1	7.4
B727 Stage 3	86.1	5.2	50.8	13.8
B737-300 (series)	79.2	133.4	54.5	32.1
B737-200 Stage 3	87.3	0.1	31.2	0.2
B747	84.5	0.2	37.0	0.6
B757	79.8	4.2	43.9	2.8
B767	81.9	3.6	45.9	4.4
B777	74.2	0.0	3.5	< 0.1
DC10	82.5	9.4	50.8	13.6
DC8 Stage 3	83.3	0.0	21.3	< 0.1
MD80 (series)	85.4	6.6	48.1	7.4
MD90	78.0	0.9	34.1	0.3
MD11	85.6	2.1	47.4	6.2
Regional Jets	77.9	10.3	41.9	1.7

Source: Port of Oakland, Brown-Buntin Associates, Inc.

**Figure 1**  
**Daily Operations by Aircraft Type**  
**Oakland Internat'l Airport: Third Quarter 2006**



**Figure 2**  
**CNEL Contributions at RMT 5**  
**Oakland Internat'l Airport: Third Quarter 2006**



Runway utilization factors influence the annual CNEL values at the noise monitoring sites. When Runways 27 and 29 are in use, noise from departing aircraft dominates the noise exposure from OIA operations at RMT Nos. 3-8. When Runways 09 and 11 are in use, noise from arriving aircraft at OIA dominates the aircraft noise environment at those sites. Table IV summarizes the departure runway use factors at OIA in the last four quarters, derived from the ANOMS data.

<b>TABLE IV</b>				
<b>DEPARTURE RUNWAY USE FACTORS</b>				
<b>OAKLAND INTERNATIONAL AIRPORT</b>				
Period	Number of Departures		Use Factor	
	Runway 29	Runway 11	Runway 29	Runway 11
First Quarter 2006	18,231	5,482	0.77	0.23
Second Quarter 2006	22,757	1,708	0.93	0.07
Third Quarter 2006	25,365	113	1.00	0.00
Fourth Quarter 2005	20,341	3,522	0.85	0.15
Total	86,694	10,825	0.89	0.11

### **MEASURED COMMUNITY NOISE EQUIVALENT LEVELS**

The average Community Noise Equivalent Level (CNEL) values for aircraft operations during the monitoring period were calculated for each RMT by the ANOMS, based upon the matched aircraft noise events. Daily CNEL values were calculated from a 24-hour period beginning at midnight of the date indicated. The daily CNEL data for each RMT during the monitoring period are presented in Appendix A. The average daily CNEL values due to OIA aircraft operations for the current quarter and the three quarters preceding this report at each RMT are listed in Table V.

**TABLE V**  
**AVERAGE MEASURED AIRCRAFT CNEL VALUES**  
**OAKLAND INTERNATIONAL AIRPORT**

RMT	CNEL, dB					
	First Quarter 2006	Second Quarter 2006	Third Quarter 2006	Fourth Quarter 2005	Current Annual Average	2005 Annual Average
1 - Oro Loma San. Dist.	64.7	65.0	65.5	65.5	65.2	65.8
2 - San Leandro Marina	62.6	59.5	57.2	62.2	60.9	61.5
3 - Fernside	48.8	49.6	49.4	50.2	49.5	50.5
4 - Godfrey Park	59.7	58.3	57.3	59.5	58.8	59.5
5 - Garden Isle	61.1	60.9	60.0	60.7	60.9	60.8
6 - Wake Lane	61.2	61.6	60.9	61.3	61.3	61.7
7 - Fire Station	61.1	61.5	61.1	62.7	61.6	61.9
8 - Earhart School	57.5	56.4	56.4	57.8	57.1	58.1
9 - Doolittle Drive	61.0	61.2	61.2	61.0	61.1	60.9
10 - Tudor Court	53.7	51.8	50.9	53.2	52.5	53.4
11 - John Muir School	53.4	52.4	52.0	53.6	52.9	53.9
12 - Garfield School	55.8	52.6	49.9	55.0	53.9	54.7
13 - SLUSD Admin. Office	45.7	43.5	42.5	46.1	44.7	48.0
14 - Washington School	41.8	42.8	41.5	43.1	42.3	43.5
15 - Beach Road	59.8	59.2	57.7	59.4	59.1	58.2
Source: Port of Oakland						

The measured quarterly CNEL values attributed to aircraft operations for this quarter were reasonably consistent with previously measured values. However, the noise level data collected at RMTs 5 and 6 between May 19, 2006 and September 29, 2006 were disregarded, since it was discovered that the meter settings were incorrect. This issue has been resolved.

## **PREPARATION OF ANNUAL CNEL CONTOURS**

BBA used Federal Aviation Administration (FAA) operations records, Port of Oakland landing reports, and noise level measurement data as the basis for predicting aircraft noise at OIA using Version 6.2 of the Federal Aviation Administration Integrated Noise Model (INM)<sup>1</sup>. Certain data for aircraft activity, aircraft fleet mix and airport configuration used in the noise modeling process were obtained from the Port of Oakland Airport Noise and Operations Monitoring System (ANOMS) and from Airport staff. The following report provides a summary of the data, methods and assumptions used in preparing the CNEL noise exposure map.

### **AIRCRAFT NOISE LEVELS**

Noise level data for aircraft operating at the Airport were obtained from the database prepared by the Federal Aviation Administration for use with the Integrated Noise Model. The current database contains generalized noise level and operational characteristics for over one hundred different aircraft types and variations, and reflects the majority of the current air carrier aircraft fleet.

Validation of the INM was accomplished by selecting representative INM aircraft types and operational assumptions to achieve reasonable agreement between measured and predicted noise levels for aircraft types operating at OIA. These selections made it possible to maintain the proper relationships between the various commercial, military and general aviation aircraft classes, and to account for local climatic, topographical and operating conditions within the OIA environs. The primary selection of aircraft types was based upon a comparison of INM-predicted noise levels to the ANOMS noise level data measured during multiple one-week periods in the previous calendar year at remote monitoring sites (RMTs) Nos. 1, 2, 5, and 6.

Table VI provides a comparison of measured and predicted single event noise levels for departures of selected aircraft at Site No. 5 in the preceding twelve months. These departures are the most noise-significant operations at this site in terms of their contribution to overall noise exposure as defined by CNEL. From Table VI it is apparent that the INM generally under predicts the single event noise levels for departures at OIA.

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<sup>1</sup> U.S. Department of Transportation, Federal Aviation Administration; Integrated Noise Model, Version 6.2, 2006.

**TABLE VI**  
**MEASURED AND PREDICTED SINGLE EVENT NOISE LEVELS**  
**Year 2005-2006 Monitoring Site No. 5**  
**OIA Departures: Runway 29**

Aircraft Type	Measured Mean SEL, dB	Predicted Range of SEL Values, dB	No. Aircraft Observed
A300	82.7	76.1 – 79.7	485
A310	82.6	75.1 – 76.5	96
A319	76.8	72.5 – 73.9	210
A320	78.3	75.1 – 76.6	1,708
B727-100, -200 Stage 3	86.1	82.6 – 85.7	710
B737-300 Series	79.2	72.0 – 77.6	12,203
B737-200 Stage 3	87.3	83.7 – 86.4	12
B747	84.5	79.1 – 82.1	19
B757	79.8	76.9 – 77.7	454
B767	81.9	76.9 – 79.3	368
DC10	82.5	75.9 – 82.9	1,032
DC8 Stage 3	83.4	80.9	3
MD80	85.4	80.9 – 83.5	615
MD90	78.0	76.8 – 78.2	13
MD11	85.6	77.9 – 80.4	250
Regional Jets	77.9	66.6 – 69.5	115

## **ANNUAL AIRPORT OPERATIONS**

Airport operational factors, which can significantly affect overall noise levels as described by CNEL, include the total number of operations, aircraft fleet mix and the time of day when aircraft operations occur. Aircraft operational assumptions were derived from data collected by the ANOMS, the FAA Tower, and the Port of Oakland landing reports for the twelve months ending in the quarter of the year addressed by this report. Allocations of cargo and air taxi aircraft to North and South Fields were based upon data provided by the Port of Oakland. Table VII summarizes the reported number of annual operations by aircraft type for the past twelve-month period at OIA.

Based upon the landing reports, it was assumed that all air carrier and air cargo aircraft operated at OIA in the current year were FAR Part 36 Stage 3 aircraft.

The distribution of aircraft operations by time of day was developed from one-week samples of ANOMS data for IFR operations during each of the twelve months included in this quarterly report. The available data for annual average VFR operations are incomplete for non-discrete transponder code operations. BBA and Airport staff reviewed quarterly general aviation IFR operational data and flight tracks collected in 2005 and 2006 to estimate the temporal and runway distributions of general aviation activity.

The majority of nighttime general aviation business aircraft departures at North Field are routed on the Salad One departure route, except that the VOR allowing use of this route was out of order from June 1, 2005 to November 7, 2005. In addition, approximately 30% of nighttime North Field departures have been observed to depart on Runways 9R and 9L. This factor was also incorporated into the calculations for preparing the INM input.

**TABLE VII**  
**ANNUAL AIRCRAFT OPERATIONS: Year 2006 Third Quarter**  
**Oakland International Airport**

Aircraft Type	Annual Operations	Percent of Operations in Class
<b>Air Carrier:</b>		
A300	4,039	2.4
A310	1,053	0.6
A319	3,509	2.0
A320	17,232	10.1
B727	4,308	2.5
B737-200	47	< .1
B737-300 Series	109,558	64.0
B747	165	< .1
B757	3,460	2.0
B767	2,956	1.7
ATR-42	294	<.1
DC10-10	6,002	3.5
DC10-30	1,725	1.0
DC8-70	18	< .1
DHC8-400	230	0.1
DC9	16	< .1
F27	0	< .1
L1011	0	< .1
MD11	1,713	1.0
MD80	5,456	3.2
MD90	766	0.4
Regional Jets	8,465	4.9
<b>General Aviation:</b>		
GA Jets	28,432	18.2
Twin Piston	12,439	8.0
Twin Turboprop	13,327	8.5
Single Turboprop	3,390	2.2
Single Piston	70,364	45.0
Helicopters	28,333	18.1
<b>Military:</b>	304	100

Flight track descriptions for South and North Fields were developed from flight track data collected by ANOMS. The current flight track assumptions are described by the Technical Addendum to the Oakland International Airport Quarterly Reports, dated July 7, 2006.

Aircraft operations were allocated to the flight tracks on the basis of published procedures (such as nighttime noise abatement departure procedures), FAA Tower data, and reviews of the data collected by the ANOMS over the past three years. Touch-and-go operations were assumed for about 45% of North Field operations, and were assigned to single-engine aircraft on Runway 09R/27L and to helicopters on Runway 33. In the twelve-month period covered by this report, Runways 29, 27L, 27R and 33 were in use about 89% of the time. In the remaining time, operations occurred on Runways 11, 9L and 9R. Runway 15 was seldom used.

## **PREPARATION OF ANNUAL NOISE EXPOSURE MAP**

The Integrated Noise Model (INM), Version 6.2, was used to prepare CNEL noise exposure maps for the airport based upon the aircraft noise level and airport operational factors described in the previous sections. The INM was developed for the FAA, and represents the federally sanctioned and preferred method for analyzing aircraft/airport noise exposure. Version 6.2 is the most recent version of the INM available, and incorporates an updated database of aircraft performance parameters and noise levels.

The INM calculates aircraft noise exposure by mathematically combining aircraft noise levels and airport operational factors at a series of points within a Cartesian coordinate system which defines the locations of airport runways and aircraft flight tracks. User inputs to the INM include the following:

- a. Airport altitude and mean temperature
- b. Runway configuration
- c. Aircraft flight track definition
- d. Aircraft stage length
- e. Aircraft departure and approach profiles
- f. Aircraft traffic volume and fleet mix
- g. Annual average flight track utilization by aircraft types

The INM database includes aircraft performance parameters and noise level data for over one hundred commercial, military and general aviation aircraft classes. When the user specifies a particular aircraft class from the INM database, the model automatically provides the necessary inputs concerning aircraft power settings, speed, departure profile, and noise levels. For OIA, ANOMS single event noise level data were used to select appropriate aircraft types and to more closely match measured single event noise levels.

After representative aircraft classes had been selected, input files containing the numbers of operations by aircraft class, time of day and flight track were prepared for the average daily levels of airport activity described for the twelve-month period covered by this report. The INM was used to calculate CNEL values at each of the current noise monitoring sites. Table VIII lists the measured and predicted CNEL values at each of the aircraft noise monitoring locations.

**TABLE VIII**  
**MEASURED AND PREDICTED AIRCRAFT ANNUAL CNEL VALUES**  
**AT OIA MONITORING SITES**  
**October 1, 2005 – September 30, 2006**

RMT No.	Measured CNEL, dB	Predicted CNEL, dB	Difference, dB
1	65.2	65.3	0.1
2	60.9	59.9	-1.0
3	49.5	51.8	2.3
4	58.8	60.5	1.7
5	60.9	60.4	-0.5
6	61.3	60.9	-0.4
7	61.6	62.4	0.8
8	57.1	55.7	-1.4
9	61.1	59.7	-1.4
10	52.5	56.9	4.4
11	52.9	52.5	-0.4
12	53.9	54.5	0.6
13	44.7	46.9	2.2
14	42.3	40.8	-1.5
15	59.1	60.2	1.1

At RMT No. 1, the INM originally predicted a CNEL value about 1 dB below the measured value. The predicted noise exposure at this site is dominated by B737-300 (series) arrivals on Runway 29. BBA has reviewed the single event noise level data collected at RMT No. 1 for arriving aircraft, and has determined that the INM under predicts single event noise levels produced by arriving B737-300 series aircraft by about 2 dB. BBA has observed a similar magnitude of discrepancy between measured and predicted arrival noise levels by B737-300 series aircraft at other airports. To better match the predicted noise levels to measured noise levels in the vicinity of RMT No. 1, BBA applied a correction to the INM inputs for arrivals on Runway 29 which resulted in the CNEL value in Table VIII.

Similarly, at the RMT sites in the vicinity of the 65 dB CNEL contour in Alameda (Sites 5, 6, and 7), the originally-predicted CNEL values were 1 to 2 dB below the measured levels. BBA applied a correction to the INM inputs for departures on Runway 29 so the INM would match the measured CNEL values within the desired tolerance of 1.5 dB in the vicinity of the 65 dB CNEL contour.

At RMT Site 2, which is located at the San Leandro Marina, the calculated CNEL value remained about 1 dB below the measured CNEL value. Since the installation of the ANOMS in September 1990, it has been apparent that predicted and measured CNEL values at this site are significantly different, by as much as 5 dB. In late 1992, the ANOMS software was refined to allow correlation of noise events measured at RMT No. 2 to aircraft taking off on Runway 29.

BBA has performed several analyses of cumulative and single event noise levels in the vicinity of RMT No. 2, as described in detail in previous noise contour reports. The conclusion of these analyses has been that the effects of wind and reflections on aircraft takeoff noise over the water separating RMT No. 2 and the east end of Runway 29 account for the discrepancies between measured and predicted CNEL values.

To arrive at the shape of the 65 dB CNEL contour in the vicinity of RMT No. 2, the INM was used to predict the location of the 64 dB CNEL contour, which provided an offset of 1 dB. This contour was graphically combined with the 65 dB CNEL contour. The resulting 65 dB CNEL contour exhibits a slight bulge in the vicinity of the San Leandro Marina, and reasonably predicts the aircraft noise exposure in that vicinity.

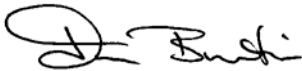
The predicted locations of the 65, 70 and 75 dB CNEL contours have been plotted on an ArcView map of the area surrounding the airport, as shown by Figure 3. The CNEL contours prepared for current annual average operations at Oakland International Airport describe the airport noise environment within the requirements of the California Airport Noise Regulations.

By plotting the 65 dB CNEL contour on the ArcView base map, it is possible to determine the number of dwelling units included within the Noise Impact Boundary defined by the California Airport Noise Regulations. For this analysis, it was assumed that a parcel was affected if it included an incompatible land use, and if any portion of the parcel was included in the 65 dB CNEL contour. Land use was determined from the AutoCAD parcel map prepared by the Port of Oakland, which was imported into ArcView. Based upon these data, there are no incompatible residences within the current Noise Impact Boundary.

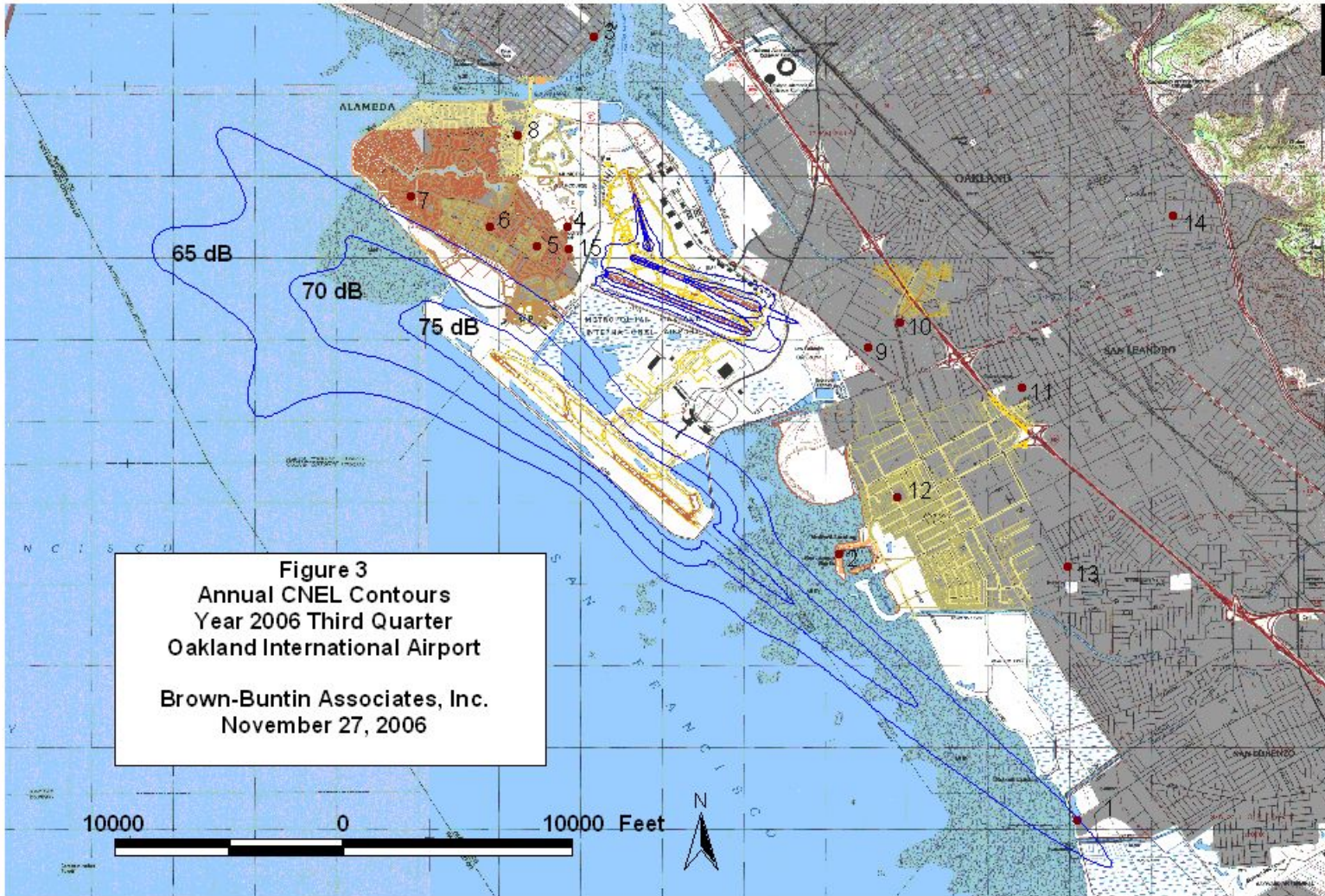
## **SUMMARY OF STATISTICAL INFORMATION**

The California Airport Noise Regulation requires certain statistical information to be filed with the Division of Aeronautics. That information is supplied on the attached Form DOA 617, which is Appendix B.

Respectfully submitted,  
Brown-Buntin Associates, Inc.

A handwritten signature in black ink, appearing to read "J. Buntin". The signature is fluid and cursive, with the first letter of the first name being a large, stylized capital 'J'.

Jim Buntin  
Vice President



**Figure 3**  
**Annual CNEL Contours**  
**Year 2006 Third Quarter**  
**Oakland International Airport**  
**Brown-Buntin Associates, Inc.**  
**November 27, 2006**

APPENDIX A-1  
OAKLAND INTERNATIONAL AIRPORT  
AIRCRAFT CNEL SUMMARY: THIRD QUARTER 2006

July	RMT Location Number														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	64.3	55.9	46.5	54.0			59.3	51.2	57.1	47.0	44.7	51.8	0.0	39.8	54.4
2	62.8	57.3		51.9			58.9	49.3	57.4			46.2	37.8	0.0	52.2
3	63.6	54.9	55.0	57.0			58.5	57.2	57.2	47.9	49.8	49.0	37.9	37.3	55.3
4	64.0	59.3	51.1	55.2			59.6	52.1	60.0	49.8	51.3	54.5	58.4	41.3	52.4
5	65.9	57.9	47.1	57.5			62.3	58.1	59.6	49.3	51.7	51.6	28.1	49.9	58.8
6	65.8	57.0	49.9	58.4			62.1	56.9	64.9	52.5	57.4	53.3	47.3	38.9	58.2
7	63.9	55.9	49.6	60.0			60.6	56.2	59.7	48.4	50.8	52.3	46.9	43.3	61.0
8	63.8	53.5	41.9	47.9			56.1	47.9	59.4	43.3	51.3	42.1	32.3	40.6	46.0
9	62.7	48.1	46.1	45.3			59.2	50.6	60.6	45.9	50.8	43.8	34.2	25.1	47.2
10	65.3	55.7	45.7	55.7			60.8	56.0	60.8	48.6	51.7	48.4	41.7	39.2	53.5
11	66.2	57.9	52.5	58.3			61.8	57.0	65.0	53.6	53.6	48.2	38.5	44.6	58.0
12	65.8	57.3	50.7	57.0			61.3	56.3	62.3	49.3	52.7	40.1	22.8	38.1	58.0
13	65.5	56.8	47.8	57.8			60.0	57.1	62.5	48.8	52.0	48.5	41.4	47.1	57.1
14	65.9	58.4	48.4	60.7			61.1	56.9	62.1	48.3	50.6	49.9	40.2	45.9	58.3
15	63.7	56.4	49.1	55.0			59.2	51.2	61.4	48.4	51.0	44.9	0.0	41.8	55.8
16	62.6	54.5	46.6	52.1			58.8	52.2	62.1	55.4	52.0	49.5	0.0	33.3	54.2
17	64.1	57.2	52.9	56.5			59.2	53.9	60.9	48.8	50.8	51.9	36.0	42.7	57.5
18	65.5	59.3	50.7	61.7			61.7	56.7	63.4	53.5	52.2	52.5	39.4	43.4	62.4
19	65.6	56.0	49.3	57.1			61.7	56.8	61.5	50.7	49.6	44.7	42.7	43.0	57.9
20	55.1	57.7	48.8	58.2			61.7	55.5	29.2	48.0	52.2	48.0	47.0	44.1	58.5
21	67.0	59.2	49.6	57.6			60.7	54.1	59.9	50.6	48.0	46.7	39.2	41.8	58.0
22	63.9	54.7	42.6	55.2			59.0	49.9	59.1	48.4	51.8	47.4	32.0	32.3	56.7
23	63.3	53.0	39.6	54.4			58.1	48.1	57.8	47.3	47.7	44.8	0.0	33.0	57.2
24	65.1	57.3	48.5	57.8			58.6	57.2	60.0	53.4	47.7	56.5	39.0	40.5	57.5
25	66.3	56.6	53.4	58.1			60.8	54.3	60.9	51.7	49.8	48.8	38.4	40.2	57.9
26	65.8	58.5	48.6	59.2			63.0	57.1	62.3	52.4	55.3	50.9	39.9	40.8	59.8
27	66.1	58.7	48.1	56.6			60.9	57.5	61.8	52.0	51.8	49.2	41.3	40.0	55.1
28	66.5	58.1	54.2	57.4			61.7	56.7	61.8	51.0	51.6	51.7	35.9	36.9	57.0
29	64.7	56.0	47.6	55.2			60.8	53.3	62.1	46.4	54.2	45.6	0.0	27.2	56.9
30	63.4	52.6	43.6	52.5			60.0	50.3	58.6	44.8	50.3	45.2	24.2	37.6	52.2
31	65.7	55.8	50.0	54.3			61.4	54.9	59.2	48.1	51.1	47.1	30.7	43.2	55.3
Average	64.9	56.9	49.8	57.0	N/A	N/A	60.5	55.2	61.0	50.3	51.8	50.0	45.0	42.1	57.2
No. Days	31	31	30	31	0	0	31	31	31	30	30	31	31	31	31

**APPENDIX A-2  
OAKLAND INTERNATIONAL AIRPORT  
AIRCRAFT CNEL SUMMARY: THIRD QUARTER 2006**

August	RMT Location Number														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	66.3	56.2	50.9	58.2			63.0	57.8	64.7	47.9	50.4	49.2	40.3	47.7	58.2
2	66.8	57.3	50.5	58.2			61.8	56.8	59.9	49.1	51.2	51.4	34.7	43.4	58.8
3	66.5	57.7	50.6	59.0			62.5	58.4	61.8	51.4	51.6	48.5	45.7	40.7	59.5
4	66.8	58.0	0.0	57.9			62.8		61.4	56.8	50.3	49.2	34.4	42.1	57.1
5	64.7	58.2	43.8	56.5			61.5		59.6	56.5	50.2	50.7	39.2	33.4	57.6
6	64.3	56.8	48.0	53.7			60.1		60.5	49.4	51.0	44.4	43.3	41.2	53.6
7	65.8	55.8	48.4	55.0			61.4		58.7	48.1	51.7	47.9	41.1	38.3	55.0
8	67.2	57.0	50.1	59.1			61.7		61.0	49.3	52.1	47.8	43.8	36.8	59.1
9	66.5	57.1	49.8	57.5			61.6		62.3	57.4	52.7	50.6	41.7	43.1	57.9
10	66.8	56.9	50.6	58.6			62.8		61.5	49.9	56.1	49.8	41.0	44.4	58.4
11	66.4	57.0	48.5	57.6			62.7		62.1	51.7	52.1	50.6	39.8	39.3	58.5
12	64.8	55.1	48.1	55.9			61.6		57.4	48.1	47.8	49.3	42.2	43.6	57.7
13	63.9	54.2	43.4	53.5			59.4		61.7	49.0	51.9	42.8	30.7	37.4	53.0
14	65.3	54.9	46.5	54.2			61.2		60.1	50.2	50.8	53.4	40.9	42.3	54.1
15	66.9	58.3	50.7	57.8			62.1		62.1	50.9	53.3	50.5	46.5	41.3	59.4
16		57.5	48.3	58.0			62.8		64.2	55.3	57.1	47.8	44.3	39.4	58.4
17		59.5	47.9	59.0			62.2		60.8	53.1	55.8	51.5	42.7	42.7	58.8
18		59.4	46.6	57.3			61.8		61.1	49.0	49.8	49.8	35.0	30.4	57.7
19		57.4	45.0	54.1			59.4		56.8	43.7	46.2	41.3	31.9	34.6	54.2
20		54.1	47.1	53.6			59.9		58.6	43.7	48.5	41.4	32.7	39.1	56.0
21		54.4	48.6	55.4			60.1		58.7	47.7	51.1	48.2	37.8	32.0	56.7
22		59.2	53.7	58.0			61.0		62.0	51.0	53.7	53.6	41.7	38.2	59.0
23		57.7	50.8	58.7			61.2		63.7	50.3	52.5	51.0	33.7	34.8	58.6
24		58.9	45.7	58.7			62.2	60.6	62.1	51.2	51.8	51.0	40.9	43.9	58.0
25		58.4	49.9	60.4			63.4	58.6	61.6	49.7	53.3	49.5	33.7	35.7	63.9
26		56.0	47.1	58.5			60.2	53.8	54.8	44.2	45.5	40.4	25.7	38.3	57.6
27		54.7	46.0	52.1			59.0	52.6	58.6	45.9	48.6	44.2	33.4	34.6	53.9
28		56.9	45.9	54.4			59.8	56.9	60.4	47.4	51.5	46.9	33.5	43.7	56.0
29	69.7	57.2	50.5	55.2			62.0	57.5	61.5	52.8	52.9	47.1	45.9	36.8	57.2
30	65.9	57.1	48.5	59.0			62.1	58.5	61.1	50.0	52.0	48.2	39.3	43.2	59.8
31	66.4	58.6	51.3	59.2			62.1	57.9	60.8	50.7	51.4	53.1	43.8	45.5	59.2
Average	66.4	57.3	49.0	57.4	N/A	N/A	61.6	57.7	61.1	51.4	52.2	49.5	41.1	41.4	58.1
No. Days	18	31	30	31	0	0	31	11	31	31	31	31	31	31	31

**APPENDIX A-3  
OAKLAND INTERNATIONAL AIRPORT  
AIRCRAFT CNEL SUMMARY: THIRD QUARTER 2006**

September	RMT Location Number														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	66.6	58.9	47.6	58.8			62.4	58.1	62.2	49.6	52.5	48.3	0.0	45.0	58.9
2	62.1	54.3	41.7	53.0			57.7	48.3	55.8	42.5	45.7	44.1	41.1	36.1	54.5
3	61.8	54.2	45.6	51.6			58.7	51.9	60.2	46.6	52.5	42.0	32.1	29.9	51.9
4	62.9	53.0	45.4	50.4			59.4	50.8	58.6	48.3	49.6	46.1	0.0	27.0	52.2
5	64.6	55.4	48.3	56.4			59.2	56.6	60.4	48.2	50.4	51.5	39.7	39.7	56.0
6	66.4	57.8	47.5	57.8			60.5	58.0	60.1	47.6	49.2	48.9	39.0	40.2	57.6
7	67.2	58.4	48.8	58.9			62.5	59.0	61.6	49.5	52.1	49.7	40.1	41.4	59.0
8	66.7	58.2	49.6	57.7			62.5	59.3	62.7	50.0	55.6	46.4	33.6	30.1	57.3
9	64.3	54.8	47.2	55.6			61.4	53.8	59.2	47.2	51.4	46.9	33.5	39.4	56.3
10	63.2	53.8	47.4	52.8			59.1	52.9	58.2	46.0	49.6	38.2	33.0	36.7	52.2
11	65.3	55.3	55.6	61.1			59.3	57.0	60.5	51.5	54.2	49.5	40.4	47.9	60.0
12	66.1	56.3	0.0	60.0			60.5	57.6	60.6	51.1	47.8	52.9	46.9	42.1	60.2
13	66.6	57.5	48.8	59.0			61.9	58.6	65.8	53.4		49.5	44.1	37.3	58.8
14	66.8	57.9	50.9	58.3			63.5	59.5	61.3	51.8		47.4	33.4	37.1	57.6
15	67.1	59.2		58.7			61.9	57.9	63.9	52.6			34.6	47.8	59.0
16	64.2	60.1		56.8			59.7	53.4	61.8	49.2			0.0	43.5	55.8
17	63.2	55.0		58.8			62.4	51.6	55.1	46.9			35.5	35.1	55.5
18	64.5	55.6		57.0			60.1	58.2	61.1	50.9			30.7	36.8	57.8
19	66.6	57.0		60.1			62.0	60.5	63.7	50.0			42.1	44.3	58.7
20	66.0	59.9		57.7			60.8	56.5	60.9	55.2			43.0	41.7	59.4
21	67.2	60.7		58.5			61.5	58.9	63.3	50.6			41.6	42.1	60.7
22	66.0	59.8		57.3			60.5	55.9	58.8	55.1			39.1	38.6	58.7
23	64.0	54.7		55.2			59.8	54.3	58.8	48.3			28.5	38.5	57.5
24	63.1	53.4		52.7			59.2	52.4	59.0	49.1			0.0	39.4	55.3
25	63.9	56.2		56.0			58.5	56.8	58.5	46.3			37.5	39.5	57.3
26	66.8	58.5		59.1			61.5	58.5	61.1	51.2		53.5	41.3	35.0	60.0
27	66.7	59.4		58.1			61.6	58.5	62.0	52.3		54.0	42.8	34.2	59.2
28	66.2	58.1		57.8			60.1	57.7	62.1	51.8		52.6	39.4	38.9	57.9
29	66.2	58.0		57.2	60.2	60.1	61.0	58.0	63.5	53.3	55.8	53.0	37.7	40.5	58.2
30	64.5	58.4		55.6	59.9	61.5	62.2	53.8	59.6	49.1	52.4	52.4	29.8	30.2	56.0
Average	65.5	57.5	49.3	57.6	60.0	60.9	60.9	57.0	61.3	50.7	52.2	50.3	39.3	41.0	57.8
No. Days	30	30	13	30	2	2	30	30	30	30	14	19	30	30	30

**APPENDIX B**  
**SUMMARY OF STATISTICAL INFORMATION**  
**FOR**  
**CALIFORNIA DEPARTMENT OF TRANSPORTATION**  
**Oakland International Airport**  
**Calendar Year 2005-2006: Third Quarter 2006**  
*Revised March 9, 2007*

1. Size of Noise Impact Area as defined in the Noise Standards (California Code of Regulations, Title 21, Chapter 2.5, Subchapter 6): 0 sq. miles
2. Estimated number of dwelling units included in the Noise Impact Area as defined in the Noise Standards: 0
3. Estimated number of people residing within the Noise Impact Area as defined in the Noise Standards: 0
4. Identification of aircraft type having highest takeoff noise level operating at this airport together with estimated number of operations by this aircraft type during the calendar quarter reporting period: Boeing 727 Hushkit: Approx. 900
5. Total number of aircraft operations during the calendar quarter: 89,521
6. Number of Air Carrier operations during the calendar quarter (not mandatory): 44,597
7. Percentage of Air Carrier operations by aircraft certified under Federal Aviation Regulation (FAR) Part 36, Stage III (Not mandatory): 100% of air carriers/air cargo
8. Estimated number of operations by General Aviation aircraft during the calendar quarter (not mandatory): 44,875\*
9. Estimated number of operations by Military aircraft during the calendar quarter (not mandatory): 49

\* - Includes Air Taxi operations