



CITY OF LONG BEACH

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LONG BEACH AIRPORT

4100 East Donald Douglas Drive • Long Beach, CA 90808 • (562) 570-2619 • Fax (562) 570-2601

December 8, 2015

HONORABLE MAYOR AND CITY COUNCIL
City of Long Beach
California

RECOMMENDATION:

Conduct a Study Session to Receive and Discuss the Fiscal Year 2015 Airport Noise Budget Analysis Report and Supplemental Slot Allocation. (District 5)

DISCUSSION

As part of the longstanding Airport Noise Compatibility Ordinance (Noise Ordinance), a Noise Budget Analysis is prepared annually to determine the noise operating level of scheduled Air Carriers at Long Beach Airport over a 12-month period. For the period October 1, 2014 through September 30, 2015, the Analysis, conducted by Mestre Greve Associates, a Division of Landrum & Brown, revealed that the Air Carriers operated well below the allowed budget levels contained in the Noise Ordinance. This initial analysis led to a further study, which resulted in a determination by Mestre Greve Associates that a minimum of nine (9) additional slots must be added to the required minimum 41 Air Carrier Slots. To ensure accuracy, the Airport requested an audit of both the Fiscal Year 2015 Noise Budget and the additional slot recommendation produced by Mestre Greve Associates. Through these audits, the firm of Harris, Miller, Miller & Hanson (HMMH) concluded that there is substantial Noise Budget available, and confirmed the findings of Mestre Greve Associates that an additional nine (9) slots must be added.

The attached memorandum provides background information on the Noise Ordinance, summarizes the Fiscal Year 2015 Airport Noise Report, and includes copies of the four analyses, as well as the Airport Director's determination per the Noise Ordinance.

This matter was reviewed by Assistant City Attorney Michael J. Mais and by Financial Management Director John Gross on November 25, 2015.

TIMING CONSIDERATIONS

A Study Session is requested to be conducted on December 8, 2015, in order to inform the City Council of the actions necessary to remain in compliance with the Airport Noise Compatibility Ordinance.

FISCAL IMPACT

There is no fiscal or local job impact associated with this recommendation.

HONORABLE MAYOR AND CITY COUNCIL

December 8, 2015

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SUGGESTED ACTION:

Approve recommendation.

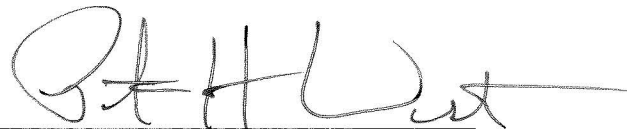
Respectfully submitted,



BRYANT L. FRANCIS
DIRECTOR, LONG BEACH AIRPORT

BF:hs
Attachments

APPROVED:



PATRICK H. WEST
CITY MANAGER



long beach
airport

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Date: November 30, 2015
To: Patrick H. West, City Manager *PLWest*
From: Bryant L. Francis, Director, Long Beach Airport *BLF*
For: Mayor and Members of City Council
Subject: **Long Beach Airport Annual Noise Budget Analysis Report**

The Airport Noise Compatibility Ordinance (Noise Ordinance or Ordinance) for the City of Long Beach (LBMC 16.43) establishes a Community Noise Equivalent Level (CNEL) noise budget for Air Carrier flights at the Airport based on CNEL limits set in the baseline year of 1989-1990. The Ordinance allows Air Carriers to operate a minimum of 41 flights per day and Commuters to operate a minimum of 25 flights per day (the 41/25 limit). All 41 Air Carrier flight slots are currently allocated at the Airport. Only three of the 25 Commuter Slots are currently allocated.

Noise Ordinance Background

The Noise Ordinance is unique and reflects consensus between the City of Long Beach, Federal Aviation Administration (FAA), our residents and various aviation stakeholders on the nature and extent of aircraft operations and noise occurring at the Airport. The Ordinance has not been amended since its adoption in 1995. The Ordinance is grandfathered under the Airport Noise and Capacity Act of 1990 and, for 20 years, the Ordinance has balanced the development of facilities and the growth of operational capacity with the environmental concerns of the surrounding communities. To ensure the continuation of the protections provided, including that noise levels not increase above 1989-1990 CNEL levels, it is necessary for the City to strictly adhere to the requirements of the Ordinance.

Provisions of the Noise Ordinance

Under the Ordinance, Air Carriers are encouraged to operate at the lowest possible noise levels. This encouragement is provided by requiring an increase in the number of flight slots if the Air Carrier category operates at or below the established noise budget, and there is enough "room" in the budget to provide a cushion against exceeding the budget. Pursuant to the Ordinance, the Airport Director must determine on an annual basis whether additional flight slots are required to be allocated based upon the cumulative noise generated by Air Carrier operations during the prior 12-month period. Any slots above the 41 flight slot minimum can only be allocated to the extent the Airport Director determines that the allocation will not lead the Air Carriers to exceed the established budget limits.

Annual Noise Report

Consistent with the City's Noise Ordinance requirements, the Annual Air Carrier Noise Budget Analysis for noise year October 1, 2014 through September 30, 2015 was recently completed by Landrum & Brown Inc., and is attached. Verification of noise budgets are conducted each year. The purpose of the Noise Budget Analysis Report is to determine the cumulative noise budget status for the Air Carrier operator category at the Airport to ensure that noise levels remain below the limits established by the Ordinance.

As detailed in the attached reports, Long Beach Airport's Air Carrier cumulative noise levels for the year are reported to be well below the allocated noise budget. Therefore, additional flight slots must be allocated. There are several factors that contribute to this result including the use of very quiet, new generation aircraft that are encouraged by the Ordinance.

Noise Ordinance Requirements

According to the City's Noise Ordinance, Section 16.43.060.E, if Air Carrier operations are below the allowable noise budget, additional flights beyond the minimum 41, "shall be awarded only to the extent the Airport Manager determines that initiation of service utilizing those flights will not lead the Air Carriers, as a group, to exceed the level established pursuant to Section 16.43.050.C."

Based on this Noise Ordinance requirement, Landrum & Brown Inc., was requested to determine the number of additional flight slots, above the minimum 41 flight slots that must be allocated. Based on the analysis provided in the attached technical reports, and subsequent peer review conducted by Harris, Miller, Miller and Hanson (attached), Landrum & Brown has recommended that an additional nine (9) Supplemental Air Carrier flight slots be allocated in order to comply with the requirements set forth in the Noise Ordinance.

Peer Review

The noise data used for the analysis was obtained from the Airport Noise and Operations Monitoring System (ANOMS™). This system is based on eighteen (18) remote microphones. The microphones are classified as "Type I" microphones and are the most accurate microphones available outside of a laboratory. The system is field calibrated annually with certification traceable to the National Institute of Standards and Technology. Noise level data was independently provided to Landrum & Brown Inc., and Harris, Miller, Miller and Hanson. These firms were selected based upon their reputations and experience evaluating aviation noise. Each of these firms is well-respected and provides services to the National Academy of Science, FAA, airports and local communities. The firms conducted independent evaluations using separate and distinct analysis methods, and the conclusions provided were consistent.

Additional Supplemental Flight Slots

The Landrum & Brown Inc., recommendation is based on 10 years of historical data from actual operations at the Long Beach Airport and includes analysis of aircraft noise levels, historical flight slot utilization, operational time periods, current trends in the aviation industry and conservative estimates of future aircraft activity. Based on this data, the addition of nine (9) Supplemental Air Carrier flight slots reflects the minimum number of flight slots that must be added in order to comply with the requirements of the Ordinance.

Allocation of Supplemental Flight Slots

Any supplemental flight slots allocated will be allocated for a period of one (1) year, consistent with the requirements of the Noise Ordinance, all implementing resolutions of the City including, but not limited to,

City Council Resolution No. C-28465, and in accordance with procedures provided by the Airport Director.

The flight slots will be awarded within 30 days of becoming available based on an established protocol. The Airport Director will notify all Air Carriers currently having a presence at the Airport, as well as other non-incumbent Air Carriers to submit a written request for the flight slot allocations. Supplemental flight slots will be allocated on a first-come, first-served basis. If slots are sought by more than one user, one slot will be allocated sequentially to each requesting Air Carrier. If the Air Carrier is a new entrant to the Airport, they can be awarded two flight slots, if available.

Technical Analysis Summary

As indicated in the attached technical report, the Landrum & Brown Inc., analysis provides conservative estimates of the number of additional flight slots that could be allocated based on a number of assumptions, including that aircraft are operated at the historical time of day distribution of 75 percent day operations, 24 percent evening operations and 1 percent nighttime operations. The analysis also assumes a conservative flight slot utilization rate of 95 percent. The current flight slot utilization rate is 74 percent. The historical 10-year average flight slot utilization rate is 84 percent. The assumptions contained in the Landrum & Brown Inc., analysis are very conservative; however, if the assumptions made regarding aircraft type require modification based on the airline/aircraft type requesting the additional flight slots, the number of flight slots available for allocation will be adjusted accordingly. In addition, in the event the Airport Director determines that the allocation of additional flights has resulted in Air Carrier cumulative noise in excess of the Air Carrier noise budget, and that overall aircraft noise exceeds the level allowed by the Noise Ordinance, the Director will revoke the flight slots allocated in order to achieve compliance with the Air Carrier noise budget.

Airport Recommendation

Based on the dictates of the Ordinance and the relevant noise analyses, the Airport Director has determined that nine (9) Supplemental Flight Slots, consistent with the requirements of LBMC Section 16.43.060.E, be made available to Air Carrier operators for possible allocation.

Appeal Process

The City's Noise Ordinance provides for administrative review of the decisions of the Airport Director if any person or entity contends that an action of the Airport Director is erroneous or unjustified. Any decision by the Airport Director may be appealed to the City Manager and any appeal of final decisions of the City Manager must be conducted consistent with the requirements of the City's Municipal Code requirements. More specific discussion regarding the appeal process is contained in the Airport's "Allocation and Withdrawal Protocol," which will be provided by the City Attorney's Office by separate memo.

If you have any questions or require additional information, please contact Airport Director Bryant L. Francis at extension 8-2605.

BF:RR:tl

Attachments:

- 1) Landrum & Brown Noise Budget Analysis for Noise Year October 1, 2014, through September 30, 2015 dated October 29, 2015
- 2) Harris, Miller, Miller and Hanson Peer Review of Landrum & Brown Noise Budget Analysis for Noise Year October 1, 2014, through September 30, 2015 dated November 2, 2015
- 3) Landrum & Brown Supplemental Flight Slot Analysis dated November 12, 2015
- 4) Harris, Miller, Miller and Hanson Peer Review of Landrum & Brown Supplemental Flight Slot Analysis dated November 19, 2015

Cc: Charles Parkin, City Attorney
Michael J. Mais, Assistant City Attorney
Tom Modica, Assistant City Manager



October 29, 2015

Mr. Mike Mais
Assistant City Attorney
Long Beach Airport
4100 Donald Douglas Drive
Long Beach, CA 90808

Subject: Long Beach Airport Noise Budget Analysis For Noise Year October 1, 2014 to September 30, 2015

Dear Mike,

Mestre Greve Associates, a Division of Landrum & Brown, has completed the analysis of the Airline Noise Budget for Noise Year October 1, 2014 through September 30, 2015 (NY '14-15).

The data show that the air carriers operated well below the allowed budget at RMT 9 and well below budget at RMT 10. Table 1 compares the allowed budget with the actual budget used:

Table 1
Noise Budget Status For Noise Year 2014/15

Location	Allowed Budget	Actual Budget Used
RMT 9	70.7	41.9
RMT 10	84.6	50.3

The reason the budget numbers are well below the permitted levels is due to the reduction in the number of noisier aircraft types and the fact that the airport operated well below the permitted minimum number of daily air carrier flights. While the permitted minimum number of air carrier flights is 41, the airlines and cargo carriers actually averaged 30.4 flights per day.

Section 16.43.060E states that if the air carrier operations are below the allowable noise budget then additional flights "shall be awarded only to the extent the Airport Manager determines that initiation of service utilizing those flights will not lead the Air Carriers, as a group, to exceed the level established pursuant to section 16.43.050 C."



Because the budget results are well below the budget limit (as was the case in NY '13-14), there is room to allocate flights above the 41 flights provided that such additional allocations do not result in exceeding the allowed budget. The number of additional flights is highly dependent on the type of aircraft used, the aircraft weight, and the time of the operation as some aircraft are noisier than others, departure noise increases with aircraft weight, and the noise budget methodology is very sensitive to the time of day of the flight.

Noise Budget Methodology

The noise budget status was computed from individual flight data collected from the Long Beach Airport's permanent airport noise monitoring system (ANOMS). Individual data was provided for each of the commercial airline flights arriving and departing from Long Beach Airport during the budget year. The following paragraphs describe the computation methodology.

An example of 5 flights recorded at RMT 9 are as follows:

<u>Max Date Time</u>	<u>Aircraft Type</u>	<u>Airline</u>	<u>A/D/O</u>	<u>Runway</u>	<u>RMT</u>	<u>SEL</u>
10/1/02 7:06	MD80	AAL	D	30	9	99.7
10/1/02 7:09	A320	JBU	D	30	9	89.8
10/1/02 7:11	A320	AWE	D	30	9	88.2
10/1/02 7:17	A320	JBU	D	30	9	94.7
10/1/02 8:02	A320	JBU	D	30	9	90

The first column lists the date and time of the flight. The time used for noise budget calculations is the time that the noise event was recorded at the monitoring site, not the scheduled flight time. Subsequent data includes the aircraft type, airline, departure/arrival/overflight, runway utilized, noise monitor measurement site, and the Sound Exposure Level (SEL), in decibels, as measured at the RMT (remote monitoring terminal).

It is interesting to note that 4 of the 5 aircraft in the above example are Airbus A-320's and there is a substantial range in the measured noise level. There are many factors that contribute to this range, but the most significant is aircraft weight. Aircraft weight is a function of the number of passengers and the distance to the destination. A flight of 2000 miles carries substantially more fuel than a flight of 250 miles.



More importantly, these data show how much louder an MD80 is on departure than the Airbus A320.

Noise Budget Calculations and Analysis

The conversion of the measured SEL at RMT 9 and RMT 10, is done according to the budget definitions and as prescribed in the City's Noise Compatibility Ordinance (LBMC 16.43).

The first step in analyzing the data is to convert the noise measurements made at RMT 9 and RMT 10 to the noise level at the nearest residences to Runway 12/30. For RMT 9 the noise level is increased by 1.1 dB and at RMT 10 the noise level is increased by 0.9 dB to account for the fact that the nearest homes are closer to the runway than the actual monitoring stations.

The next step is to convert the noise level at the nearest home to an equivalent number of daytime flights of the 'standard' aircraft that is built into the budget. This equivalent number of daytime flights is termed "budget units." The 'standard' aircraft noise level is the SEL that 100 daytime flights would have to have to produce a CNEL of 65 dB at the nearest residence.

The resulting numbers of equivalent budget units are then compared to the budget allocations of 70.7 budget units at RMT 9, and 84.6 at RMT 10. The budget allocations were based on the 1989/90 baseline actual noise level and industrial aircraft forecast as prescribed in the federal court approved and federal code-grandfathered Long Beach Airport Noise Compatibility Ordinance (LBMC 16.43).

If you have any questions please do not hesitate to call.

Yours very truly,

Mestre Greve Associates Division of Landrum & Brown

A handwritten signature in black ink, appearing to read 'Vincent Mestre', is written over a horizontal line.

Vincent Mestre, P.E.

HMMH

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November 2, 2015

Mr. Ron Reeves
Noise & Environmental Affairs Officer
Long Beach Airport
4100 E. Donald Douglas Dr.
Long Beach, California 90808

Subject: Long Beach Airport Air Carrier Noise Budget Contribution Audit

Reference: HMMH Project Number 307950

Dear Mr. Reeves:

 Per your request, HMMH conducted an audit of the Long Beach Airport (LGB) Noise Budget for Budget Year 2015 (October 1, 2014 through September 30, 2015). The purpose of the audit was to verify the accuracy of the input data, calculation methods and results for the Air Carrier aircraft category. These aircraft are defined by the Airport Noise Compatibility Ordinance (Long Beach Municipal Code (LBMC) Chapter 16.43) as follows¹:

“Air Carrier” means a scheduled carrier, certificated under FAR Parts 121, 125, or 135, operating aircraft having a certificated maximum takeoff weight of seventy-five thousand pounds or more, transporting passengers or cargo.”

I understand LBMC 16.43 reflects consensus, derived through an extensive twelve year litigation history between the City of Long Beach and various Air Carriers operating out of the Long Beach Airport. The Airport Noise Compatibility Ordinance is grandfathered under the Airport Noise and Capacity Act of 1990 (ANCA) and for 20 years, the Ordinance has balanced the development of facilities and the growth of operational capacity with the legitimate environmental concerns of the surrounding communities.

It is the stated goal of the City, consistent with State of California requirements and federal guidelines, that incompatible property in the vicinity of the Airport not be exposed to noise levels above 65 dB² in terms of the Community Noise Equivalent Level (CNEL). To achieve this goal, LBMC Chapter 16.43 establishes noise budgets for five airport user categories. Initial noise budgets were determined based on actual monitored noise levels for the twelve month period ending October 31, 1990. These budgets are shown in **Table 1: Runway 12-30 Cumulative Noise Budgets**. I understand the noise budgets shown in **Table 1** have not been modified since inception of the Ordinance and there are currently no plans to modify these allocations.

Aircraft User Category	RMT 9	RMT 10
Air Carrier	70.7	84.6
Commuter	0.4	3.6
Industrial	8.5	6.6
Charter	0.14	0.09
General Aviation	23.0	26.0
Total	102.74	120.89

Source: Airport Noise Compatibility Ordinance (Long Beach Municipal Code (LBMC) Chapter 16.43, Technical Appendix.

¹ Long Beach Municipal Code, 16.43.010 Definitions, Section A. Air Carrier.

² Note that all noise levels presented in this document are A-weighted unless otherwise specified.

According to the Airport Noise Compatibility Ordinance, the Airport Director is required to evaluate compliance with the budgets on an annual basis. Air Carriers are permitted to operate not less than forty-one (41) flights per day. 41 flights per day was the minimum number of flights specified when the Ordinance was originally adopted in 1995. The Ordinance defines a flight as one arrival and one departure by an aircraft. The Ordinance provides an incentive to the airlines to operate as quietly as possible. According to the Ordinance³:

"In order to achieve applicable noise budgets, users within the Air Carrier category will be encouraged to operate at the lowest average noise level consistent with safety. This encouragement will be provided by permitting increases in the number of allowed Air Carrier Flights if the Air Carrier user group achieves compliance with the CNEL budget established pursuant to this Chapter, as determined on an annual basis."

"Additional flights above those permitted [by the Municipal Code] shall be awarded only to the extent the Airport Manager determines that initiation of service utilizing those flights will not lead the Air Carriers, as a group, to exceed the level established..."

The "level established" by the Ordinance is defined as the Noise Contribution Budget (presented in Table 1), which is enforced based on the measured Single Event Noise Exposure Level (SENEL) at remote monitoring terminals (RMT) 9 and 10 of the LGB aircraft noise monitoring system. Since the Ordinance allows for the increase in flights if they will not exceed the "level established", not increasing the number of flights, if permitted based on the measured noise levels, would result in the Airport being more restrictive and may jeopardize the grandfathered status of the Ordinance.

Measured SENEL values are used to determine the annual Noise Contribution Budget and CNEL at the nearest noise sensitive properties to the respective terminals. Since neither of the RMTs are located at the nearest noise sensitive properties, an offset or correction factor is applied to the noise levels measured at the RMTs to represent the noise levels at the nearest noise sensitive properties. For RMT 9 the SENEL is increased by 1.1 dB and at RMT 10 the SENEL is increased by 0.9 dB to account for the nearest residential properties being closer to LGB than the noise monitors⁴.

The intent of establishing the noise budget was to allow only the number of flights that would result in producing a CNEL of 65 dB at the nearest residence. CNEL is a cumulative 24-hour noise metric that includes all single event noise levels for an entire day and multiplies the measured level by a factor of 3 for noise events measured during evening hours (7 pm to 10 pm) and a factor of 10 during nighttime hours (10 pm to 7 am). Assuming 100 daytime flights, an SENEL of 94.4 dB for each of those flights will generate a CNEL of 65 dB. Since the number of total flights in the noise budget is slightly higher than 100 flights, using 94.4 dB SENEL for the flights allowed in the noise budget, we calculate that the baseline CNEL or the CNEL for which the Municipal Code budget permits at the nearest residences in proximity to RMTs 9 and 10 are 65.1 dB and 65.8 dB, respectively.

The total Noise Contribution Budget is 102.74 at RMT 9 and 120.89 at RMT 10. The air carrier Noise Contribution Budget⁵ is 70.7 (68.8% of 102.74) at RMT 9 and 84.6 (70% of 120.89) at RMT 10. Based on the CNEL budgets allowed at the noise sensitive properties nearest the monitoring locations, the air carrier Noise Contribution Budget equates to 63.5 dB (of the 65.1 dB budget) and 64.3 dB (out of the 65.8 dB budget) in terms of CNEL at RMT 9 and 10, respectively.

Using correlated aircraft noise event data from the LGB Airport Noise and Operations Monitoring System (ANOMS™), which included SENEL measured at RMT 9 and RMT 10 along with the flight operation (e.g., airline, aircraft type, destination/origin airport, and date and time of the noise event), HMMH assessed the existing air

³ Long Beach Municipal Code, 16.43.060 Compliance with noise budgets, Section E. Air Carrier Flights.

⁴ Long Beach Airport Terminal Improvements, Appendix F Technical Report: Noise Analysis, October 2005, Mestre Greve Associates.

⁵ Technical Appendix to Chapter 16.43 Airport Noise Compatibility Municipal Code, Noise Contribution Values for Proposed Long Beach City Ordinance.



carrier Noise Contribution Budget for the annual period of October 1, 2014 through September 30, 2015 as summarized in **Table 2: Calculated Air Carrier Noise Budget Contribution (2015)**.

Table 2: Calculated Air Carrier Noise Budget Contribution (2015)		
Category	RMT 9	RMT 10
Total Noise Contribution Budget ¹	102.74	120.89
Air Carrier Noise Contribution Budget ¹	70.7	84.6
Air Carrier Noise Contribution Budget ¹ (%)	68.8%	70.0%
Total CNEL Allowed at Nearest Noise Sensitive Property	65.1 dB	65.8 dB
Air Carrier CNEL Allowed at Nearest Noise Sensitive Property	63.5 dB	64.3 dB
Measured Air Carrier CNEL	61.3 dB	62.0 dB
Actual Air Carrier Noise Contribution for year ending September 30, 2015	42.2	50.7
Unused Air Carrier Noise Contribution Budget for year ending September 30, 2015	28.3	33.6
Unused Air Carrier Noise Contribution Budget for year ending September 30, 2015 (%)	40.0%	39.7%
<i>Note: (1) Technical Appendix to Chapter 16.43 Airport Noise Compatibility Municipal Code. Total is equal to the budgets from air carriers, commuters, industrial, charter and general aviation. Percent is air carrier budget divided by total budget.</i>		



Our analysis shows that for the most recent full year of operations ending September 30, 2015, the actual air carrier Noise Contribution levels are far below those allowed in the Noise Contribution Budget of the Municipal Code: 42.4 actual vs. 70.7 budgeted at noise sensitive properties close to RMT 9 and 50.7 actual vs 84.6 budgeted at noise sensitive properties close to RMT 10. The difference in actual vs. budget indicates that approximately 40% more flights could have occurred during the year ending September 30, 2015 and still have remained within the budget.

Sincerely yours,

Harris Miller Miller & Hanson Inc. d/b/a/ HMMH

Eugene M. Reindel
 Vice President and Principal Consultant

Note: Excel spreadsheet with Noise Contribution calculations provided separately



To: Mr. Mike Mais, Assistant City Attorney, City of Long Beach
From: Vincent Mestre, P.E., Associate Vice President, Landrum & Brown
Date: November 12, 2015
Re: Long Beach Airport Additional Slots Budget

Long Beach Municipal Code (LBMC) Chapter 16.43 requires the Airport to evaluate noise budgets for each user category to ensure compliance with the applicable budget limit for each user category and to encourage compliance with the overall goal of the City that incompatible property in the vicinity of the Airport not be exposed to noise above 65 Community Noise Equivalent Level (CNEL). The Code states that on an annual basis, the Airport shall determine whether additional air carrier slots may be added¹:

“In order to achieve applicable noise budgets, users within the Air Carrier category will be encouraged to operate at the lowest average noise level consistent with safety. This encouragement will be provided by permitting increases in the number of allowed Air Carrier Flights if the Air Carrier user group achieves compliance with the CNEL budget established pursuant to this Chapter, as determined on an annual basis.”

Based on analysis and review of data for Noise Year October 1, 2014 through September 30, 2015 (NY '14-15), the Airport is currently operating well below the noise budgets for Air Carriers and additional flight slots, beyond the minimum forty-one flights specified by LBMC 16.43.060 E, may be allocated. As shown in **Table 1**, noise budget limits for the Air Carrier Category at RMT 9 and RMT 10 are 70.7 and 84.6 respectively. The actual budget utilized by Air Carriers for NY '14-15 was 41.9 at RMT 9 and 50.3 at RMT 10. These data indicate that 28.8 budget units are available at RMT 9 and 34.3 budget units are available at RMT 10.

Table 1: Air Carrier Noise Budget Performance (October 1, 2014 – September 30, 2015)

Location	Allowable Budget ²	Actual Used ³	Budget Available ⁴	Percent of Budget Remaining
RMT 9	70.7	41.9	28.8	40.7%
RMT 10	84.6	50.3	34.3	40.5%

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CNEL is based on the loudness of noise events and the time of day noise events occur. In order to determine the potential number of flight slots that may be available, the budget data must be adjusted for the time of each operation and aircraft noise level. These factors greatly influence the noise budget calculations.

CNEL incorporates weighting penalties to account for the increased intrusiveness of noise that occurs during the evening and nighttime periods. Evening is defined as the period from 7:00 p.m. to 10:00 p.m. Noise events occurring during the evening period are weighted by 4.8 dBA. Nighttime is defined as the period from 10:00 p.m. to 7:00 a.m. Noise events occurring during the nighttime period are weighted by 10 dBA. Historically, approximately seventy-five percent of the Airport's Air Carrier operations occur during the daytime (7:00 a.m. to 7:00 p.m.) period, twenty-four percent occur during the evening period and one percent occur during the nighttime period.

Aircraft noise levels are another key factor in the noise budget calculations. The conversion of the measured Single Event Noise Exposure Level (SENEL) at RMT 9 and RMT 10, is done according to the budget definitions and as prescribed in State of California Noise Standards⁵ and LBMC 16.43. The equation for CNEL as a function of SENEL and number of daytime flights is as follows:

$$CNEL = SENEL + 10\text{Log}_{10}N_{eq} - 49.4$$

The above equation can be solved for a value of 65 CNEL and 100 daytime flights and the result is that the 'standard' aircraft SENEL is 94.4 dBA. The task of converting the actual SENEL to an equivalent number of budget units is done using the following equation:

$$N = \frac{10^{SEL/10}}{10^{94.4/10}}$$

The N computed in the above equation is the number of equivalent noise budget units that are contributed to the budget for a daytime flight. If the flight occurred between the hours of 7:00 pm and 10:00 pm, the result is multiplied by a factor of 3. This is equivalent to adding 4.8 dBA. If the flight occurred between the hours of 10:00 pm and 7:00 am the result is multiplied by a factor 10. This is equivalent to adding 10 dBA.

Budget values for representative aircraft in the Air Carrier Category that may be candidates to operate scheduled service from Long Beach Airport (LGB) are shown in **Table 2**. These aircraft were selected based on commonality in current airline fleets for LGB service markets and include the Airbus A319 and A320 aircraft, the Boeing 737-400, 737-700, 737-800 and 757-200 aircraft, along with the McDonnell Douglas MD-83 aircraft.

Table 2: Representative Aircraft Noise Budget Performance

Aircraft Type	Op	RMT	Average SENEL	Sample Size	Budget Units			Day	Eve	Night	Weighted Average Budget Units
					Day	Eve	Night	75%	24%	1%	
A319	A	10	93.9	1,168	0.9	2.7	8.9	0.7	0.6	0.1	1.4
A319	D	9	92.2	1,220	0.6	1.8	6.0	0.5	0.4	0.1	0.9
A320	A	10	94.1	86,279	0.9	2.8	9.3	0.7	0.7	0.1	1.5
A320	D	9	93.6	86,884	0.8	2.5	8.3	0.6	0.6	0.1	1.3
B734	A	10	96.9	27	1.8	5.4	17.8	1.3	1.3	0.2	2.8
B734	D	9	94.8	26	1.1	3.3	11.0	0.8	0.8	0.1	1.7
B737	A	10	95.7	3,634	1.3	4.1	13.5	1.0	1.0	0.1	2.1
B737	D	9	94.1	3,573	0.9	2.8	9.3	0.7	0.7	0.1	1.5
B738	A	10	95.2	59	1.2	3.6	12.0	0.9	0.9	0.1	1.9
B738	D	9	93.6	59	0.8	2.5	8.3	0.6	0.6	0.1	1.3
B757	A	10	97.9	106	2.2	6.8	22.4	1.7	1.6	0.2	3.5
B757	D	9	93.3	106	0.8	2.3	7.8	0.6	0.6	0.1	1.2
MD83	A	10	96.6	2,177	1.7	5.0	16.6	1.2	1.2	0.2	2.6
MD83	D	9	101.6	2,158	5.2	15.8	52.5	3.9	3.8	0.5	8.3

Note: The data in this table and **Table 4** are based on historical noise data for when these aircraft operated at Long Beach and represent the operating weights for those operations. Any new operations at lower weights or higher weights would cause the average budget units to go down or up accordingly.

The first column of **Table 2**, "Aircraft Type" lists the representative aircraft types. The second column, "Op" refers to the type of operation, aircraft arrival or departure. RMT 10 is the primary arrival noise monitor and RMT 9 is the primary departure noise monitor. The long-term average noise levels (SENEL) for arrivals and departures for each aircraft type is shown in column four. The individual aircraft noise levels (SENELs) are based on long-term historical data gathered over a ten-year period (January 1, 2005 through December 31, 2014) from the Airport Noise and Operations Monitoring System (ANOMS™) database for the specific aircraft types. The "Sample Size" is the total number of aircraft measured and validated at each location.

For these calculations, the historical average Day (75%), Evening (24%) and Night (1%) Air Carrier time-of-day distribution was used to calculate the weighted average budget units. The Budget Units for each aircraft operation for Day, Evening and Night operations are shown in the following columns along with the respective contributions. The weighted average noise budget values are shown in the far right column and represent the average noise budget for a single arrival and departure for the representative aircraft types. If an Air Carrier operator were to add a higher percentage of day flights, less noise budget, below the values shown in **Table 2**, would be used.

These data indicate that the number of available flight slots vary by aircraft type and operation. Because aircraft arrival and departure flight procedures, performance and noise characteristics vary for specific aircraft; the number of available slots also varies for arrivals and departures within the aircraft types. As shown in **Table 2**, the lowest noise levels are associated with the A319 and A320 aircraft. The "next generation" B737 aircraft are represented by the B737-700 and B737-800. The B737-400 represents the "classic" or older generation B737 aircraft. The

B757 represents larger aircraft and the MD-83 is an example of older technology aircraft. These aircraft are significantly louder than the Airbus and Boeing aircraft.

The data shown in **Table 2** can be used to determine the number of additional flights that may be operated while remaining within the noise budgets contained in LBMC Chapter 16.43. The available noise budget at RMT 9 and RMT 10 is shown in **Table 1**. Based on these data and the Weighted Average Budget Unit for each aircraft, the number of additional operations can be estimated.

During this period air carriers operated an average of 30.4 daily flights of the 41 daily flights that are allocated. The current utilization of 30.4 flights per day represents a utilization rate of seventy-four percent and is well below the long-term average utilization rate of eighty-four percent or 34.4 flights per day. Per the Ordinance, Air Carriers could operate an additional 10.6 flights per day to achieve one hundred percent utilization (41 flights per day).

It is very unlikely that the Air Carriers as a group would ever achieve one hundred percent utilization. For example, airlines and air cargo operators typically operate reduced schedules on the weekends. In order to determine the budget available for additional flight slots that may safely be added to ensure compliance with the provisions of LBMC Chapter 16.43, it is necessary to make reasonable and conservative assumptions with regard to slot utilization.

Historical flight slot utilization data indicates that the average long-term flight slot utilization is eighty-four percent and the maximum annual flight slot utilization was ninety-three percent. These values are based on historical data for the ten-year period January 1, 2005 through September 30, 2015. For purposes of this analysis, maximum annual flight slot utilization of ninety-five percent is used, that is, no matter how many slots are allocated, only ninety-five percent are actually flown on a given day.

If the Air Carriers operate ninety-five percent of the minimum forty-one flight slots the noise budget used would increase. This is shown in **Table 3**. These data indicate that if there Air Carriers utilized ninety-five percent of the available flight slots, approximately twenty-four percent of the allowable noise budget at RMT 9 and RMT 10 would remain available for allocation to additional flight slots.

Table 3: Predicted Air Carrier Noise Budget Performance at 95% Flight Slot Utilization

Location	Allowable Budget	Predicted Used	Budget Available	Percent of Budget Remaining
RMT 9	70.7	53.8	16.9	23.9%
RMT 10	84.6	64.6	20.0	23.7%

Table 4 indicates the available flight slots for each representative aircraft type. Note that the additional flight slots shown in the last column are exclusive to that aircraft type and operation, not cumulative.

Table 4: Available Flight Slots At 95 Percent Utilization

Aircraft Type	Op	RMT	Average SENEL	Sample Size	Budget Units			Day	Eve	Night	Weighted Average	Additional Flight Slots Available	
					Day	Eve	Night	75%	24%	1%		RMT 9	RMT 10
A319	A	10	93.9	1,168	0.9	2.7	8.9	0.7	0.6	0.1	1.4		14.3
A319	D	9	92.2	1,220	0.6	1.8	6.0	0.5	0.4	0.1	0.9	17.8	
A320	A	10	94.1	86,279	0.9	2.8	9.3	0.7	0.7	0.1	1.5		13.6
A320	D	9	93.6	86,884	0.8	2.5	8.3	0.6	0.6	0.1	1.3	12.9	
B734	A	10	96.9	27	1.8	5.4	17.8	1.3	1.3	0.2	2.8		7.2
B734	D	9	94.8	26	1.1	3.3	11.0	0.8	0.8	0.1	1.7	9.8	
B737	A	10	95.7	3,634	1.3	4.1	13.5	1.0	1.0	0.1	2.1		9.4
B737	D	9	94.1	3,573	0.9	2.8	9.3	0.7	0.7	0.1	1.5	11.5	
B738	A	10	95.2	59	1.2	3.6	12.0	0.9	0.9	0.1	1.9		10.6
B738	D	9	93.6	59	0.8	2.5	8.3	0.6	0.6	0.1	1.3	12.9	
B757	A	10	97.9	106	2.2	6.8	22.4	1.7	1.6	0.2	3.5		5.7
B757	D	9	93.3	106	0.8	2.3	7.8	0.6	0.6	0.1	1.2	13.8	
MD83	A	10	96.6	2,177	1.7	5.0	16.6	1.2	1.2	0.2	2.6		7.7
MD83	D	9	101.6	2,158	5.2	15.8	52.5	3.9	3.8	0.5	8.3	2.0	

The data shown in **Table 4** indicates that a minimum of 2.0 additional flight slots could be added if all additional slots were flown with MD-83 aircraft and a maximum of 14.3 flight slots could be added if A319 aircraft exclusively flew the additional slots. Fortunately, the older, louder MD-80 series aircraft are reaching the end of their service life and are rapidly being retired by the airlines. It is very unlikely that MD-80 air carrier operations would be introduced at Long Beach Airport. It is also not prudent that the Airport rely on operators to exclusively use very quiet aircraft such as the A319 when evaluating the potential for additional operations.

In order to assess the number of additional flight slots, beyond the minimum 41, that could be made available within the Ordinance, it is necessary to make assumptions regarding the aircraft types that may operate these additional flights. Aircraft noise levels have historically reduced over time. As shown in **Table 4**, the older MD-83 aircraft are significantly louder than the newer A319 aircraft. The A319 aircraft first flew in 1996, nearly twenty years ago. Airlines are currently ordering even quieter aircraft such as the A320neo "new engine option" and the B-737 Max.

A mix of B737-700, B737-800 and B757 aircraft were evaluated for future operations at Long Beach Airport. These aircraft are common in existing airline fleets and are considered to be representative with respect to noise levels for existing and future aircraft that may serve additional flight slot allocations. The B757 is the largest aircraft that can be accommodated at the airport terminal. These aircraft are louder than the A320 aircraft, the most common air carrier aircraft operating at Long Beach Airport, and reflect a very conservative estimate of future aircraft noise levels.

In terms of potential options for additional flights, if four B737-700 aircraft slots, four B737-800 slots and one B757 slot were added, and ninety-five percent utilization and existing time of day were maintained, the Airport would continue to remain below the established noise limits. This scenario is reflected in **Table 5**.

Table 5: Predicted Air Carrier Noise Budget Performance at 95% Flight Slot Utilization Plus Nine Additional Slots

Location	Allowable Budget	Predicted Used	Budget Available	Percent of Budget Remaining
RMT 9	70.7	65.5	5.2	7.3%
RMT 10	84.6	83.2	1.4	1.7%

This analysis uses a very conservative assumption for flight slot utilization (95%). The long-term average flight slot utilization is eighty-four percent. The mix of aircraft assumed for the additional slots is representative of the loudest aircraft that could be reasonably expected to utilize additional slots. Based on the long-term data and conservative assumptions used in this analysis, it can be concluded that an additional nine flights, beyond the current minimum of 41 flights, could be safely accommodated within the existing noise budgets contained in LBMC 16.43.

Additional flights, beyond the minimum 41 flights, are allocated for a period of one year. In the unlikely event the air carrier and overall noise budgets are exceeded, LBMC 16.43 contains provisions for revocation of these additional flight slots. LBMC 16.43 E.5 states:

In the event the Airport Manager determines: (a) that implementation of Flights awarded under Subsection E.4 has resulted in air carrier cumulative noise in excess of the Air Carrier noise budget; and (b) that overall aircraft noise exceeds the level allowed by Subsection 16.43.050.A, the Airport Manager shall revoke such of the Flight awards granted under Subsection E.4 as the Airport Manager determines must be revoked in order to achieve compliance with the Air Carrier noise budget.

¹ Long Beach Municipal Code Chapter 16.43.060 E.

² Long Beach Municipal Code Chapter 16.43 Technical Appendix.

³ Landrum & Brown Inc. Analysis, November 5, 2015.

⁴ Long Beach Airport Staff calculations.

⁵ California Code of Regulations, Title 21 Subchapter 6 Noise Standards, Paragraph 5001.

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November 19, 2015

Mr. Ron Reeves
 Noise & Environmental Affairs Officer
 Long Beach Airport
 4100 E. Donald Douglas Dr.
 Long Beach, California 90808

Subject: Review of Potential Increase in Daily Air Carrier Operations Allowed within Existing Air Carrier Noise Budget – Long Beach Airport
 Reference: HMMH Project Number 307950

Dear Mr. Reeves:



Based on the results of the noise budget audit HMMH completed and summarized in a letter dated November 2, 2015, this follow-up letter determines the number of additional air carrier flights¹ permitted above the minimum of 41 allowed by the Airport Noise Compatibility Ordinance (Long Beach Municipal Code (LBMC) Chapter 16.43)² without exceeding the Air Carrier Noise Budget of 70.7 and 84.6 at RMT 9 and RMT 10, respectively as shown in **Table 1: Runway 12-30 Cumulative Noise Budgets**.

Table 1: Runway 12-30 Cumulative Noise Budgets		
Aircraft User Category	RMT 9	RMT 10
Air Carrier	70.7	84.6
Commuter	0.4	3.6
Industrial	8.5	6.6
Charter	0.14	0.09
General Aviation	23.0	26.0
Total	102.74	120.89

Source: Airport Noise Compatibility Ordinance (Long Beach Municipal Code (LBMC) Chapter 16.43, Technical Appendix.

As documented in our November 2, 2015 letter, HMMH assessed the existing air carrier Noise Contribution Budget for the annual period of October 1, 2014 through September 30, 2015 as summarized in **Table 2: Calculated Air Carrier Noise Budget Contribution (2015)**. Our analysis showed that for the most recent full year of operations ending September 30, 2015, the actual air carrier Noise Contribution levels are far below those allowed in the Noise Contribution Budget of the Municipal Code.

¹ The Ordinance defines a flight as one arrival and one departure by an aircraft.

² Long Beach Municipal Code, 16.43.010 Definitions, Section A. Air Carrier.

Table 2: Calculated Air Carrier Noise Budget Contribution (2015)

Category	RMT 9	RMT 10
Total Noise Contribution Budget ¹	102.74	120.89
Air Carrier Noise Contribution Budget ¹	70.7	84.6
Air Carrier Noise Contribution Budget ¹ (%)	68.8%	70.0%
Total CNEL Allowed at Nearest Noise Sensitive Property	65.1 dB	65.8 dB
Air Carrier CNEL Allowed at Nearest Noise Sensitive Property	63.5 dB	64.3 dB
Measured Air Carrier CNEL	61.3 dB	62.0 dB
Actual Air Carrier Noise Contribution for year ending September 30, 2015	42.2	50.7
Unused Air Carrier Noise Contribution Budget for year ending September 30, 2015	28.3	33.6
Unused Air Carrier Noise Contribution Budget for year ending September 30, 2015 (%)	40.0%	39.7%

Note: (1) Technical Appendix to Chapter 16.43 Airport Noise Compatibility Municipal Code. Total is equal to the budgets from air carriers, commuters, industrial, charter and general aviation. Percent is air carrier budget divided by total budget.



The data from the LGB noise monitoring system consisted of 10,980 aircraft operations as measured at RMT 9 and 11,090 at RMT 10, which equates to an annual average of 30 daily aircraft operations as compared to the currently available "slots" provided to the air carriers for up 41 daily operations. In order to protect the grandfathered noise budget at LGB, the Airport is interested in determining the additional number of slots, above the minimum of 41 allowed by Ordinance, they can provide to air carriers and remain within the air carrier noise budget as shown in Table 1.

Our analysis assumes the following:

1. Air carriers will operate a similar fleet mix with the additional slots as they currently operate
2. Air carriers will operate the same mix of day, evening and night operations as they do currently

As shown in Table 2, air carrier operations accounted for CNEL of 61.3 dB at RMT 9 and 62.0 dB at RMT 10. Had the number of daily operations increased from 30 to 41 (along with the preceding assumptions), the resulting measured CNEL at RMT 9 and RMT 10 would have been 62.6 dB and 63.4 dB, respectively. This is 0.9 dB below the allowable CNEL. To increase the CNEL by 0.9 dB, the allowable slots could increase from the minimum of 41 to 50 at RMT 9 and 51 at RMT 10. Therefore, we find the Airport may increase the minimum slots from 41 to 50 (an increase of 9 slots) based on the air carrier noise budget contribution as measured in 2015.

Our analysis confirms the findings in the Landrum & Brown November 12, 2015 Memo, **Long Beach Airport Additional Slots Budget**, which suggested the Airport could add 9 slots:

"In terms of potential options for additional flights, if four B737-700 aircraft slots, four B737-800 slots and one B757 slot were added, and ninety-five percent utilization and existing time of day were maintained, the Airport would continue to remain below the established noise limits."

Sincerely yours,

Harris Miller Miller & Hanson Inc. d/b/a/ HMMH

Eugene M. Reindel
 Vice President and Principal Consultant

Note: Excel spreadsheet with Noise Contribution calculations provided separately