Attachment C:
Air Quality Analysis of Aircraft Taxing & Queuing Alternatives for Taxiway November at Logan International Airport

Report No. 300280.004
May 2006

Prepared for
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and the
Federal Aviation Administration

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EXECUTIVE SUMMARY

This document represents Attachment C to the main report "Logan International Airport, Additional Taxiway Evaluation Report."[1] This attachment contains the technical details of the Phase 1 air quality analysis of the taxiing and queuing alternatives for Taxiway November at Boston Logan International Airport. The main report discusses the purpose, methodology and results of all of the assessments.

The purpose of this assessment is to evaluate the potential effects on air quality resulting from two different aircraft taxiing and queuing alternatives for Taxiway November. The alternatives analyzed are referred to as "Free Flow" (i.e., the unrestricted case) and "Limit All Jets" (i.e., the restricted case).

The approach to completing this assessment involves models, data and other supporting information common to airport-related air quality analyses. This includes the use of the latest version of the Federal Aviation Administration (FAA) Emissions Dispersion & Modeling System (EDMS) to compute aircraft emissions. Aircraft operational data developed by Harris Miller Miller & Hanson (HMMH) on behalf of the FAA were also used. For consistency, these are the same data utilized by HMMH for its study of the potential noise effects associated with the Taxiway November alternatives.

The primary aim of this assessment is the evaluation of aircraft emissions along Taxiway November and their potential impacts to regional air quality and the local air quality in the residential areas of East Boston and Winthrop that are closest to the airport. In order to achieve this goal, the assessment is comprised of two primary components: a quantitative analysis and a qualitative analysis.

According to the results, two primary findings important to air quality are evident when comparing the Free Flow and Limit All Jets alternatives. These are summarized as follows:

- The Limit All Jets Alternative will result in the same amount of total aircraft emissions when compared to the Free Flow Alternative. This is because the total aircraft taxi and queue times are forecasted to be the same on Taxiway November under both alternatives.

- Under the Limit All Jets Alternative, fewer aircraft emissions will be generated north of Runway 15L when compared to the Free Flow Alternative. This is because taxiing and queuing aircraft will spend less time in this area under the restricted condition. However, in the context of the total emissions from the airport as a whole, these differences are quite small.

[1] "Logan International Airport, Additional Taxiway Evaluation Report per FAA August 2, 2002 Record of Decision," Harris Miller Miller & Hanson Inc. Report 300280.001, April 2006.

Based on these findings**,** the Limit All Jets Alternative is not expected to have any impact on regional air quality conditions when compared to the Free Flow Alternative. This is because the total amounts of emissions are essentially the same under both alternatives. Local air quality in the areas of East Boston and Winthrop, which are closest to Taxiway November, will also likely not experience any measurable effects from the Limit All Jets Alternative for much the same reason and because the emissions on Taxiway November are a small percentage of the overall total at the airport.

Finally, the effects of total airport-related emissions (including those associated with Taxiway November) were also analyzed in the *Logan Airside Improvements Planning Project Supplemental DEIS/FEIR.* The dispersion modeling results from this analysis indicated that these emissions will not cause nor substantially contribute to any violation of the National Ambient Air Quality Standards. Furthermore, the differences in emissions between the alternatives evaluated in this study are not expected to exceed the *de minimis* emission thresholds contained in the Federal Clean Air Act General Conformity Rule.

I. INTRODUCTION & APPROACH

This document represents Attachment C to the main report entitled "Logan International Airport, Additional Taxiway Evaluation Report."[2] This attachment contains the technical details of the Phase 1 air quality analysis, which addresses taxiing and queuing alternatives for Taxiway November. The main report discusses the purpose, methodology and results of all of the assessments, which include operations and noise analyses.

Background and Study Purpose

The overall study of which this Attachment is a part was conducted to evaluate the environmental effects of alternative scenarios pertaining to the taxiing and queuing of aircraft on Taxiway November and on the proposed new Centerfield Taxiway whose impacts were assessed in the Environmental Impact Statement for Logan Airside Improvements Planning Project. This overall study is designed to address requirements of the Record of Decision on the EIS in which the Federal Aviation Administration (FAA) deferred a decision on the new taxiway pending an additional analysis of taxiway operations on the northern portion of the airfield "to assess potential beneficial operational procedures that would preserve or improve the operational and environmental benefits of the Centerfield Taxiway."[3]

As described in the main report, "candidate actions" to address community concerns were identified by community members and the FAA for review and consideration. Candidate Action 2 would revise the existing Noise Abatement Order ("good neighbor" policy) to limit the number of queued aircraft on Taxiway November at all times, rather than "when possible," as the current order states. Such a revised order would state that no more than five jet aircraft would be permitted to queue north of Runway 15L.

Candidate Action 2 was determined to warrant further operational and environmental analysis. The operational details of this Action are reported in Attachment A to the main report. The air quality analysis associated with Candidate Action 2 is presented in detail below in this Attachment.

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[2] "Logan International Airport, Additional Taxiway Evaluation Report per FAA August 2, 2002 Record of Decision," Harris Miller Miller & Hanson Inc. Report 300280.001, April 2006.

[3] Lewis, Paula, Department of Transportation, Federal Aviation Administration New England Region, "Record of Decision, Airside Improvements Planning Project, Logan International Airport, Boston, Massachusetts," Section VIII (3); 2 August 2002.

The approach taken to the overall evaluation was to "bracket" the potential environmental effects of changes to the Noise Abatement Order by examining two extremes of its use. One extreme would have the Order not implemented at all, and the other would have the Order implemented and required at all times. Therefore, two alternative scenarios of aircraft queuing on Taxiway November were developed and evaluated:

Free Flow Alternative – Unconstrained queuing of aircraft operations on Taxiway November.

Limit All Jets Alternative – A maximum of five turbojet aircraft queued north of the intersection with Runway 15L *at all times*.

The purpose of the assessment reported in this Attachment is to evaluate the potential effects on regional air quality and air quality in the communities surrounding the northern end of Logan Airport resulting from aircraft taxiing and queuing alternatives for Taxiway November. In general terms, ambient (i.e., outdoor) air quality conditions and impacts are largely determined by (a) the types and amounts of emissions generated and (b) the location of the emission sources relative to nearby receptors.[4,5] In this case, the sources of emissions of primary interest are taxiing and queuing aircraft utilizing Taxiway November located in the northern end of the airfield. Based on these considerations, the overall Study Area for this assessment is illustrated on Figure 2 in the Appendix.

Study Approach

The approach to completing this assessment was to use appropriate models, data and other supporting information to evaluate the effects of the Free Flow and Limit All Jets Alternatives. This was to be accomplished by undertaking both quantitative and qualitative analyses and comparing the results.

In the summer of 2003 during a 24-hour period when Runways 22R and 22L were in continuous use for departures, FAA staff in the Boston Tower kept a detailed log of the status of the queue on Taxiway November. This log was used to develop a model of the taxi and queue/hold times for each aircraft during that day under Free Flow conditions. The model was then extended to compute taxi/queue times under the Limit All Jets restricted flow condition. Finally, the times were scaled up to represent worst-case busy-day aircraft volumes. A summary of the taxi/queue time model and the results for the two alternatives are given in the main report. More complete details on the model development and results are given in the Taxiway November Operations report, which is included as Attachment A to the main report.

[4] For air quality assessment purposes, the term "receptors" is used to describe locations where the general public is located or can gain regular access and be exposed to ambient (i.e., outdoor) air pollutants. These include (but may not necessarily be limited to) residential areas, parks and recreation facilities, schools, nursing homes and hospitals.

[5] Meteorological conditions (e.g., wind direction, speed, etc.) also play important roles in the formulation and assessment of air quality impacts. However, because the alternatives occur in the same location at the airport, it is assumed that the effects of wind direction and speed will be the same under both alternatives.

II. TECHNICAL ANALYSIS

As discussed above, the sources of emissions of primary interest for this assessment are taxiing and queuing aircraft utilizing Taxiway November. During the taxi/queue mode, aircraft engines emit a variety of substances, some of which are considered air pollutants. The more predominant of these include carbon monoxide (CO), nitrogen oxides (NOx) and volatile organic compounds (VOC). Emissions of sulfur oxides (SOx) and particulate matter (PM) also occur, but in much smaller amounts.

In order to evaluate the potential effects of the Taxiway November taxiing and queuing alternatives on these pollutants, the air quality assessment is comprised of two primary components: a quantitative analysis and a qualitative analysis. The methodology and objectives of these analyses are summarized below.

Quantitative Analysis

For this analysis, the taxi and queue times for aircraft using Taxiway November were combined with appropriate engine emissions factors to compute emissions of CO, NOx, VOC, SOx and PM. The aircraft operational data were developed by Harris Miller Miller and Hanson (HMMH) on behalf of the FAA.[6] Aircraft engine emissions data were derived from the latest version of the FAA Emissions Dispersion & Modeling System (EDMS Version 4.4). Other important variables used for this analysis include the aircraft fleet mix and engine combinations for Logan Airport.[7]

Called an emissions inventory, the outcome from EDMS is expressed as a measure of aircraft emissions on Taxiway November in units of tons/year, by pollutant (i.e., CO, NOx, etc.) and alternative (i.e., Free Flow and Limit All Jets). For this analysis, the emission inventory results are further segregated by aircraft emissions that are generated north of the intersection of Taxiway November and Runway 15L (i.e., positions N_0 through N_8 on Figure 2).

Qualitative Analysis

For this analysis, the amounts and locations of aircraft emissions generated and released along Taxiway November were evaluated by URS and KBE air quality specialists[8] to help determine the effect these factors have on the air quality conditions both regionally and locally.

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[6] These data consisted of Total Minutes (Taxi/Queue) in 24 Hours, by Aircraft Type and by position on Taxiway November. The data was transmitted electronically by HMMH to KB Environmental Science, Inc. on March 31 and April 8, 2005 and are contained in the Appendix. Consistent with the Noise Analysis, the results from the EDMS analysis were scaled up by 30% to account for the corresponding increase in operations that are not reflected in the aircraft operation data.

[7] The fleet mix was derived from the HMMH data set discussed under footnote 5 and the aircraft/aircraft engine combination data were obtained from the 2003 Environmental Data Report (EDR) for Logan International Airport.

[8] See List of Preparers at the end of this report.

Supporting Information & Assumptions

Additional information and a number of assumptions were also used to complete the quantitative and qualitative analyses. These are briefly summarized as follows:

- Aircraft times-in-mode and emissions for the takeoff, climbout, landing and taxi-in portions of the landing and takeoff (LTO) cycle are essentially unchanged between the two alternatives. It is only the taxi-out portion of the LTO cycle (including the queue time) on Taxiway November that varies between the two alternatives and is of importance to this assessment.

- Aircraft taxi-in, taxi-out (including the queue time), takeoff and landing operations elsewhere on the airfield remain unchanged between the two alternatives.

- Other sources of air emissions associated with the airport (i.e., aircraft ground service equipment (GSE), motor vehicles, fuel facilities and stationary facilities) are unchanged.

- Wind speed and direction in the vicinity of Taxiway November will have the same effect on the dispersion of air emissions associated with each alternative.

The results of the air quality assessment are described in the following section.

III. RESULTS

As discussed above, this air quality assessment consisted of two components: a quantitative analysis and qualitative analysis. Both types of analyses were conducted for the Free Flow Alternative (i.e., unrestricted case) and Limit All Jets Alternative (i.e., restricted case). Consistent with this approach, the results are also discussed separately below.

Quantitative Results

The outcome of the air emissions inventory is summarized in Table 1. The results are presented by alternative (i.e., Free Flow and Limit All Jets) and pollutant type (i.e., CO, VOC, NOx, SOx and PM.).

Table 1 Aircraft Taxiing & Queuing Emissions North of Runway 15R (by Alternative) and Total Airport-Related Emissions

Alternative	Location	Pollutant (tons per day)				
		CO carbon monoxide	**VOC** volatile organic compounds	**NOx** nitrogen oxides	**SOx** sulfur oxides	**PM** particulate matter
Free Flow	N. of 15L	1.24	0.19	0.16	0.04	0.006
	S. of 15L	0.36	0.06	0.04	0.01	0.003
	Totals N. of 15R	1.60	0.25	0.20	0.05	0.009
Limit All Jets	N. of 15L	1.15	0.18	0.14	0.03	0.004
	S. of 15L	0.45	0.07	0.06	0.01	0.005
	Totals N. of 15R	1.60	0.25	0.20	0.04	0.009
Airport-Related Totals for an Average Day*		11.17	1.28	4.06	n/a**	n/a**

Source: Free Flow and Limit All Jets emissions inventory data from KB Environmental Sciences based upon EDMS output.
* Airport-related totals from "2003 Environmental Data Report (EDR), Boston Logan International Airport, June 2004," and converted from tons per year to tons per day.
** Totals for SOx and PM are not published in the EDR.

Expressed in units of tons/day, the results show that total amounts of aircraft emissions on Taxiway November are the same for both alternatives. This is to be expected as the total aircraft taxi and queue times are also the same for the unrestricted and restricted cases.

For this analysis, the emission inventory results are further segregated into emissions generated north of Runway 15L. These data are also contained in Table 1. As shown, total emissions of CO, VOCs, NOx, SOx and PM generated and released to the atmosphere north of Runway 15L under the Limit All Jets Alternative are less when compared to the Free Flow Alternative. This is due to the differences in queue times north and south of Runway 15L between the two alternatives.

As mentioned above, *total* aircraft emissions generated on Taxiway November would not change under the Limit All Jets Alternative, but north of Runway 15L there would be a decrease in amounts that are generated and released to the atmosphere. However, it is important to note that the decrease in emissions is small when compared to the total amounts of emissions associated with the airport. Figure 1 presents a graphical representation of these differences as a percentage of the overall airport-related totals for the three pollutants for which total emissions data are available.

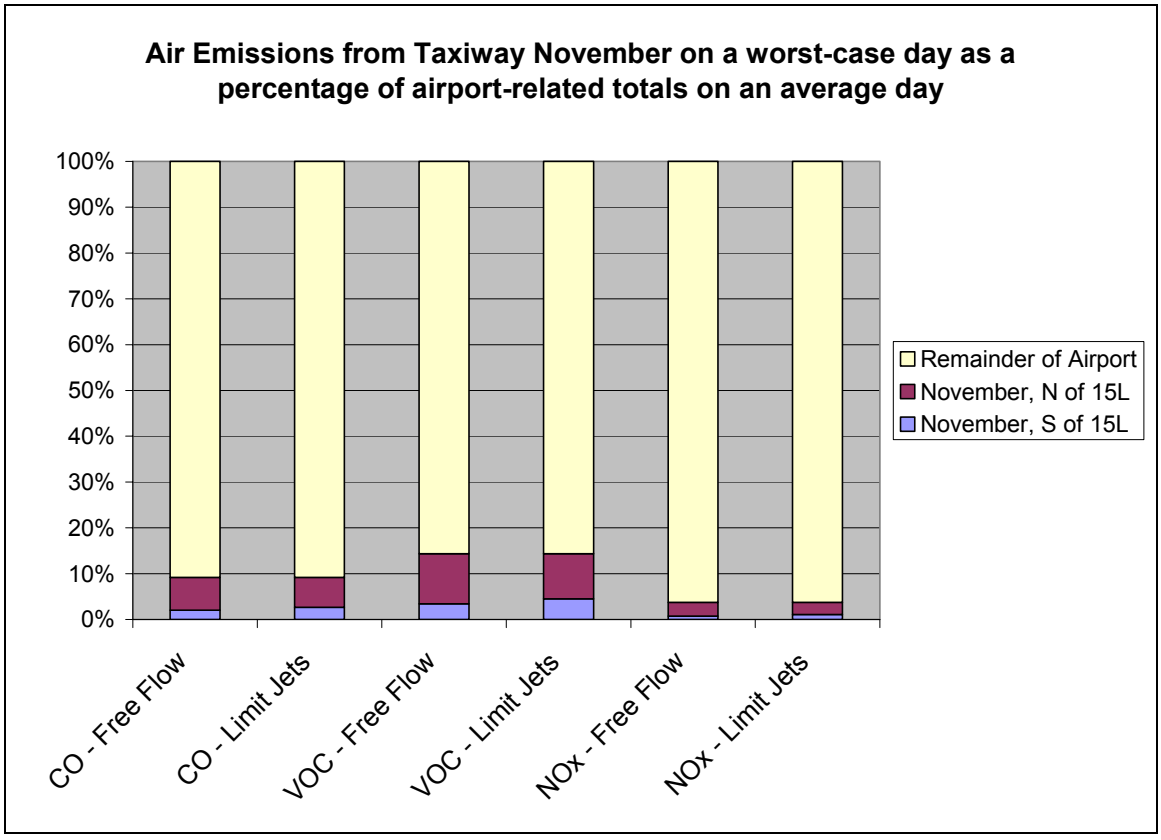

Figure 1 Air Emissions from Taxiway November on a Worst-case Day as a Percentage of Airport-related Totals on an Average Day

Qualitative Results

Based upon the results of this analysis, neither the Free Flow nor the Limit All Jets alternative is expected to have a significant impact on regional air quality conditions. This is because the differences in the amounts of emissions between the alternatives are negligible and the total amounts are small when compared in context to the total amounts associated with the whole airport. Local air quality in the areas of East Boston and Winthrop, which are closest to Taxiway November, will also likely not experience any measurable effects from either alternative for much the same reasons.

IV. CONCLUSIONS

According to the results, two primary findings important to air quality are evident when comparing the Free Flow and Limit All Jets Alternatives. These are summarized as follows:

- The Limit All Jets Alternative will result in the same amount of total aircraft emissions when compared to the Free Flow Alternative. This is because the total aircraft taxi and queue times are also forecasted to be the same along Taxiway November under both alternatives.

- Under the Limit All Jets Alternative, fewer aircraft emissions will be generated north of the Runway 15L taxiway crossing when compared to the Free Flow Alternative. This is because taxiing and queuing aircraft will spend less time in this area under the restricted condition. However, in the context of the total emissions from the airport as a whole, these differences are quite small, as shown in Figure 1.

Based on these findings**,** the Limit All Jets Alternative is not expected to have any impact on regional air quality conditions when compared to the Free Flow Alternative. This is because the total amounts of emissions are essentially the same under both alternatives. Local air quality in the areas of East Boston and Winthrop, which are closest to Taxiway November, will also likely not experience any measurable effects from the Limit All Jets Alternative for much the same reason and because the emissions on Taxiway November are a small percentage of the overall total at the airport.

Importantly, the effects of total airport-related emissions (including those associated with Taxiway November) were also analyzed in the *Logan Airside Improvements Planning Project Supplemental DEIS/FEIR.* The dispersion modeling results from this analysis indicated that these emissions will not cause nor substantially contribute to any violation of the National Ambient Air Quality Standards. Furthermore, the differences in emissions between the alternatives evaluated in this study are not expected to exceed the *de minimis* emission thresholds contained in the Federal Clean Air Act General Conformity Rule.

LIST OF PREPARERS

The following individuals were involved in the preparation of this air quality assessment.

Mike Kenney: Project Manager, KB Environmental Sciences, Inc. - Responsible for technical assessment of air quality impacts including the overall approach, interpretation of data and presentation of results. Over 24 years experience with air quality assessments of airports across the U.S. and around the world. Certified Hazardous Materials Manager, Qualified Environmental Professional and Certified Industrial Hygienist.

Wayne Arner: Air Quality Specialist, URS Corp. – Involved in data analysis and responsible for preparation of air emissions inventory. Over four years experience with air quality assessments of airports. Certified Engineer-In-Training.

Debbie Wilson: Air Quality Specialist, URS Corp. – Responsible for QA/QC of technical analysis. Over six years experience with air quality assessments of airports.

REFERENCES

The following publications and resource materials were used in support of this air quality assessment.

1. *Emissions & Dispersion Modeling System* (EDMS) Version 4.4, release date November 11, 2005, Office of Environment and Energy, Federal Aviation Administration.

2. *2003 Environmental Data Report* (EDR) for Boston Logan International Airport, June 2004.

3. *Logan Airside Improvements Planning Project Supplemental Draft Environmental Impact Statement/Final Environmental Impact Report*, Federal Aviation Administration, March 2001.

4. *Logan Airside Improvements Planning Project Final Environmental Impact Statement*, Federal Aviation Administration, June 2002.

5. *Record of Decision, Airside Improvements Planning Project, Logan International Airport, Boston, Massachusetts*, Federal Aviation Administration New England Region, 2 August 2002.

APPENDIX

Figure 2 Air Quality Assessment Study Area

Matrix of Taxi/Queue Minutes - Free Flow Alternative

	Total Taxi Minutes by Aircraft Type and Position															
Type	N_0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_10	N_11	N_12	N_13	N_14	Total min/day
A306	2	9	5	3	1	1	1	1	1	1	1	1	1	1	2	34
A310	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
A319	7	29	23	23	19	14	11	11	8	8	7	6	6	5	7	183
A320	3	12	11	10	11	5	4	5	4	4	4	3	3	3	4	86
A321	0	1	1	1	1	2	1	1	1	1	0	0	0	0	0	11
A332	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	9
A333	0	1	1	1	1	2	1	1	1	0	0	0	0	0	0	10
A343	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	8
ASTR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
B190	6	25	16	10	9	7	7	7	8	8	7	5	5	5	7	134
B462	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	8
B712	3	11	10	11	10	9	5	4	3	3	2	2	2	2	3	83
B722	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
B727	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	10
B72Q	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	11
B732	1	3	1	1	1	1	1	1	0	0	0	0	0	0	0	13
B733	12	48	42	33	29	26	20	18	17	13	14	10	9	9	12	311
B734	1	4	6	5	3	3	3	2	2	1	1	1	1	1	1	33
B735	1	5	5	4	4	3	2	2	1	1	1	1	1	1	1	32
B737	1	3	2	2	2	1	2	1	1	1	1	2	1	1	1	23
B738	3	12	13	9	7	6	6	7	6	4	3	2	2	2	3	85
B739	0	2	1	2	0	0	0	0	0	0	0	0	0	0	0	7
B744	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	9
B752	15	59	59	41	32	28	24	20	17	16	14	13	11	11	16	376
B762	1	5	3	2	2	2	1	1	1	1	1	1	1	1	1	22
B763	2	11	7	7	5	3	2	2	2	2	1	1	1	1	2	51
B764	1	2	3	2	2	1	2	0	0	0	0	0	0	0	0	16
B772	1	4	2	2	4	2	2	2	2	2	2	1	1	1	1	30
BE20	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	8
BE40	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	15
BE58	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	10
BE9L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
C402	22	86	69	58	45	38	33	26	22	19	17	17	17	17	24	510
C421	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	4
C525	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	8
C550	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	9
C560	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
C56X	1	6	2	2	2	2	2	2	1	1	1	1	1	1	1	22
C750	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	4
CL64	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4
CRJ1	4	16	12	13	8	8	6	5	6	5	3	3	3	3	4	97
CRJ2	3	10	9	8	7	5	5	5	3	2	2	2	2	2	3	67
DC10	1	2	2	2	2	2	2	2	1	1	1	1	1	1	1	17
DC8Q	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
DC93	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	10
DC95	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	9
DC9Q	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
DH8A	2	8	5	5	4	1	1	1	1	1	1	1	1	1	2	38
E135	15	64	45	36	31	28	26	24	20	15	15	13	12	12	17	372
E145	5	20	16	12	12	7	7	6	5	6	3	3	3	3	5	113
F2TH	1	2	2	1	1	1	0	0	0	0	0	0	0	0	0	11
F900	1	2	1	1	1	1	1	1	2	0	0	0	0	0	0	14
FA50	0	2	1	1	1	2	1	1	1	1	0	0	0	0	0	12
GALX	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	4
GLF2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
GLF4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4
H25B	1	2	3	2	2	2	2	2	2	1	1	1	1	1	1	20
H25C	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	6
HS25	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4
J328	6	25	17	16	12	11	10	8	7	6	7	6	6	5	7	151
LJ35	1	3	2	2	1	1	1	1	1	1	1	1	1	1	1	16
LJ60	2	6	4	4	2	2	2	2	2	3	1	1	1	1	1	33
LR45	0	1	2	1	1	1	2	1	1	1	1	0	0	0	0	13
MD80	6	21	18	16	12	10	10	9	8	5	5	6	5	4	6	141
MD81	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	4
MD82	1	3	2	1	1	1	1	0	0	0	0	0	0	0	0	13
PA31	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	13
PA32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
SF34	1	2	2	2	2	3	2	2	2	2	1	1	1	1	1	25
Total	141	559	448	365	302	256	222	195	171	149	131	118	109	107	151	3425

Matrix of Taxi/Queue Minutes - Limit All Jets Alternative

	Total Taxi Minutes by Aircraft Type and Position																	
Type	N_0	N_1	N_2	N_3	N_4	N_5	N_6	N_7	N_8	N_9	N_10	N_11	N_12	N_13	N_14	N_15	N_16	Total min/day
A306	2	9	5	3	1	1	1	1	1	1	1	1	1	1	2	0	0	34
A310	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
A319	7	29	23	23	19	12	8	7	7	8	9	8	11	6	7	0	0	183
A320	3	12	11	10	11	5	3	3	3	3	5	6	4	4	4	0	0	86
A321	0	1	1	1	1	2	1	1	0	0	1	1	1	0	0	0	0	11
A332	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	9
A333	0	1	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	10
A343	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	8
ASTR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
B190	6	25	16	10	9	7	7	6	6	7	5	7	7	6	8	0	0	134
B462	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
B712	3	11	10	11	10	7	2	2	2	2	5	5	4	3	3	0	0	83
B722	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
B727	0	1	1	1	1	0	0	0	0	0	4	0	0	0	0	0	0	10
B72Q	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	11
B732	1	3	1	1	1	0	0	0	0	0	1	1	1	0	0	0	0	13
B733	12	48	42	33	29	23	16	13	9	9	28	17	11	11	13	0	0	311
B734	1	4	6	5	3	1	1	1	1	1	3	2	2	2	1	0	0	33
B735	1	5	5	4	4	3	1	1	1	1	2	2	1	1	1	0	0	32
B737	1	3	2	2	2	1	1	1	1	1	2	6	1	1	1	0	0	23
B738	3	12	13	9	7	5	4	5	4	3	4	4	4	4	5	0	0	85
B739	0	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	7
B744	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	9
B752	15	59	59	41	32	23	17	13	11	11	22	18	18	16	19	2	0	376
B762	1	5	3	2	2	2	1	1	1	1	1	1	1	1	1	0	0	22
B763	2	11	7	7	5	2	1	1	1	1	2	2	2	2	3	0	0	51
B764	1	2	3	2	2	1	2	0	0	0	0	0	0	0	0	0	0	16
B772	1	4	2	2	4	2	1	1	1	1	2	2	2	2	2	1	0	30
BE20	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	8
BE40	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	0	0	15
BE58	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	10
BE9L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
C402	22	86	69	58	45	38	31	22	18	17	17	21	21	20	25	0	0	510
C421	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
C525	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
C550	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	9
C560	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
C56X	1	6	2	2	2	2	1	1	1	1	2	1	1	1	1	0	0	22
C750	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
CL64	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
CRJ1	4	16	12	13	8	7	5	4	5	4	4	3	4	3	4	0	0	97
CRJ2	3	10	9	8	7	4	3	3	2	2	4	4	4	2	3	0	0	67
DC10	1	2	2	2	2	1	1	1	1	1	2	2	1	1	1	0	0	17
DC8Q	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
DC93	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	10
DC95	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	9
DC9Q	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
DH8A	2	8	5	5	4	1	1	1	1	1	1	1	1	1	2	0	0	38
E135	15	64	45	36	31	22	18	15	13	13	22	21	20	19	18	1	0	372
E145	5	20	16	12	12	7	6	5	3	3	6	6	4	4	5	0	0	113
F2TH	1	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	11
F900	1	2	1	1	1	1	1	1	2	0	0	0	0	0	0	0	0	14
FA50	0	2	1	1	1	2	0	0	0	0	1	1	0	1	1	0	0	12
GALX	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
GLF2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
GLF4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
H25B	1	2	3	2	2	2	1	1	1	1	2	2	1	1	1	0	0	20
H25C	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	6
HS25	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
J328	6	25	17	16	12	9	6	5	5	5	10	8	6	8	8	2	1	151
LJ35	1	3	2	2	1	1	1	1	1	1	1	1	1	1	1	0	0	16
LJ60	2	6	4	4	2	2	2	2	2	3	1	1	1	1	1	0	0	33
LR45	0	1	2	1	1	1	1	0	0	0	1	1	1	0	1	1	0	13
MD80	6	21	18	16	12	9	7	5	4	4	11	9	5	4	8	1	0	141
MD81	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
MD82	1	3	2	1	1	0	0	0	0	0	1	1	0	0	0	0	0	13
PA31	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	0	0	13
PA32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
SF34	1	2	2	2	2	3	2	1	1	1	1	3	2	1	1	0	0	25
Total	141	559	448	365	302	224	167	137	121	116	195	181	156	137	168	7	1	3425