APPENDIX R
ALTERNATE CONSIDERATIONS

R.1 INTRODUCTION

This EIS utilizes forecasts of aviation activity at O'Hare prepared by the FAA (FAA Terminal Area Forecast), as presented in **Appendix B, Aviation Demand Forecast**. The forecast used for the EIS was prepared using industry-standard methodology, and is the FAA's best projection of potential future activity levels for the purposes of this EIS.

The FAA annually produces forecasts of nationwide aviation activity, and has developed a forecast process that is reviewed with other industry forecasts. FAA also conducts an annual review of the accuracy of prior forecasts based on actual activity. The most recent annual review indicated that the average forecast error for a 10-year period was 9 percent for passenger activity and 3 percent for aircraft activity.[1] FAA has concluded that its forecasts compare favorably with those produced by other major forecasting services.

Nevertheless, all forecasts are subject to a degree of uncertainty. Therefore, it is possible that some future developments may result in actual aviation activity somewhat different from that which was forecast in this EIS. The purpose of this appendix is to identify and consider a range of potential alternate outcomes with regard to aviation activity at O'Hare, and to identify the possible alternate environmental impacts that could occur under these conditions.

R.2 IDENTIFICATION OF ALTERNATE SCENARIOS AND FACTORS

The potential future developments that could produce aviation activity at O'Hare that is different from the forecast used for this EIS can be summarized as follows:

- Higher growth in aviation activity as a result of stronger "fundamentals" such as economic growth or airline hubbing activity.
- Lower growth in aviation activity as a result of developments such as the loss of one of the hubbing airlines at O'Hare.
- Changes in aircraft operations (higher or lower) due to changes in the fleet mix used by airlines at O'Hare.

Each of these hypothetical possibilities is discussed below.

[1] FAA Aerospace Forecasts 2005-2016, USDOT, FAA, Office of Aviation Policy and Plans, p. VIII-4, March 2005.

R.2.1 Higher Growth in Aviation Activity

The FAA's 2002 TAF was used as the "base forecast" for the main body of the EIS. This 2002 TAF was prepared using the best available information at the time, including assumptions regarding the recovery of traffic at O'Hare following the events of September 11, 2001, and the recent economic recession. A stronger recovery than assumed in preparing the 2002 TAF is possible, and, therefore, there could be higher levels of activity in future years than represented by the 2002 TAF.

R.2.1.1 More Recent TAF Results

The FAA has published both a 2003 TAF and 2004 TAF. Both forecasts show higher activity levels (for any given forecast year) than presented in the 2002 TAF that was used as the forecast for this EIS. This is an indication of the potential for there to be higher aviation demand levels at O'Hare in future years. **Table R-1** below summarizes the 2003 and 2004 TAFs in comparison to the 2002 TAF for the year 2018.

TABLE R-1
2002/2003 TAF COMPARISON FOR 2018

	2002 TAF	2003 TAF	Variance	2004 TAF	Variance
Enplaned Passengers	50,372,000	56,336,000	11.5%	50,196,123	0.9%
Aircraft Operations	1,194,000	1,388,000	16.8%	1,258,984	7.5%

Note: TAF numbers converted from Federal fiscal years to calendar years.
Sources: 2002 TAF, FAA; 2003 TAF, FAA; 2004 TAF, FAA.

As shown, both the 2003 and 2004 TAFs have a higher forecast than the 2002 TAF for annual enplaned passengers and annual aircraft operations in 2018. Also as shown, the variance, in both cases, is greater for aircraft operations than for enplaned passengers. This is the result of an assumption in the 2003 and 2004 TAFs that much of the higher near-term growth at O'Hare would be from commuter/regional jet activity—that is, in comparison to the 2002 TAF, there would be more aircraft operations at any given level of enplaned passengers.

Table R-2 shows the percentage distribution of aircraft operations in the 2002 TAF, 2003 TAF, and 2004 TAF, for the year 2018.

TABLE R-2
COMPARISON OF FLEET MIX FOR 2002 TAF VS. 2003 TAF FOR 2018

Percent of Operations by Category	Forecast for 2018		
	2002 TAF (c)	**2003 TAF**	**2004 TAF**
Air Carrier (a)	64%	59%	53%
Commuter / Air Taxi (b)	34%	39%	45%
General Aviation	3%	2%	2%
Military	0%	0%	0%
Total	**100%**	**100%**	**100%**

Note: (a) Aircraft in this category generally include those with more than 60 seats and operated by large air carriers (i.e., MD80, B737, A320, B767, A340, B747).
(b) Aircraft in this category include two types of activity: 1] regional / commuter carriers generally operating aircraft with 60 seats or less (i.e., CRJ, E145) and 2] non-scheduled on-demand / for-hire air taxi service (i.e., general aviation aircraft).
(c) Percentages may not add to 100 percent due to rounding.

Source: 2002 and 2003 TAF, Federal Aviation Administration.

As shown in **Table R-2** above, in the 2002 TAF, it was forecast that approximately 64 percent of total operations would be in the category of air carrier, whereas in the 2003 TAF this share was a lower 59 percent. In the 2004 TAF, the percentage of air carrier operations was reduced further to 53 percent. Conversely, in the 2002 TAF it was forecast that commuter/air taxi operations would account for 34 percent of the total, compared to a share of 39 percent in the 2003 TAF and 45 percent in the 2004 TAF.

R.2.1.2 Other Factors Considered

The 2003 TAF information presented in **Tables R-1** and **R-2** illustrates a potential higher level of activity for both passengers and aircraft operations, relative to the 2002 TAF used as the forecast for this EIS. FAA also considered, independently, reasons that actual results could be higher than the 2002 TAF. These reasons include factors such as generally more optimistic economic conditions (locally and nationwide), or greater airline hubbing and service development at O'Hare. After consideration of these factors, FAA believes that the 2003 TAF adequately represents the "high range" potential for development of **Appendix R, Alternate Considerations.** However, in establishing the high end of the forecast range, a small number of operations were added to provide an additional increment beyond the 2003 TAF operation total. The resultant high range forecast for 2018 operational levels was 1,397,000, representing an increase over the base forecast from the main body of the EIS of approximately 17 percent. The high range enplaned passenger forecast for 2018 was 56,920,000 representing an increase over the base forecast of approximately 13 percent.

R.2.2 Lower Growth in Aviation Activity

Just as there could be higher growth in aviation activity at O'Hare relative to the 2002 TAF used as the forecast for this EIS, there could also be lower growth in aviation activity. Factors that could possibly contribute to lower activity at O'Hare include: (1) the loss of one of the two major hubbing carriers, and/or (2) generally less optimistic conditions related to the underlying demand factors such as economic growth.

R.2.2.1 Loss of a Hubbing Carrier

O'Hare is currently used as a major system hub for two airlines—United Airlines (United) and American Airlines (American). United and American and their regional/commuter code-share partners together accounted for approximately 87 percent of all operations at O'Hare during 2003.[2] Approximately 50 percent of the enplaned passengers at O'Hare are connecting passengers, and this traffic is dependent on the continuation of connecting hub operations. Given the recent financial pressures experienced by the major airlines in the United States, it is hypothesized within the context of this **Appendix R, Alternate Considerations** that one of the two major hubbing carriers at O'Hare could decide to substantially reduce or eliminate its connecting hub operation at O'Hare. This potential scenario was analyzed in order to assess a potential "low range" forecast of activity at O'Hare.

O'Hare is one of the three largest connecting hubs in the United States (along with Atlanta and Dallas-Fort Worth). As shown in **Table R-3**, these three largest hubs are far above other connecting hubs in terms of their accommodation of connecting passengers in the national airport system.

TABLE R-3
LARGEST NATIONAL CONNECTING HUBS

Rank	Airport	Estimated Connecting Passengers	Hubbing Carriers
1	Atlanta	24,754,000	Delta, AirTran
2	Chicago O'Hare	16,015,000	United, American
3	Dallas Fort-Worth	14,935,000	American, Delta
4	Houston Intercontinental	9,463,000	Continental
5	Minneapolis	8,521,000	Northwest
6	Detroit	8,427,000	Northwest
7	Charlotte	8,279,000	US Airways
8	St. Louis	7,785,000	American
9	Denver	7,715,000	United
10	Cincinnati	7,396,000	Delta

Source: Leigh Fisher Associates Analysis of DOT data.

The top three hubs have this status due to (1) geographic location, making it convenient to connect passengers from throughout the country, (2) large local demand for domestic and international service, providing a solid foundation on which to build connecting activity, and (3) historic investments at these airports by airport operators and carriers. Therefore, it is not believed that there is significant "downside" potential associated with the loss of one of the major hubbing airlines. That is, it is believed that there would be replacement of much of the "lost" connecting service due to O'Hare's role as a major national connecting hub. Indeed, the FAA believes that O'Hare, because of the substantial regional population when combined with

2 American's regional/commuter code-share partner is American Eagle. United's regional/commuter code-share partners are currently Air Wisconsin, Chautauqua, Mesa, Skywest, and TransStates (based on the BACK Aviation Solutions OAG Database).

its location and historic function as a hub, is uniquely situated in its ability to function as a hub for two major air carriers.

Moreover, when Eastern Airlines liquidated in the early 1990s and eliminated its hub at Atlanta, there was almost no loss of traffic or interruption of "trend" growth, due to the expansion of service by Delta Airlines. In that case, traffic levels recovered within 2 years to previous levels, and have since grown considerably higher.

In 2004, Delta Airlines announced that it would be substantially reducing its hubbing operations at DFW, leaving that airport with one hubbing airline, American. This development is too recent to be able to conclude the results for future airline traffic at DFW. However, given the status of DFW as one of the top three hubs in the country, it is reasonable to expect that there would be interest by American and/or other airlines in taking advantage of the opportunity to replace service previously provided by Delta at DFW.

For purposes of developing a "low range" scenario, it was assumed that one of the two hubbing carriers at O'Hare ceased operations or otherwise substantially discontinued their hub at O'Hare. It was further assumed that some, but not all, of the connecting activity would be replaced by either the remaining hubbing carrier or a potentially new hubbing carrier. While the case study data from Atlanta suggests that virtually all of the hubbing activity would be replaced, it is not certain that this would be the case at O'Hare (and it is too early to tell what the result will be at DFW). Specifically, it was assumed that connecting passenger traffic (at O'Hare) would be 75 percent of the base forecast. It was also assumed that there would be no change in the originating passenger traffic. Assuming no significant change in average passenger per operation, the variance in aircraft operations would be the same as the variance in total enplaned passengers. The resulting "low range" forecast is presented in **Table R-4.**

TABLE R-4
SENSITIVITY ANALYSIS: LOSS OF A HUBBING CARRIER (LOW RANGE)

	Forecast for 2018		
	2002 TAF	**Low Range**	**Variance**
Annual Enplaned Passengers			
Originating	27,251,500	27,251,500	0%
Connecting	23,120,500	17,340,000	-25%
Connecting Percentage	46%	39%	
Total	50,372,000	44,692,000	-11%
Annual Aircraft Operations	1,194,000	1,059,000	-11%

Source: TPC Analysis.

As shown, the resulting estimated impact on activity is an 11 percent decline relative to the base forecast, for both annual enplaned passengers and annual aircraft operations at O'Hare.

R.2.2.2 Other Considerations

In addition to the scenario of the loss of a hubbing carrier, there are other considerations related to potential lower traffic growth at O'Hare, such as less optimistic economic conditions. FAA believes that, given the fundamental strength of the O'Hare market, these other considerations would not produce a lower result than the scenario presented in **Section R.2.2.1, Loss of a Hubbing Carrier.** In other words, the loss of a hubbing carrier would be more significant at O'Hare than the effect of a typical local and/or national economic downturn. Therefore, FAA believes that the "loss of a hubbing carrier" scenario is an adequate representation of a potential lower range of activity at O'Hare.

R.2.3 Aircraft Fleet Mix

An additional factor to consider in identifying alternate scenarios and factors is aircraft fleet mix. For a given level of passenger demand, the level of aircraft operations could vary from the base forecast due to changes in airline aircraft fleet mix. This change in fleet mix could occur in either direction: (1) increased use of smaller aircraft (e.g., regional jets or business jets), resulting in more aircraft operations for a given level of passenger demand, or (2) increased use of larger aircraft (e.g., main-line jets), resulting in fewer aircraft operations for a given level of passenger demand.

For the high end of the forecast range of aircraft operations, an appropriate scenario would be greater use of smaller aircraft (such as regional jets), which would result in a greater number of aircraft operations for a given level of passenger demand. For instance, the FAA's 2003 TAF included an assumption of increased share of commuter/regional jet aircraft. Thus, FAA believes that the 2003 TAF provides a reasonable illustration of the potential increase in aircraft operations associated with utilization of smaller aircraft.

For the low end of the forecast range, it is possible that airline "up-gauging" to larger aircraft would result in fewer aircraft operations for a given level of passenger demand. FAA believes that it is reasonable to expect that this potential effect would not reduce annual aircraft operations by more than 10 percent relative to the base forecast, which is similar to the variance in aircraft operations associated with the "loss of hubbing carrier" scenario presented above. As a result, no further changes to the lower growth forecast presented in **Table R-4** are required.

R.3 FORECAST RANGE

A forecast range has been developed to reasonably "bound" the potential higher and lower ends of activity at O'Hare, and to use as input to alternate analysis of environmental impacts. This forecast range has been developed considering the potential factors described previously in this appendix. In addition, the high end of the forecast range is sufficient to "accommodate" the higher activity levels contained in the 2003 TAF.

Table R-5 summarizes the forecast range to be used to conduct the alternate analysis of environmental impacts.

TABLE R-5
FORECAST RANGE

	Forecast for 2018		
	2002 TAF	**High Range**	**Low Range**
Annual Enplaned Passengers	50,372,000	56,920,000	44,692,000
Variance from base forecast	N/A	13%	-11%
Annual Aircraft Operations	1,194,000	1,397,000	1,059,000
Variance from base forecast	N/A	17%	-11%

Source: Leigh Fisher Associates Analysis.

Exhibit R-1 illustrates the forecast range for annual enplaned passengers for the period from 2003 to 2018. **Exhibit R-2** illustrates the forecast range for annual aircraft operations for the period from 2003 to 2018.

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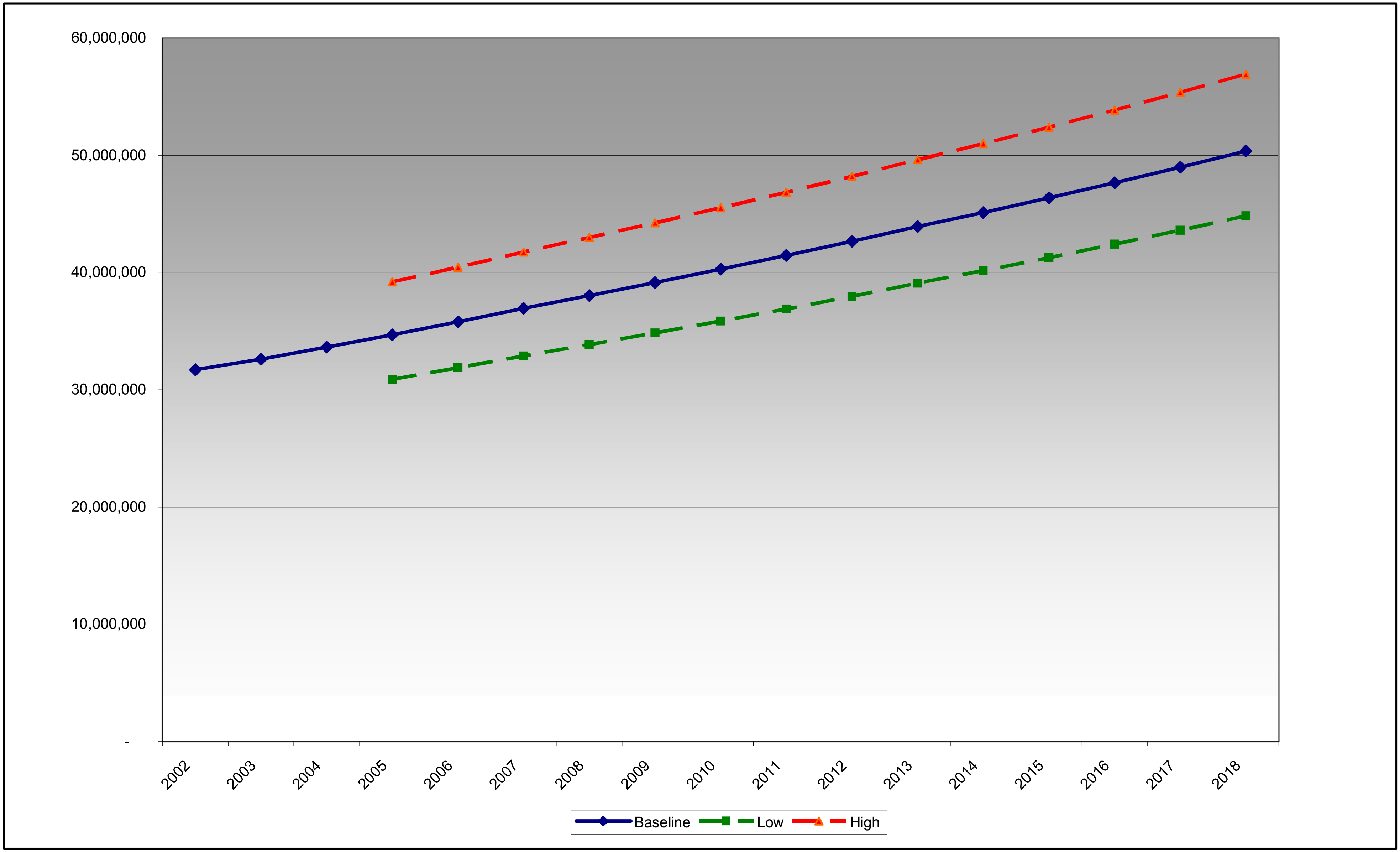

Source: Leigh Fisher Associates (TPC), 2004

Chicago O'Hare International Airport

O'Hare Modernization
Environmental Impact Statement

Forecast Range
Enplaned Passengers

▶ Exhibit R-1

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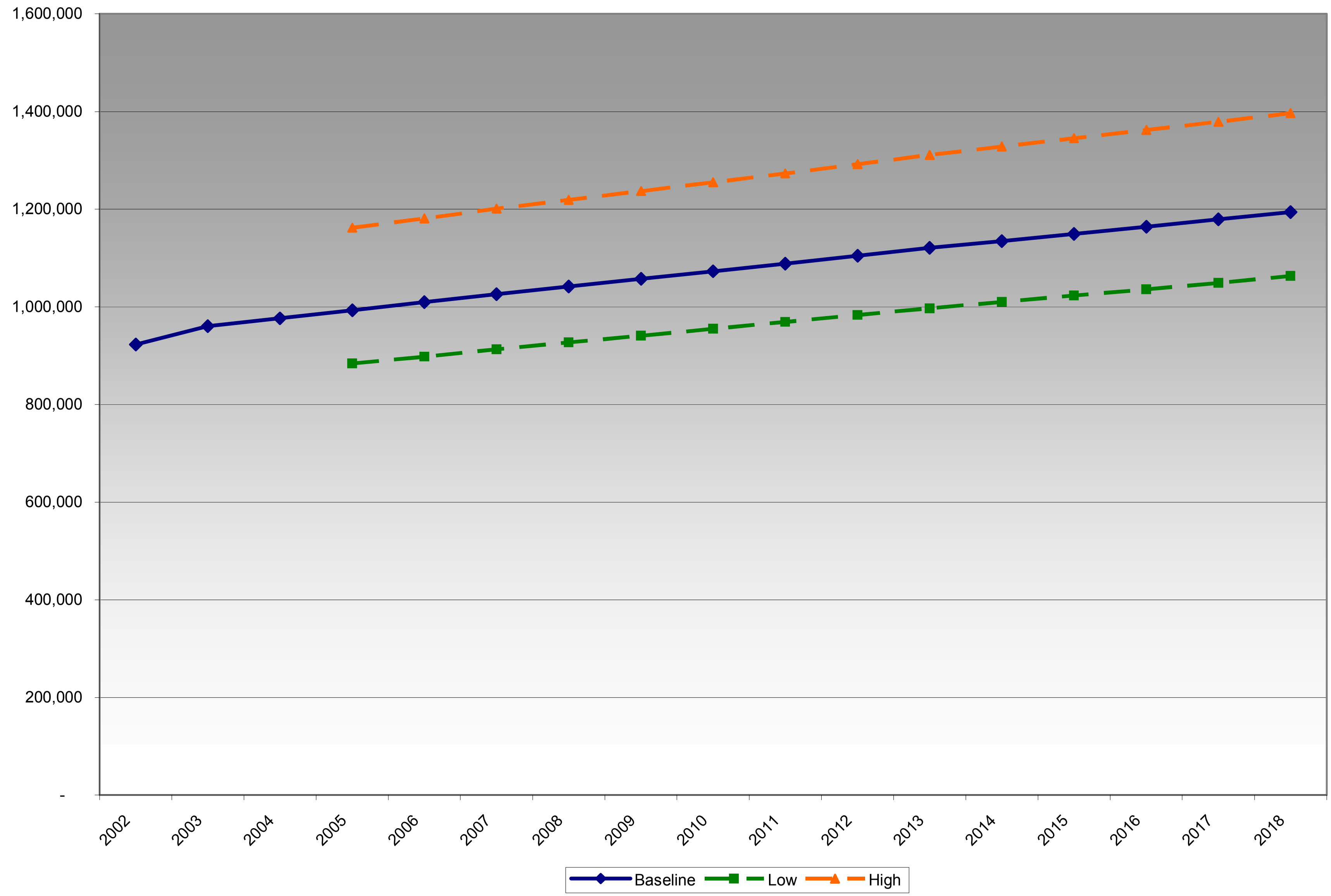

Source: Leigh Fisher Associates (TPC), 2004

Chicago O'Hare International Airport

O'Hare Modernization
Environmental Impact Statement

Forecast Range Aircraft Operations

Exhibit R-2

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R.4 IMPACTS OF THE ALTERNATE LEVELS OF ACTIVITY

For disclosure purposes within this appendix, comparisons of the potential operational and environmental impacts associated with the alternate high range forecast are made relative to the impacts that are presented in the main body of the EIS for the Build Out + 5 phase. Throughout the remainder of this appendix, the comparison is made between an alternative using the base forecast and an alternative using the high range forecast (e.g. Alternative C (base forecast) vs. Alternative C (high range forecast)).

The primary objective of this appendix is to assess the environmental impacts of the alternate activity range. This is not intended to be a basis for an examination of the need for the project. **Chapter 2, Purpose and Need,** sets forth the reasoning for the project to move forward. However, the low range forecast could result in a potential extension of the time horizon under which certain projects would come online. Environmental impacts of the low range of activity need not be estimated because these impacts would be equal to or less than the impacts calculated for the base forecast.

The high range forecast is not assumed to result in a change to the footprint of the development. Given this assumption, certain environmental impact categories (e.g. wetlands, floodplains, threatened and endangered species, biotic communities, et cetera) would not be impacted by the high range forecast. Impacts to these resources would be similar to those presented within **Chapter 5, Environmental Consequences**. Therefore, the following categories were the focus of analysis in this appendix relative to the high range forecast.

R.4.1 Methodology

This section includes a discussion of the methodology used to assess impacts for the alternate forecast presented in **Table R-5.** To consider the consequence of the alternate forecast, the impacts that might occur with regard to the following categories were evaluated:

- **Operational Delay:** A qualitative description of Alternative C's operational delay under the high range forecast is presented. Using extrapolation and professional judgment, the FAA estimated the operational delay for Alternative C (high range forecast).
- **Noise:** The potential impacts of the high range forecast on the aircraft noise exposure area were evaluated utilizing the FAA's Area Equivalent Method (AEM). The AEM is a mathematical procedure that provides an estimate of the area (in square miles) of the DNL 65 dB and greater noise contours. The change in the contour area was used to estimate the potential change in population affected by the DNL 65 dB and greater noise levels. Alternatives C, D, and G from **Section 5.1, Noise** in **Chapter 5, Environmental Consequences,** are each presented for comparison purposes to these same Alternatives for the high range forecast.
- **Surface Transportation:** The material presented in **Section 5.3, Surface Transportation,** in **Chapter 5, Environmental Consequences,** was drawn upon to estimate the

hypothetical impacts (e.g. levels of service, traffic volumes) of the high range forecast. The surface transportation impacts of Alternatives C, D, and G are similar for the base forecast. Therefore, the comparison represented in this section is between the Build Alternatives (base forecast) and the Build Alternatives (high range forecast).

- **Air Quality:** The emission inventories were assessed using the high range forecast in aircraft operations and vehicle-miles-traveled, as well as the high range forecast operational delay assessment. Emission estimates are presented for the Alternative C (high range forecast) versus the Alternative C (base forecast).

R.4.1.1 Operational Delay Assessment

Detailed operational modeling was not conducted for the high range forecast summarized in **Table R-5.** However, it is possible to use the existing TAAM modeling results to develop some hypothetical conclusions regarding the potential for operational delay impacts relative to the high range forecast. See **Appendix D, Simulation Modeling** for the detailed TAAM modeling results.

For the high range forecast, the 2018 level of annual aircraft operations is about 1.4 million and exceeds any of the levels that were modeled for this EIS. As presented in the main body of the EIS, the base forecast is approximately 1.2 million annual aircraft operations in 2018. Delays for Alternative C under the base forecast are estimated to be about 5.8 minutes per operation. Delays would continue to increase as activity grows. Delays are not linear but tend to grow exponentially once the airfield approaches capacity. This phenomenon creates a delay curve. Examining higher forecast levels on the delay curve can provide an approximation of the average annual delays for a given activity level. Estimating the average annual delay in minutes per operation for higher activity levels can be derived from the demand delay curves presented in **Appendix D.**

Using extrapolation and professional judgment, the FAA believes that Alternative C with the high range forecast would most likely perform at an average annual delay of between 13 and 16 minutes per operation at the high range forecast level in 2018 (1.4 million operations).

R.4.1.2 Noise Assessment

The high range forecast presented in **Table R-5** was used to estimate changes to the noise exposure area for Alternatives C, D and G as reported in **Section 5.1, Noise** in **Chapter 5, Environmental Consequences**. Using the AEM method, a change in the base forecast 65 DNL contour area for Build Out + 5 can be computed based on the high range forecast.

The comparison between the results of the AEM for the base forecast to the results of the AEM for the high range forecasts indicates that the size of the 65 DNL and greater contour area would be approximately 6.5 percent greater under the high range forecast. Assuming a uniform distribution in the change in the shape of the 65 DNL contour and in land use within the contour, population and housing units potentially affected would increase by 6.5 percent over the base forecast. The population and the number of housing units for the Build Out + 5 base forecast and the high range forecast are depicted in **Tables R-6** and **R-7,** respectively. As stated in FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*:

> If the AEM calculations indicate that the proposed action would result in less than a 17 percent (approximately a DNL 1 dB) increase in the DNL 65 dB contour area, it may be concluded that there would be no significant impact over noise sensitive areas and that no further noise analysis is required.

Because the AEM demonstrates that the additional area of noise exposure associated with the high range forecast is less than 17 percent greater than the base forecast contour area, no further noise analysis is required.

TABLE R-6
NOISE EXPOSURE – ESTIMATED POPULATION WITHIN 65+ DNL CONTOUR
BUILD OUT+5 PHASE

Alternative	Base Forecast	High Range Forecast	Difference	Percent Change
C	24,103	25,670	1,567	6.5%
D	23,537	25,067	1,530	6.5%
G	23,307	24,822	1,515	6.5%

Source: Leigh Fisher Associates Inc., [TPC]

TABLE R-7
NOISE EXPOSURE – ESTIMATED HOUSING UNITS WITHIN 65+ DNL CONTOUR
BUILD OUT+5 PHASE

Alternative	Base Forecast	High Range Forecast	Difference	Percent Change
C	8,502	9,055	553	6.5%
D	8,360	8,903	543	6.5%
G	8,179	8,711	532	6.5%

Source: Leigh Fisher Associates Inc., [TPC]

R.4.1.3 Surface Transportation Assessment

The alternate environmental impacts for this section were prepared comparing high range forecast to the base forecast for 2018. For purposes of the analysis, it is assumed that the peak hour originating and termination airline passengers, airport employment, and peak hour surface traffic generated by cargo and other airport land uses would vary in direct proportion to the variance between the high range forecast and base forecast (13 percent).

It was also assumed that there would be no change in the factors used to model surface transportation conditions or forecast future surface access conditions including airline and airport employee travel mode choice patterns, vehicle occupancy patterns, access time distributions prior to and after flights, directional distribution of airport-related trips, and other factors as presented in **Section 5.3, Surface Transportation** in **Chapter 5, Environmental Consequences**. Thus, for purposes of the impact analysis presented in this appendix, the high range forecast would result in a corresponding 13 percent increase in airport-generated peak hour vehicle trips.

A qualitative review of the potential environmental impacts resulting from the 13 percent increase in airport-generated peak hour vehicle trips was prepared for the Build Out + 5 phase. This review considered the changes in peak hour intersection performance and roadway volume-to-capacity relationships occurring within the study area for the Build Alternatives (base forecast) versus the Build Alternatives (high range forecast). This qualitative review focused on those roadway segments and intersections that were forecast to operate slightly above (or below) the project's threshold of significance and thus could be affected by the increase in airport-generated peak hour trips associated with the high range forecasts.

An increase in airport-generated traffic is not anticipated to cause a corresponding change in peak hour intersection performance or peak hour volume-to-capacity relationships. This is because:

(a) airport-generated traffic volumes represent a percentage of total traffic volumes at any location, and a lower percentage at locations that are more distant from the airport,

(b) airport-generated traffic is not a contributing factor to all critical movements (i.e., the movements that are limiting the intersection or roadway performance) and thus a change in airport traffic would not affect all critical movements or the resulting performance, and

(c) the travel paths used by airport and other traffic would change as drivers select paths that avoid increased delays causing a re-distribution of traffic volumes.

For purposes of this appendix, intersections and roadway segments located within one mile of the airport were defined as being near the airport. Furthermore, it was assumed that:

(a) volume-to-capacity ratios on roadway segments located near the airport would increase by less than 3 percent (i.e., airport-generated traffic would represent up to 25 percent of the volumes on the segment) and that volume-to-capacity ratios on more distant roadway segments would increase by less than 1 percent (i.e., airport-generated traffic would represent less than 5 percent of the volumes on the segment), and

(b) delays at intersections located near the airport would increase by 5 seconds or less (i.e., 10 percent of the amount of traffic delay that defines the lower bound of Level of Service E).

Based on the assumptions above, it was estimated that the high range forecast would result in no additional intersections and no additional roadway segments exceeding the project's threshold of significance.

R.4.1.4 Air Quality Assessment

Using the forecast difference in aircraft operations, and vehicle-miles-traveled, and the operational delay assessment related to the high range forecast presented in **R.4.1.1, Operational Assessment**, emission inventories were prepared. For purposes of conducting the air quality assessment in this appendix, it was assumed that the components of the operational delay (e.g., arrival and departure delay) would occur in proportion to the components estimated for the Alternative C (base forecast). The emission estimates for the Alternative C (high range forecast) are compared to the results of the emission inventories for Alternative C (base forecast), as presented in **Table R-8**.

TABLE R-8
AIRPORT-RELATED EMISSION INVENTORIES – HYPOTHETICAL CONDITION (BUILD OUT + 5)

		Estimated Tons (2018) (b)					
Alternative	**Source Category**	**Carbon Monoxide**	**Volatile Organic Compounds**	**Nitrogen Oxides**	**Sulfur Oxides**	**Particulate Matter 10 microns or less**	**Particulate Matter 2.5 microns or less**
C (Base Forecast)	Aircraft	5,233	466	6,242	495	39	39
	GSE/APU(a)	11,799	461	417	44	18	17
	Roadways	8,806	353	491	15	47	28
	Parking Lots	63	5	3	<1	1	<1
	Stationary Sources	72	30	86	<1	7	7
	Training Fires	4	2	1	<1	15	15
	Total	**25,977**	**1,318**	**7,239**	**554**	**125**	**105**
C (High Range Forecast)	Aircraft	14,060	1,248	9,228	996	69	69
	GSE/APU(a)	13,804	540	488	51	21	20
	Roadways	9,951	399	555	17	53	32
	Parking Lots	71	6	3	1	1	<1
	Stationary Sources	72	30	86	1	7	7
	Training Fires	4	2	1	<1	15	15
	Total	**37,962**	**2,194**	**10,360**	**1,065**	**164**	**142**
	Increase	**11,985**	**876**	**2,121**	**511**	**39**	**37**

Notes: (a) GSE/APU = Ground service equipment/auxiliary power units.
(b) Numbers reflect numerical rounding.
Source: Environmental Science Associates, Inc. [TPC] analysis, 2004.

Alternative C (base forecast) compared to Alternative C (high range) - As shown in **Table R-8,** emissions of carbon monoxide for Alternative C (high range) would increase by approximately 11,985 tons (33 tons per day or 46 percent) while emissions of the other pollutants/precursors are predicted to increase from 16 to 3,121 tons (less than one to approximately nine tons per day). The emission of carbon monoxide would increase as a result of the forecast differences in aircraft operations, aircraft delay, and in motor vehicle-miles-traveled.

The increase in emissions from an individual source varies depending on the type of source (aircraft, ground support equipment, etc.) and how the source would be affected. The following discusses the differences in the source-specific emissions of Alternative C (high range) relative to Alternative C (base forecast).

Aircraft

A portion of the increase in aircraft emissions is directly attributable to the increase in annual operations with the high range forecast. Factors that affect the increase in individual pollutant or precursor emissions include differences in the aircraft fleet mix, the distribution of aircraft types within the fleet, and the increase in the cumulative ground movement time.

Ground Service Equipment/Auxiliary Power Units

The increase in ground service equipment emissions is directly attributable to the increase in annual operations. Variations in the percent increase of the emissions are attributable to variations in operations of each type of equipment (baggage tugs, loaders, etc.).

Roadways

The increase in motor vehicle emissions both on and off airport is directly attributable to the forecast increase in vehicle-miles-traveled, a 13 percent increase with Alternative C (high range forecast). The increase in vehicle-miles-traveled results from a combination of the increase in the number of vehicles and the distance each vehicle would travel.

Parking Lots

The increase in motor vehicle emissions in airport parking facilities is directly attributable to the increase in forecast vehicle-miles-traveled (again, either an increase in the number of vehicles or the distance each vehicle would travel).

Stationary Sources and Fire Training Activities

There are no forecast increases in stationary sources or in training fire activities with Alternative C (high range forecast) when compared to Alternative C (base forecast).

Dispersion Modeling

As with the emission inventories, the results of the dispersion analysis for the high range forecast was estimated using the forecast in aircraft operations and vehicle-miles-traveled, and the operational delay assessment (per source and pollutant/precursor). While emission loads related to the Alternative C (high range forecast) are higher than the Alternative C (base forecast); predicted ambient concentrations of carbon monoxide, nitrogen dioxide, sulfur dioxide, and particulate matter are below the NAAQS.