64

"Shawn Kinder"
<s_kinder@ricondo.com>
08/23/2005 06:13 PM

To Richard Kula/AGL/FAA@FAA
cc Dennis Walsh/AWA/FAA@FAA, Joe Hebert/AWA/FAA@FAA, Jeffrey Wharff/AWA/FAA@FAA, Ward Keech/AWA/FAA@FAA
bcc
Subject Preliminary Draft of Supplemental Analysis

History: This message has been forwarded.

Please see the attached.

We have some formatting issues still to work out. And we will be cleaning this up tonight/tomorrow with the idea of providing you with a clean final report by tomorrow night.

I would greatly appreciate your thoughts on this draft, as we want to ensure you get all that you need to complete this process.

Thanks for your assistance.

Shawn M. Kinder
Ricondo & Associates, Inc. - Chicago
Downtown Office:
Phone: 312.606.0611; Facsimile: 312.606.0706
O'Hare Modernization Program Office:
Phone: 773.557.4869; Facsimile: 773.557.4988
Mobile Phone: 312.890.5222


Draft Supplemental BCA 8_23_05.pdf

Summary

In February 2005, the City of Chicago (City) submitted a revised request for a Letter of Intent (LOI) for a multiyear commitment of Airport Improvement Program (AIP) funding for Phase 1 of the O'Hare Modernization Program. That submittal included a Benefit/Cost Analysis (BCA) based primarily on the delay reduction (measured in terms of changes in total aircraft travel time) benefits anticipated to be produced by the project. At that time, the City indicated that the methodology used in that BCA did "not attempt to quantify or consider all benefits associated with the project, but rather illustrate that the aircraft travel time savings alone are sufficient to produce benefits that in all cases exceed project costs. Thus, the benefit-cost ratios and NPV's (net present values) presented here (in the original BCA) are based on underestimated benefits and would be expected to be higher if a full accounting of project benefits were performed." (LOI Application, pages iv, IV-1). The Federal Aviation Administration subsequently requested that the City provide a supplemental BCA incorporating a quantitative analysis of the benefits resulting from the increased capacity produced by the proposed project. This document outlines the methodology, assumptions, and results of that supplemental analysis.

In this analysis, the capacity benefits of the project, i.e. the airport's ability to process additional traffic and passengers as a result of the proposed project, are estimated using consumer surplus as the appropriate measure of the benefits of the project. Consumer surplus is defined as the difference between what consumers must pay for a given level of service and what they would be willing to pay for that same level of service. The FAA provided a document prepared by GRA, Incorporated (GRA) which describes the approach to calculate the consumer surplus for an airport project. The GRA methodology is based on information contained in Appendix C, Section C.2 of the *FAA Airport Benefit-Cost Analysis Guidance, December 15, 1999* (*BCA Guidance*).

In the original BCA prepared by the City, benefit-cost ratios were estimated for the *OMP-Phase 1 Airfield Projects* (which consist of the OMP projects for which the LOI monies are being requested and include the airfield components for which the City has received Majority-In-Interest approval from the airlines and the supporting Program-wide requirements such as preliminary engineering, wetlands mitigation, OMP-Phase 1 noise mitigation, land acquisition, and other miscellaneous program-wide requirements) using the base assumptions as well as various sensitivity assumptions. In addition, Appendix D of that document included benefit-cost ratios for the *Master Plan Phase 1* (which included the costs of all projects covered under Phase 1 as defined in the Master Plan Study and Environmental Impact Statement, including but not limited to the costs of the Western Concourse, Concourse K extension, Taxiway LL, etc.), the *OMP Total Airfield* (which included the costs of all airfield components of the OMP but did not include terminal and other facility development), and the *Total Master Plan* (which included the costs of all capital projects described in the Airport's Master Plan). This supplemental analysis uses the same project groupings and focuses on the two Phase 1 definitions: *OMP-Phase 1 Airfield Projects* and *Master Plan Phase 1*. These two scenarios differ in their cost data; however, their benefit streams are identical. As in the previous analyses, 2001 is assumed to be the base year for the analysis, and all dollar values are presented in 2001 dollars.

The City has reviewed the methodology provided by FAA, as prepared by GRA, and determined that it is consistent with the FAA's BCA guidance. While the City's February 2005 BCA provided a worst-case scenario to the estimation of project benefits by focusing only on aircraft travel time savings resulting from implementation of the OMP, the methodology provided by FAA for this

supplemental analysis provides a mechanism to quantify the benefits associated with the increased traffic and passengers that can be processed by the airport as a result of the capacity increase attributed to the project. This methodology utilizes sound, common economic principles in analyzing the benefits of the program. It relies on the principle that consumers make travel decisions based on the value they receive for the price they are expected to pay. The following is a summary of the results of the application of this supplemental methodology.

Summary of Results from BCA and Sensitivity Analyses

Project	Present Value Benefits (billions)	Present Value Costs (billions)	Net Present Value (billions)[1]	Benefit-Cost Ratio	Other Information
BCA					
Phase 1 - Airfield	$11.8	$1.9	$9.9	6.1	
Phase 1 - Master Plan	$11.8	$2.6	$9.2	4.5	
Sensitivity Analyses					
Elasticity of Demand					New Elasticity of Demand Values
Phase 1 - Airfield	$1.9	$1.9		1.0	-10.30
Phase 1 - Master Plan	$2.6	$2.6		1.0	-5.55
Future Enplanements					New Avg. Annual Growth Rate
Phase 1 - Airfield	$1.9	$1.9		1.0	2.01%
Phase 1 - Master Plan	$2.6	$2.6		1.0	2.01%
Value of Time					Assumed Value of Time
Phase 1 - Airfield	$8.9	$1.9		4.6	$0.00
Phase 1 - Master Plan	$8.9	$2.6		3.4	$0.00
Money Fare					Alternate Money Fare
Phase 1 - Airfield	$8.3	$1.9		4.3	$132.59
Phase 1 - Master Plan	$8.3	$2.6		3.3	$132.59

Source: Ricondo & Associates, Inc.

New runways at the World's Busiest Airport are necessary. The State of Illinois legislature[1] has determined this. The Administrator of the FAA[2] has determined this. The FAA's Final Environmental Impact Statement (EIS) has determined this. The information contained in the supplemental BCA further substantiates that new runways are worthwhile investments. Consumers will receive more value from a modernized O'Hare than they will from the existing O'Hare; this supplemental BCA supports this conclusion.

The methodology utilized in this supplemental analysis provides for an estimation of project benefits at O'Hare. It does not account for the downstream benefits nor the additional system benefits, expected to be significant, that would also be realized should the project be implemented. For instance, reducing delays at O'Hare would provide benefits to other airports in the national aviation system because O'Hare is a hub for two major airlines. It is well documented that delays at O'Hare have repercussions throughout the country. Likewise, benefits of modernizing O'Hare would "ripple" throughout the system. These additional benefits are not accounted for in this supplemental analysis. Should they be accounted for, the BCA ratios would be even larger than those measured herein. This methodology does not account for benefits attributable solely to delay reduction. As stated above, this supplemental method provides for the quantification of benefits attributable to additional traffic

[1] O'Hare Modernization Act, Illinois Public Act 93-0450, 6 August 2003.
[2] Marion C. Blakely, FAA Administrator, 4 August 2004.

and passengers provided by the project. However, as the February 2005 BCA illustrates, there are substantial benefits without any growth in traffic at the airport.

The costs associated with the OMP have been reviewed by the FAA and their Third Party Consultant as part of the EIS process. They have found these costs to be reasonable, and documentation of this finding is contained in Appendix B of this document. Further, the FAA and their Third Party Consultant have reviewed the City of Chicago's financing plan for the full master plan program, and they have found no reason to believe that this financing plan is not viable. Documentation of this review is also contained in Appendix B of this document.

I. Supplemental BCA Methodology

The following assumptions and methodology used to prepare the BCA are in accordance with the FAA's *Benefit-Cost Analysis Guidance* dated December 15, 1999 (the *BCA Guidance*) and the *Economic Values for Evaluation of FAA Investment and Regulatory Decisions*, dated June 1998. The methodology for the BCA process is outlined in the *BCA Guidance* and generally consists of the following steps:

- Establish the Objectives: *As stated by the EIS, the proposed Federal action, which is the subject of the EIS, encompasses the following purposes:*
    - *Address the projected needs of the Chicago region by reducing delays at O'Hare, and thereby enhancing capacity of the NAS.*
    - *Ensure that existing and future terminal facilities and supporting infrastructure (access, landside, and related ancillary facilities) can efficiently accommodate airport users.*

- Formulate Assumptions: *Assumptions about future conditions at the airport being analyzed must be clearly explained and documented because they form the framework against which the alternatives are to be evaluated.*

    The FAA, as part of the Environmental Impact Statement (EIS) analysis for O'Hare, defined a constrained forecast of activity that would be anticipated to occur without airfield development at the Airport. The 2002 TAF, the most recent demand forecast available when the EIS analysis began, was used for the unconstrained scenarios in the EIS. The FAA, for the purposes of this supplemental analysis, has determined that demand would be constrained following the implementation of Phase 1 if the modernization program were not completed, and the FAA has developed a constrained forecast activity for this situation.

- Identify the Base Case: *The Base Case is a reference point from which incremental benefits and costs can be quantified. In the absence of major airfield construction (such as the OMP), opportunities to increase airfield capacity at the Airport are limited. As such, the Base Case for this BCA is defined as the no action scenario. The Airport's ongoing Capital Improvement Program (CIP), which would occur regardless of the proposed LOI Projects' implementation, is included in the Base Case.*
- Identify and Screen Alternatives: *The FAA has identified and screened alternatives as part of the EIS process. The Final EIS documents this screening process and identifies the O'Hare Modernization Program as the preferred alternative. The City of Chicago also believes this is the most effective solution to O'Hare's problems; and, thus, this BCA is based on the OMP.*
- Define Evaluation Period: *Consistent with the BCA Guidance, the evaluation period assumed for this BCA is 20 years after the completion of construction. For the OMP-Phase 1, the evaluation period ends in 2028.*
- Determine Costs: *Costs must be identified, quantified, and evaluated in total dollar amounts and for each year of a project's life. Typical costs include initial investments, such as planning and construction of the main project as well as any enabling projects, and recurring investments,*

such as operation and maintenance (O&M) costs. OMP costs are discussed in Appendix B of this document.

- Determine Benefits: *Typical benefits include reduced delays, the ability to accommodate more efficient aircraft and/or larger aircraft, safer and more secure air travel, and reduced environmental impacts.*

For purposes of this BCA, the benefit stream was calculated solely using benefits obtained from consumer surplus. Consumer surplus is defined as the difference between what consumers must pay for a given level of service and what they would be willing to pay for that same level of service. Two benefits can be obtained from consumer surplus calculations: a reduction in total travel time and a reduction in money fare. Other benefits of the OMP-Phase 1 Airfield, including greater schedule predictability, ability to accommodate larger aircraft, and safety improvements are not considered at this time. In addition, those system benefits beyond O'Hare are not accounted for in this analysis. Monetary quantification of these other benefits is not included in this analysis to avoid speculation. While this approach underestimates the overall benefits of the project, these benefits are not needed to demonstrate the program's justification.

- Compare Benefits and Costs: *Most airport investments require resources at the outset of a project in return for an annual flow of benefits over the long-term future. Because the costs are incurred up front, and the benefits are returned over a longer time period, an analysis recognizing the time value of money must be conducted to appropriately compare the benefits and costs of alternatives to inform ultimate selection of the preferred alternative for development. In the BCA, discounted benefits and costs are used to accurately compare project scenarios by their NPVs and benefit-cost ratios. Section V presents the comparison of benefits and costs. Detailed tables for these calculations can be found in Appendix A.*
- Conduct Sensitivity Analysis: *Sensitivity analyses are conducted to assess the ability of the project to meet the BCA requirements under alternative assumptions regarding future demand and economic values. This analysis is included as part of Section V, and detailed tables for these sensitivity analyses can be found in Appendix A.*
- Make Recommendation: *Finally, a BCA must state whether a project should be pursued based on the quantified benefits and costs, non-quantified benefits and costs, and sensitivity analysis.*

II. Aviation Activity Forecasts

As previously discussed, the 2002 TAF is being used as the basis for the OMP EIS analysis. The 2002 TAF, which presents aircraft operations and enplaned passengers by user category at the Airport through the year 2020, was prepared by FAA assuming the absence of any constraints to growth in activity at the Airport. Selected at the initiation of the OMP EIS analysis, the 2002 TAF remains the basis for EIS analysis even though subsequent TAFs were published in 2003 and 2004. To maintain consistency with the DEIS, the 2002 TAF is the primary unconstrained forecast used in this BCA.

Table II-1 presents the 2002 TAF of operations and enplaned passengers converted from federal fiscal years, which end September 30, to calendar years, and extrapolated through the evaluation period using linear extrapolation. As shown, the 2002 TAF forecasts grow to approximately 1.2 million operations and 50.4 million enplaned passengers in 2018, the last year of the EIS analysis.

Since initiation of the EIS analysis, the FAA has published a 2003 TAF and 2004 TAF, as shown on **Exhibit II-1** and **Exhibit II-2** in federal fiscal years. Both the 2003 and 2004 TAFs contain operations and enplaned passenger forecasts greater than those in the 2002 TAF. As previously mentioned, the 2002 TAF is used in this BCA to maintain consistency with the EIS analysis.

In addition to the unconstrained forecast represented by the 2002 TAF, the FAA, as part of the EIS analysis, developed a constrained forecast to represent the potential activity at the Airport if no action is undertaken to improve Airport capacity. This constrained forecast was developed based on simulation modeling efforts to reflect the assumption that growth in aircraft operations will cease once delays exceed the level the airlines and FAA consider "acceptable". The EIS analysis period extends until 2018; however, this analysis extends through 2028. Data for forecast years after 2018 was obtained by extrapolating values at gradually decreasing annual growth rates. An additional constrained forecast that includes the Phase I project is also used for analysis in this document. This forecast also extends through 2028. Forecast values are identical to the 2002 TAF until 2016, after which time values are extrapolated using gradually decreasing annual growth rates. In both constrained forecasts passenger enplanements are expected to grow due to increased enplaned passengers per operation and an increase in originating passengers. Both of these forecasts were prepared by the Federal Aviation Administration. **Table II-2** and **Table II-3** present the constrained forecasts for operations and enplanements.

Table II-1

2002 FAA Terminal Area Forecast for O'Hare International Airport –
Total Operations and Enplaned Passengers (Unconstrained Schedule)

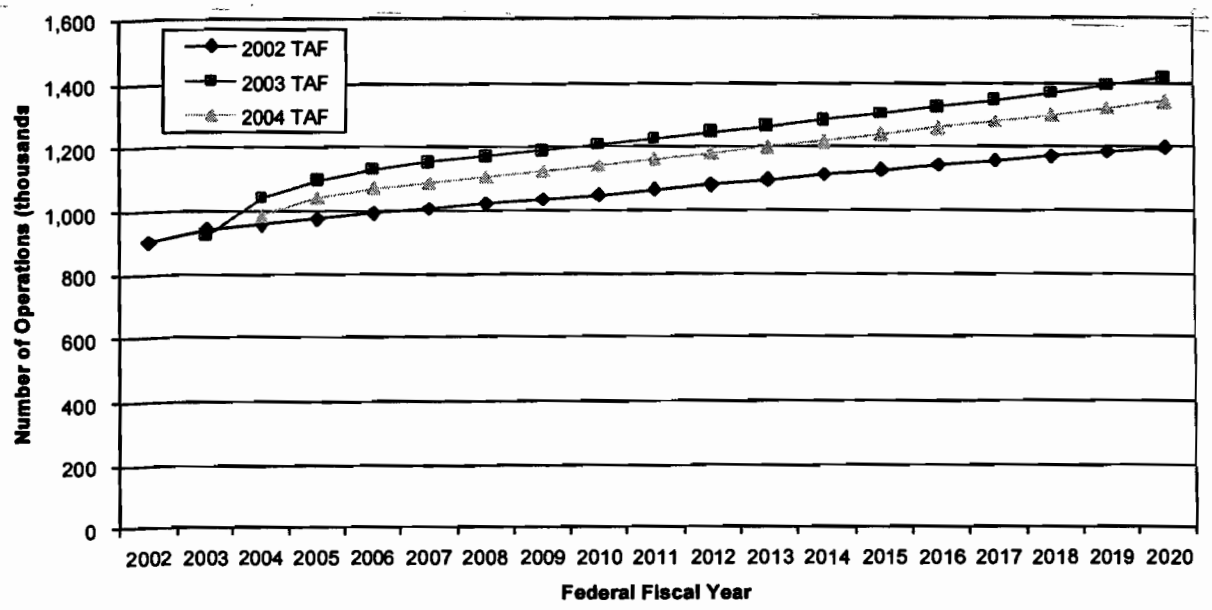
	Total Operations	Total Passenger Enplanements	
Calendar Year	2002 Terminal Area Forecast	2002 Terminal Area Forecast	Extrapolation[1]
2002	922,787	31,710,512	
2003	960,500	32,609,000	
2004[2]	976,544	33,633,730	
2005	992,855	34,696,477	
2010	1,072,706	40,280,622	
2015	1,149,402	46,367,491	
2018	1,194,000	50,372,000	
2020			52,224,100
2025			58,060,253
2030			63,896,405
2032			66,230,866

[1] Linear extrapolation based on calendar year projections.
[2] 2004 data are preliminary and subject to change.

Source (Forecast): FAA, *O'Hare Modernization Draft Environmental Impact Statement,* January 2005.
Source (Extrapolations): Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit II-1

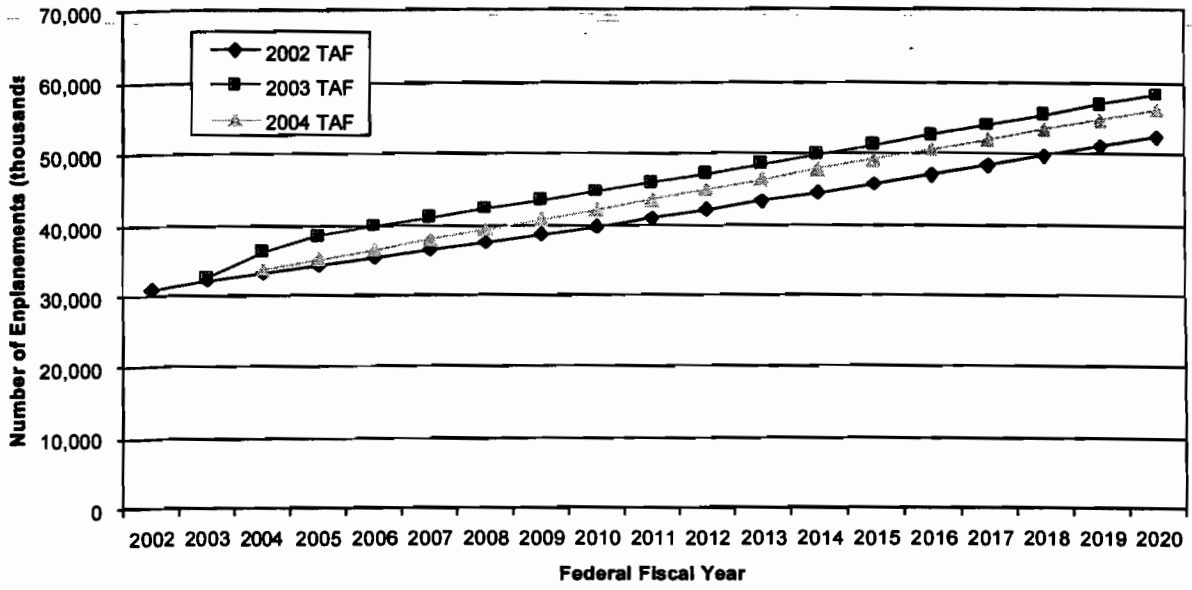
FAA Terminal Area Forecast Comparisons for O'Hare International Airport – Total Operations



Source: FAA.
Prepared by: Ricondo & Associates, Inc.

Exhibit II-2

FAA Terminal Area Forecast Comparisons for O'Hare International Airport – Enplaned Passengers



Source: FAA.
Prepared by: Ricondo & Associates, Inc.

Table II-2

Forecast for Constrained – No Project for O'Hare International Airport – Total Operations and Enplanements

	Total Operations		Total Passenger Enplanements	
Calendar Year	2002 Terminal Area Forecast	Capped Operations	2002 Terminal Area Forecast	Constrained – No Project
2002	922,787		31,710,512	
2003	960,500		32,609,000	
2004	976,544		33,633,730	
2005	992,855		34,696,477	
2006	1,009,439		35,798,962	
2007		974,000		36,219,500
2008		974,000		36,957,132
2009		974,000		37,717,500
2010		974,000		38,481,562
2011		974,000		39,267,508
2012		974,000		40,076,189
2013		974,000		40,908,500
2014		974,000		41,680,693
2015		974,000		42,472,622
2016		974,000		43,284,845
2017		974,000		44,117,940
2018		974,000		44,972,500
2019		974,000		45,692,000
2020		974,000		46,423,000
2021		974,000		47,166,000
2022		974,000		47,921,000
2023		974,000		48,688,000
2024		974,000		49,321,000
2025		974,000		49,962,000
2026		974,000		50,612,000
2027		974,000		51,270,000
2028		974,000		51,937,000

Source: Leigh Fisher Associates, FAA TAF, and U.S. DOT data.
Prepared by: Ricondo & Associates, Inc.

Table II-3

Forecast for Constrained Phase I Airfield and Master Plan for O'Hare International Airport – Total Operations and Enplanements

	Total Operations		Total Passenger Enplanements	
Calendar Year	2002 Terminal Area Forecast	Capped Operations	2002 Terminal Area Forecast	Constrained – Phase I
2002	922,787		31,710,512	
2003	960,500		32,609,000	
2004	976,544		33,633,730	
2005	992,855		34,696,477	
2006	1,009,439		35,798,962	
2007	1,026,300		36,943,000	
2008	1,041,635		38,027,251	
2009	1,057,200		39,149,000	
2010	1,072,706		40,280,622	
2011	1,088,438		41,450,619	
2012	1,104,402		42,660,538	
2013	1,120,600		43,912,000	
2014	1,134,910		45,119,418	
2015	1,149,402		46,367,491	
2016		1,150,000	47,181,000	
2017		1,150,000		48,110,000
2018		1,150,000		49,062,000
2019		1,150,000		49,994,000
2020		1,150,000		50,944,000
2021		1,150,000		51,810,000
2022		1,150,000		52,691,000
2023		1,150,000		53,587,000
2024		1,150,000		54,498,000
2025		1,150,000		55,315,000
2026		1,150,000		56,145,000
2027		1,150,000		56,987,000
2028		1,150,000		57,842,000

Source: Leigh Fisher Associates, FAA TAF, and U.S. DOT data.
Prepared by: Ricondo & Associates, Inc.

III. Project Costs

To provide the basis for the BCA and NPV calculations, costs associated with the project must be quantified to the extent possible. Quantifiable costs to be considered should consist of capital investment and incremental O&M costs. Only those costs that are attributable to a project being undertaken are to be considered. In other words, costs that would be incurred regardless of whether or not a project is undertaken should not be considered. Appendix B of this document provides information on the cost estimates utilized in this analysis, as well as the FAA's review of those cost estimates.

In addition to capital investment costs, estimated incremental O&M costs are included for the evaluation period. Incremental O&M costs for additional runway pavement were estimated at the unit rate for budgeted 2004 Airfield Area O&M expenses for the existing runways adjusted to 2001 dollars using the GDP Implicit Price Deflator.

IV. Project Benefits

The FAA BCA Guidance suggests that consumer surplus is an appropriate measure of benefits in projects where an investment for current users of the airport will induce new users to come to the airport. Because the OMP, and OMP-Phase 1 in particular, consists largely of airfield capacity improvements it is reasonable to assume that the increased capacity due to the infrastructure improvements will induce new demand at the airport. The primary benefits obtained from the OMP will be in the form of lower total travel costs (travel time and money fare). An increase in capacity will reduce delays and therefore lower travel time costs, and an increase in demand will lower fares.

.

IV.1 Simulation Modeling

In the analyses undertaken as part of OMP planning and the EIS, operational delay and travel times were assessed for the Base Case, OMP-Phase 1, and the OMP Total Airfield. These assessments were undertaken using the *Total Airspace and Airport Modeler* (TAAM), developed by Preston Aviation Solutions, a Boeing Company. TAAM is a fast-time gate-to-gate simulator of airport and airspace operations that facilitates decision-making, planning, and analysis. TAAM has been used in the United States for airfield and airspace assessments by the FAA, the National Airspace Redesign team, American Airlines, Continental Airlines, Delta Air Lines, and Boeing Air Traffic Management, among others. The FAA and its EIS consultant, known as the third party contractor (TPC), have been actively involved in the TAAM simulation analysis of the OMP. As documented in the DEIS:

> "An unprecedented series of TAAM simulation analyses were conducted by the City of Chicago's Consultant Team (CCT) with direction, oversight, review and approval by the FAA and the TPC. The FAA and TPC participated in an intensive, nine-month review process during the simulation effort. The objective of this process was to ensure that TAAM input assumptions, modeling methodologies, and output data conformed to the industry best practices in modeling and accurately reflected air traffic control rules and procedures. In total, FAA invested over 2,000 hours reviewing assumptions, draft results, animations, and final results. The FAA review was conducted by an Air Traffic Work Group, which consisted of FAA Management and National Air Traffic Controller Association (NATCA) representatives from O'Hare Tower, the Chicago Terminal Radar Approach Control Facility (TRACON), and the Chicago Center (ZAU); FAA Airports Division; and the FAA's TPC." [3]

The simulation modeling showed that delays increase exponentially under the Base Case as demand approaches capacity. Theoretically, delays can continue to increase to unrealistically high levels as demand exceeds capacity for more and more hours of the day. However, these excessively high levels of delay may not be experienced, as the airlines and passengers may change their behavior to

[3] Source: FAA, *O'Hare Modernization Draft Environmental Impact Statement*, January 2005.

avoid these delays. In response to increasing delays, airlines might increase average aircraft size to accommodate forecast demand, shift connecting passenger traffic through other hub airports.

The FAA in its *BCA Guidance* recognizes the limitations on delay growth, and suggests the need to modify demand growth when delays exceed 15 minutes per operation and that demand should be capped at approximately 20 minutes of delay per operation. Consistent with the *BCA Guidance*, the FAA developed constrained activity forecasts in the DEIS for the Airport to reflect the level of aircraft operations at which FAA believes further growth in aircraft activity would cease due to delays reaching "unacceptable" levels. As indicated in the DEIS, the constrained forecasts developed by FAA result in maximum average aircraft delays at the Airport of approximately 17 minutes per aircraft, which is lower than the 20 minutes per aircraft threshold outlined in the *BCA Guidance*.

IV.2 Simulation Results

As discussed earlier, simulation modeling using TAAM was performed to provide quantitative information on the performance of the Base Case and the OMP-Phase 1 Projects. The simulations used in this analysis are those originally prepared for the FAA EIS analysis. The methodologies and assumptions used in the simulation modeling have been documented in numerous data packages developed and published by the FAA in support of the EIS process.

Delay is the difference between unimpeded travel time and total travel time. Travel time is the time from gate departure at the origin airport to gate arrival at O'Hare, or the time of gate departure at O'Hare to gate arrival at the destination airport.

The differences in average delay between (1) the Base Case and OMP-Phase 1 Projects are greater than the differences between the average travel times in any given year. This results because the proposed plan increases unimpeded travel times due in part to the increase in taxi distance associated with the new runways. Therefore, this BCA uses the differences in travel times to calculate benefits in order to ensure that these benefits are understated.

V. Benefit - Cost Comparison

The comparison of benefits and costs involves the calculation of NPVs and benefit-cost ratios (BCRs) based on recognition of the time value of money in discounting the benefits and costs. Additionally, travel time savings must be converted into monetary values based on appropriate assumptions regarding the value of passenger time.

This BCA considers only reductions in travel times and reductions in air fares. Table I-1 summarizes other benefits not considered in this BCA, which if considered, would further increase the value of the economic benefits attributed to the project(s). The analyses performed in this section provide the benefit-cost comparison for the OMP-Phase 1 Airfield Projects. The following points outline relevant assumptions associated with the quantification of these benefits and **Table V-1** summarizes the assumptions.

- *Base Year.* Project benefits were evaluated using 2001 as the base year because OMP cost estimates are in 2001 dollars in the LOI request, OMP EIS, and Airport Master Plan. Project benefits and costs are stated in 2001 dollars in the year of accrual/expenditure, and benefits and costs are discounted 7 percent per year in accordance with the *BCA Guidance* to calculate present value.

- *Passenger Value of Time.* As set forth in the BCA Guidance, a blended rate accounting for the value of O'Hare's personal and business travelers' time may be used. As described in FAA Technical Report, Economic Values for Evaluation of FAA Investment and Regulatory Decisions the specified value of passenger travel time is $34.50 per hour for business travelers and $19.50 for personal travelers. Results of the In-Flight Air Survey in 1997 by Landrum & Brown indicated that business travel was the main purpose of the trip 52.4 percent of the time and personal travel 47.6 percent of the time. Based on this passenger distribution, the weighted average passenger cost for O'Hare is $27.36 per hour or $0.46 per minute.

- *Average Segment Money Fare.* The average segment money fare was compiled by Database Products, Inc. and obtained from U.S. DOT sources. The value was determined to be $220.05. However, this data source has certain limitations. For example, except under code-share agreements, the O&D survey does not include foreign flag carriers nor does it include data from air carriers flying aircraft with under 60 seats. The total revenue from passengers that have two stops in their itinerary is included in this fare calculation. Limitations to this data are addressed in a sensitivity analysis.

- *Elasticity of Demand.* As set forth in the BCA Guidance, values of total elasticity of demand for all travel distances are –0.8 for business travelers and –1.6 for non-business travelers. When the passenger distribution for ORD is applied to these values, the weighted value of the elasticity of demand in –1.18.

- *Salvage Value.* As set forth in the BCA Guidance, salvage value of the project may be considered. The salvage value of improvements at the end of the 20-year evaluation period is estimated to include only the value of the land acquired for the projects. For purposes of this analysis, it was assumed that the value of the land remains the same as on the purchase date, and the discounted value is included in the project benefits.

- *Sunk Costs.* As set forth in the BCA Guidance, sunk costs of the project should be excluded from the BCA. Through 2003, approximately $105.1 million has been spent on Program-Wide Requirements and land acquisition. Therefore, this amount is considered a sunk cost in the BCA.
- *Evaluation Period.* The evaluation period is the time period over which project benefits and costs are calculated. As recommended in the BCA Guidance, the evaluation period extends for 20 years after completion of construction.

Table V-1

Summary of BCA Data Sources and Assumptions

Input	Data Source	Assumptions
Average Travel Time per Operation (minutes)	Phase I - TAAM Simulation Results	
Value of Time ($/minute)	*Economic Values for Evaluation of FAA Investment and Regulatory Decisions, FAA Technical Report Document, Report No. FAA-APO-98-8* Table E-1 - Economic Values for Use in Analyses Conducted in 2002 Value of Passenger Time: $19.50/hour (personal) $34.50/hour (business)	A weighted value of passenger time was used for calculations. Results from Landrum & Brown's 1997 *In-Flight Air Survey* at Chicago O'Hare International Airport (ORD) indicated that the main purpose of an air trip was business 52.4 percent of the time and personal travel 47.6 percent of the time. Weighted Value of Passenger Time: $27.36/hour $00.46/minute
Average Segment Money Fare	U.S. DOT O&D passenger survey (10 percent ticket sample), Database Products, Inc.	Except under code-share agreements, the O&D survey does not include foreign flag carriers nor does it include data from air carriers flying aircraft with under 60 seats. The total revenue from passengers that have two stops in their itinerary is included in this fare calculation. Limitations to this data are addressed in a sensitivity analysis Average Segment Money Fare: $220.05
Base Case Total Passengers (millions)	Leigh Fisher Associates, FAA Terminal Area Forecast, and U.S. DOT data	An unconstrained forecast based on the 2002 TAF was used until 2007, after which time a "Constrained-No Project" forecast was used. "Constrained -No Project" data through 2018 is from ORD OMP EIS. Data after 2018 extrapolated.
Scenario Total Passengers (millions)	Leigh Fisher Associates, FAA Terminal Area Forecast, and U.S. DOT data.	An unconstrained forecast based on the 2002 TAF was used until 2016, after which time a "Constrained – Phase I Project" forecast was used.
Present Value of Total Benefits	*BCA Guidance*	Base Year: 2001 End Year: 2028 Discount Rate for NPV: 7.0 % Salvage Value: $44.6 million Sunk Costs: $105.1 million
Scenario - Full Price of Travel (elasticity of demand)	*BCA Guidance* Table C.2: Total Elasticity of Demand For all Travel Distances: -0.8 (business) -1.6 (personal)	The same business/personal percentages used to calculate the Value of Time were used to determine the Elasticity of Demand. Elasticity of Demand: -1.18 (all travelers, all distances)

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

V.1 Project Analysis

Based on the information presented in Table V-1, and information on costs and travel time benefits presented in prior sections of this document, the benefit-cost ratio and NPV were derived for the OMP-Phase 1 – Airfield and Master Plan scenarios. These values are presented in **Table V-2**. As shown, the benefit-cost ratio is greater than 1.0 and the NPV is approximately $9.9 and $9.2 billion dollars, respectively. Supplemental information to illustrate the BCRs and NPVs for the OMP-Phase 1 – Airfield and Master Plan can be found in **Appendix A, Table A-1** and **Table A-2**.

Table V-2

Benefit-Cost Ratio and Net Present Value (2001 dollars) – OMP-Phase 1 Airfield and OMP-Phase 1 Master Plan Projects
Benefits from Consumer Surplus Only

Project	Present Value Benefits (billions)	Present Value Costs (billions)	Net Present Value (billions) [1]	Benefit-Cost Ratio
OMP-Phase 1 Airfield Projects	$11.8	$1.9	$9.9	6.1
OMP-Phase 1 Master Plan Projects	$11.8	$2.6	$9.2	4.5

[1] Total may not add due to rounding.

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

V.2 Sensitivity Analyses

Due to the risks involved in infrastructure development and the number of assumptions regarding future conditions that occur in benefit-cost analyses, the analysis should be evaluated for its sensitivity to certain basic parameters to confirm its economic viability. For this BCA, the following sensitivity analyses were conducted for the OMP-Phase 1 Airfield Projects and the OMP-Phase 1 Master Plan Projects. These are assumptions used only to demonstrate the continued economic justification for the OMP-Phase 1 Airfield Projects and the OMP-Phase 1 Master Plan Projects under varying cost and schedule conditions and are not anticipated program changes.

- Evaluate the range of elasticities of demand over which the project is cost beneficial.
- Evaluate the range of future demand in the scenario case over which the project is cost beneficial.
- Evaluate the plausibility of the value of time in the scenario case.
- Evaluate the plausibility of the money fare in the scenario case.

V.2.1. Elasticity of Demand

To evaluate the range of elasticities of demand, different values for the elasticity of demand were entered as model inputs until a cost-benefit ratio of slightly greater than 1.0 was obtained. **Table V-3** describes the range of elasticity of demand for each scenario where the benefit-cost ratio is positive.

Table V-3

Range of Elasticity of Demand

Scenario	Original Elasticity Value	New Elasticity Value	New Benefit-Cost Ratio
Phase I – Airfield	-1.18	-10.30	1.0
Phase I – Master Plan	-1.18	-5.55	1.0

Source: *FAA Airport Benefit-Cost Analysis Guidance, December 15, 1999* and Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

The range over which the elasticity of demand values will still produce a positive benefit-cost ratio is quite large. A summary of the NPV calculations resulting from this sensitivity analysis can be found in the *Summary – Elasticity Sensitivity Analysis* worksheet for each scenario.

V.2.2. Future Enplanements

To evaluate the range of future demand over which the project is cost beneficial, the growth rate of passenger enplanements was reduced to closely match the "Constrained" growth rate. This rate was reduced to the minimum value possible while still achieving a benefit-cost ratio of one. An annual average growth rate for each scenario was calculated for the forecast period (2002 through 2028). The average annual growth rate used in each scenario is presented below in **Table V-4.**

Table V-4

Average Annual Growth Rate for Future Demand

Scenario	Base Case Growth Rate 1/	Project Growth Rate (Original) 1/	Project Growth Rate (Sensitivity) 1/	New Benefit-Cost Ratio 1/
Phase I – Airfield	1.92 %	2.34 %	2.01 %	1.0
Phase I – Master Plan	1.92 %	2.34 %	2.01 %	1.0

Note:
1/ Growth Rate refers to the annual average growth rate for the forecast period (2002 through 2028).

Source: *FAA Airport Benefit-Cost Analysis Guidance, December 15, 1999* and Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

An annual average growth rate of 2.01 percent results in an 8 percent reduction in passengers in 2028. Expressed as a number of passengers, this is a 9.25 million-passenger decrease. A summary of the NPV calculations resulting from this sensitivity analysis can be found in **Table A-5** and **Table A-6** of Appendix A.

Note, that this supplemental method provides for the quantification of benefits attributable to additional traffic and passengers provided by the project. As this sensitivity analysis illustrates,

traffic growth lower than the FAA forecast levels provide for a BC ratio greater than 1. However, as the February 2005 BCA illustrates, there are substantial benefits without any growth in traffic at the airport.

Additional forecasts were evaluated to determine the impact of alternate enplanement scenarios on project benefits. The 2003 TAF and 2004 TAF both show larger project enplanements than Constrained – Phase I forecast used in this analysis, and they were evaluated as the "high-growth" scenarios. The 2003 TAF in 2018 projects 56.3 million enplanements. This value is reached in 2027 of the Constrained – Phase I forecast. Thus, if a positive BCR is shown using this forecast, it follows that using the 2003 TAF would also produce a positive BCR. The same comparison was made with the 2004 TAF. In 2018 enplanments are project to reach 50.2 million. The Constrained – Phase I forecast predicts this level of enplanements to occur in 2020. As stated in the case of the 2003 TAF, if a positive BCR was obtained using the Constrained – Phase I forecast, then a positive BCR will be obtained using this forecast that predicts a larger number of enplanements.

V.2.3. Value of Time

The influence of the value of time on the benefit stream was examined by assuming a passenger's value of time to be equal to zero. When the value of time is equal to zero, a positive benefit-cost ratio is still obtained for both scenarios. *Phase I – Airfield* has a benefit-cost ratio of 4.6, and *Phase I – Master Plan* has a benefit-cost ratio of 3.4. Thus, the benefits obtained from the reduction in travel time are not significant when compared with the benefits obtained from the reduction in fare. A summary of the NPV calculations can be found in **Table A-7** and **Table A-8** in Appendix A.

V.2.4. Money Fare

To evaluate the plausibility of the money fare, R&A obtained an enhanced data set from Database Products, Inc. This data corresponds to the first quarter of 2005, and it includes estimates of revenue from Foreign Flag Carriers (T100 Data) and revenue estimates from non-reporting commuter airlines (aircraft with less than 60 seats). The new dataset resulted in an average segment money fare of $132.59, whereas the money fare used in the original calculation was $220.05. This new calculation produced a benefit-cost ratio of 4.3 for *Phase I – Airfield* and 3.3 for *Phase I – Master Plan*. A summary of the NPV calculations can be found in **Table A-9** and **Table A-10**.

VI. Recommendation

This BCA has been performed in accordance with the BCA Guidance. Using a consumer surplus calculation results in a BCR and NPV that far exceed the FAA thresholds. Sensitivity analyses also confirm that values for elasticity of demand and forecast values for passenger enplanements can vary significantly while still creating a positive benefit stream. This is also true of the money fare and the value of time. The OMP-Phase 1 Airfield and the OMP-Phase 1 Master Plan Projects were determined to have the economic justification necessary for FAA to consider the project for AIP discretionary grants. A summary of the results from the Base Scenario and Sensitivity Analysis is shown in **Table VI-1**.

Table VI-1

Summary of Results from BCA and Sensitivity Analyses

Project	Present Value Benefits (billions)	Present Value Costs (billions)	Net Present Value (billions)[1]	Benefit-Cost Ratio	Other Information
BCA					
Phase 1 - Airfield	$11.8	$1.9	$9.9	6.1	
Phase 1 - Master Plan	$11.8	$2.6	$9.2	4.5	
Sensitivity Analyses					
Elasticity of Demand					New Elasticity of Demand Values
Phase 1 - Airfield	$1.9	$1.9		1.0	-10.30
Phase 1 - Master Plan	$2.6	$2.6		1.0	-5.55
Future Enplanements					New Avg. Annual Growth Rate
Phase 1 - Airfield	$1.9	$1.9		1.0	2.01%
Phase 1 - Master Plan	$2.6	$2.6		1.0	2.01%
Value of Time					Assumed Value of Time
Phase 1 - Airfield	$8.9	$1.9		4.6	$0.00
Phase 1 - Master Plan	$8.9	$2.6		3.4	$0.00
Money Fare					Alternate Money Fare
Phase 1 - Airfield	$8.3	$1.9		4.3	$132.59
Phase 1 - Master Plan	$8.3	$2.6		3.3	$132.59

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Appendix A

Tables included in this appendix show detailed information regarding the NPV calculation used to calculate the BCR for the base scenarios and the sensitivity analyses. A yearly calculation of benefits and costs is included for the entire analysis period.

Table A-1

Benefit-Cost Analysis Summary, OMP-Phase 1 Airfield (millions of 2001 dollars)

	Benefits	Costs			Present Value				
Year	Project Benefits from Consumer Surplus	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0
2002	0.0	17.1	0.0	17.1	1.0700	0.0	0.0	16.0	(16.0)
2003	0.0	127.3	0.0	127.3	1.1449	0.0	0.0	111.2	(111.2)
2004	0.0	505.1	0.0	505.1	1.2250	0.0	0.0	412.3	(412.3)
2005	0.0	604.6	0.0	604.6	1.3108	0.0	0.0	461.3	(461.3)
2006	0.0	535.4	0.0	535.4	1.4026	0.0	0.0	381.8	(381.8)
2007	347.0	329.2	4.8	334.0	1.5007	231.2	231.2	222.5	8.7
2008	513.3	316.1	4.8	320.9	1.6058	319.6	319.6	199.8	119.8
2009	684.4	20.0	15.6	35.6	1.7182	398.3	398.3	20.7	377.6
2010	859.6	0.0	15.6	15.6	1.8385	467.6	467.6	8.5	459.1
2011	1,042.5	0.0	15.6	15.6	1.9672	530.0	530.0	7.9	522.0
2012	1,233.4	0.0	15.6	15.6	2.1049	586.0	586.0	7.4	578.6
2013	1,432.7	0.0	15.6	15.6	2.2522	636.1	636.1	6.9	629.2
2014	1,636.2	0.0	15.6	15.6	2.4098	679.0	679.0	6.5	672.5
2015	1,848.7	0.0	15.6	15.6	2.5785	716.9	716.9	6.1	710.9
2016	1,852.2	0.0	15.6	15.6	2.7590	671.3	671.3	5.7	665.7
2017	1,899.3	0.0	15.6	15.6	2.9522	643.4	643.4	5.3	638.1
2018	1,947.2	0.0	15.6	15.6	3.1588	616.4	616.4	4.9	611.5
2019	2,045.9	0.0	15.6	15.6	3.3799	605.3	605.3	4.6	600.7
2020	2,147.5	0.0	15.6	15.6	3.6165	593.8	593.8	4.3	589.5
2021	2,205.1	0.0	15.6	15.6	3.8697	569.8	569.8	4.0	565.8
2022	2,264.0	0.0	15.6	15.6	4.1406	546.8	546.8	3.8	543.0
2023	2,324.3	0.0	15.6	15.6	4.4304	524.6	524.6	3.5	521.1
2024	2,452.2	0.0	15.6	15.6	4.7405	517.3	517.3	3.3	514.0
2025	2,533.6	0.0	15.6	15.6	5.0724	499.5	499.5	3.1	496.4
2026	2,616.7	0.0	15.6	15.6	5.4274	482.1	482.1	2.9	479.2
2027	2,701.6	0.0	15.6	15.6	5.8074	465.2	465.2	2.7	462.5
2028	2,788.2	0.0	15.6	15.6	6.2139	448.7	448.7	2.5	446.2
2029	0.0	0.0	0.0	0.0	6.6488	0.0	0.0	0.0	0.0
2030	0.0	0.0	0.0	0.0	7.1143	0.0	0.0	0.0	0.0
2031	0.0	0.0	0.0	0.0	7.6123	0.0	0.0	0.0	0.0
2032	0.0	0.0	0.0	0.0	8.1451	0.0	0.0	0.0	0.0
Total	$39,375.7	$2,454.9	$322.1	$2,777.0		$11,749.1	$11,749.1	$1,919.6	$9,829.5
Plus: Salvage Value	$44.6						$11,793.7	$1,919.6	$9,874.0

Benefit-Cost Ratio of Project:	6.14

Table A-2

Benefit-Cost Analysis Summary, Master Plan Phase 1 (millions of 2001 dollars)

	Benefits	Costs			Present Value				
Year	Project Benefits from Consumer Surplus	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0
2002	0.0	17.1	0.0	17.1	1.0700	0.0	0.0	16.0	(16.0)
2003	0.0	127.3	0.0	127.3	1.1449	0.0	0.0	111.2	(111.2)
2004	0.0	516.0	0.0	516.0	1.2250	0.0	0.0	421.2	(421.2)
2005	0.0	637.5	0.0	637.5	1.3108	0.0	0.0	486.4	(486.4)
2006	0.0	811.8	0.0	811.8	1.4026	0.0	0.0	578.8	(578.8)
2007	347.0	614.3	5.4	619.6	1.5007	231.2	231.2	412.9	(181.7)
2008	513.3	597.2	5.4	602.6	1.6058	319.6	319.6	375.3	(55.6)
2009	684.4	30.1	21.0	51.1	1.7182	398.3	398.3	29.8	368.6
2010	859.6	25.8	21.0	46.8	1.8385	467.6	467.6	25.5	442.1
2011	1,042.5	25.8	21.0	46.8	1.9672	530.0	530.0	23.8	506.2
2012	1,233.4	25.8	21.0	46.8	2.1049	586.0	586.0	22.2	563.8
2013	1,432.7	0.0	21.0	21.0	2.2522	636.1	636.1	9.3	626.8
2014	1,636.2	0.0	21.0	21.0	2.4098	679.0	679.0	8.7	670.3
2015	1,848.7	0.0	21.0	21.0	2.5785	716.9	716.9	8.1	708.8
2016	1,852.2	0.0	21.0	21.0	2.7590	671.3	671.3	7.6	663.7
2017	1,899.3	0.0	21.0	21.0	2.9522	643.4	643.4	7.1	636.2
2018	1,947.2	0.0	21.0	21.0	3.1588	616.4	616.4	6.6	609.8
2019	2,045.9	0.0	21.0	21.0	3.3799	605.3	605.3	6.2	599.1
2020	2,147.5	0.0	21.0	21.0	3.6165	593.8	593.8	5.8	588.0
2021	2,205.1	0.0	21.0	21.0	3.8697	569.8	569.8	5.4	564.4
2022	2,264.0	0.0	21.0	21.0	4.1406	546.8	546.8	5.1	541.7
2023	2,324.3	0.0	21.0	21.0	4.4304	524.6	524.6	4.7	519.9
2024	2,452.2	0.0	21.0	21.0	4.7405	517.3	517.3	4.4	512.9
2025	2,533.6	0.0	21.0	21.0	5.0724	499.5	499.5	4.1	495.4
2026	2,616.7	0.0	21.0	21.0	5.4274	482.1	482.1	3.9	478.3
2027	2,701.6	0.0	21.0	21.0	5.8074	465.2	465.2	3.6	461.6
2028	2,788.2	0.0	21.0	21.0	6.2139	448.7	448.7	3.4	445.3
2029	0.0	0.0	21.0	21.0	6.6488	0.0	0.0	3.2	(3.2)
2030	0.0	0.0	21.0	21.0	7.1143	0.0	0.0	3.0	(3.0)
2031	0.0	0.0	21.0	21.0	7.6123	0.0	0.0	2.8	(2.8)
2032	0.0	0.0	21.0	21.0	8.1451	0.0	0.0	2.6	(2.6)
Total	$39,375.7	$3,428.8	$514.6	$3,943.4		$11,749.1	$11,749.1	$2,608.6	$9,140.5
Plus: Salvage Value	$44.6						$11,793.7	$2,608.6	$9,185.1

Benefit-Cost Ratio of Project:	4.52

Table A-3

Summary – Elasticity Sensitivity Analysis, OMP Phase 1 – Airfield (millions of 2001 dollars)

	Benefits	Costs			Present Value				
Year	Project Benefits from Consumer Surplus	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0
2002	0.0	17.1	0.0	17.1	1.0700	0.0	0.0	16.0	(16.0)
2003	0.0	127.3	0.0	127.3	1.1449	0.0	0.0	111.2	(111.2)
2004	0.0	505.1	0.0	505.1	1.2250	0.0	0.0	412.3	(412.3)
2005	0.0	604.6	0.0	604.6	1.3108	0.0	0.0	461.3	(461.3)
2006	0.0	535.4	0.0	535.4	1.4026	0.0	0.0	381.8	(381.8)
2007	54.3	329.2	4.8	334.0	1.5007	36.2	36.2	222.5	(186.4)
2008	80.5	316.1	4.8	320.9	1.6058	50.2	50.2	199.8	(149.7)
2009	107.7	20.0	15.6	35.6	1.7182	62.7	62.7	20.7	42.0
2010	135.7	0.0	15.6	15.6	1.8385	73.8	73.8	8.5	65.3
2011	165.1	0.0	15.6	15.6	1.9672	83.9	83.9	7.9	76.0
2012	195.9	0.0	15.6	15.6	2.1049	93.1	93.1	7.4	85.6
2013	228.2	0.0	15.6	15.6	2.2522	101.3	101.3	6.9	94.4
2014	261.3	0.0	15.6	15.6	2.4098	108.4	108.4	6.5	102.0
2015	296.1	0.0	15.6	15.6	2.5785	114.8	114.8	6.1	108.8
2016	296.5	0.0	15.6	15.6	2.7590	107.5	107.5	5.7	101.8
2017	304.1	0.0	15.6	15.6	2.9522	103.0	103.0	5.3	97.7
2018	311.8	0.0	15.6	15.6	3.1588	98.7	98.7	4.9	93.8
2019	328.0	0.0	15.6	15.6	3.3799	97.0	97.0	4.6	92.4
2020	344.6	0.0	15.6	15.6	3.6165	95.3	95.3	4.3	91.0
2021	354.0	0.0	15.6	15.6	3.8697	91.5	91.5	4.0	87.4
2022	363.5	0.0	15.6	15.6	4.1406	87.8	87.8	3.8	84.0
2023	373.3	0.0	15.6	15.6	4.4304	84.3	84.3	3.5	80.7
2024	394.4	0.0	15.6	15.6	4.7405	83.2	83.2	3.3	79.9
2025	407.8	0.0	15.6	15.6	5.0724	80.4	80.4	3.1	77.3
2026	421.4	0.0	15.6	15.6	5.4274	77.7	77.7	2.9	74.8
2027	435.4	0.0	15.6	15.6	5.8074	75.0	75.0	2.7	72.3
2028	449.7	0.0	15.6	15.6	6.2139	72.4	72.4	2.5	69.8
2029	0.0	0.0	0.0	0.0	6.6488	0.0	0.0	0.0	0.0
2030	0.0	0.0	0.0	0.0	7.1143	0.0	0.0	0.0	0.0
2031	0.0	0.0	0.0	0.0	7.6123	0.0	0.0	0.0	0.0
2032	0.0	0.0	0.0	0.0	8.1451	0.0	0.0	0.0	0.0
Total	$6,309.5	$2,454.9	$322.1	$2,777.0		$1,878.1	$1,878.1	$1,919.6	($41.6)
Plus: Salvage Value	$44.6						$1,922.6	$1,919.6	$3.0

Benefit-Cost Ratio of Project:	**1.00**

Table A-4

Summary – Elasticity Sensitivity Analysis, Master Plan Phase 1 (millions of 2001 dollars)

	Benefits	Costs			Present Value					
Year	Project Benefits from Consumer Surplus	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0	$0.0
2002	0.0	17.1	0.0	17.1	1.0700	0.0	0.0	0.0	16.0	(16.0)
2003	0.0	127.3	0.0	127.3	1.1449	0.0	0.0	0.0	111.2	(111.2)
2004	0.0	516.0	0.0	516.0	1.2250	0.0	0.0	0.0	421.2	(421.2)
2005	0.0	637.5	0.0	637.5	1.3108	0.0	0.0	0.0	486.4	(486.4)
2006	0.0	811.8	0.0	811.8	1.4026	0.0	0.0	0.0	578.8	(578.8)
2007	74.3	614.3	5.4	619.6	1.5007	49.5	0.0	49.5	412.9	(363.4)
2008	110.2	597.2	5.4	602.6	1.6058	68.7	0.0	68.7	375.3	(306.6)
2009	147.4	30.1	21.0	51.1	1.7182	85.8	0.0	85.8	29.8	56.0
2010	185.7	25.8	21.0	46.8	1.8385	101.0	0.0	101.0	25.5	75.5
2011	225.8	25.8	21.0	46.8	1.9672	114.8	0.0	114.8	23.8	91.0
2012	267.9	25.8	21.0	46.8	2.1049	127.3	0.0	127.3	22.2	105.0
2013	312.0	0.0	21.0	21.0	2.2522	138.5	0.0	138.5	9.3	129.2
2014	357.3	0.0	21.0	21.0	2.4098	148.3	0.0	148.3	8.7	139.5
2015	404.7	0.0	21.0	21.0	2.5785	157.0	0.0	157.0	8.1	148.8
2016	405.3	0.0	21.0	21.0	2.7590	146.9	0.0	146.9	7.6	139.3
2017	415.7	0.0	21.0	21.0	2.9522	140.8	0.0	140.8	7.1	133.7
2018	426.2	0.0	21.0	21.0	3.1588	134.9	0.0	134.9	6.6	128.3
2019	448.2	0.0	21.0	21.0	3.3799	132.6	0.0	132.6	6.2	126.4
2020	470.9	0.0	21.0	21.0	3.6165	130.2	0.0	130.2	5.8	124.4
2021	483.7	0.0	21.0	21.0	3.8697	125.0	0.0	125.0	5.4	119.6
2022	496.8	0.0	21.0	21.0	4.1406	120.0	0.0	120.0	5.1	114.9
2023	510.2	0.0	21.0	21.0	4.4304	115.2	0.0	115.2	4.7	110.4
2024	538.9	0.0	21.0	21.0	4.7405	113.7	0.0	113.7	4.4	109.3
2025	557.2	0.0	21.0	21.0	5.0724	109.8	0.0	109.8	4.1	105.7
2026	575.8	0.0	21.0	21.0	5.4274	106.1	0.0	106.1	3.9	102.2
2027	594.8	0.0	21.0	21.0	5.8074	102.4	0.0	102.4	3.6	98.8
2028	614.3	0.0	21.0	21.0	6.2139	98.9	0.0	98.9	3.4	95.5
2029	0.0	0.0	21.0	21.0	6.6488	0.0	0.0	0.0	3.2	(3.2)
2030	0.0	0.0	21.0	21.0	7.1143	0.0	0.0	0.0	3.0	(3.0)
2031	0.0	0.0	21.0	21.0	7.6123	0.0	0.0	0.0	2.8	(2.8)
2032	0.0	0.0	21.0	21.0	8.1451	0.0	0.0	0.0	2.6	(2.6)
Total	$8,623.5	$3,428.8	$514.6	$3,943.4		$2,567.3	$0.0	$2,567.3	$2,608.6	($41.3)
Plus: Salvage Value	$44.6							$2,611.9	$2,608.6	$3.2

Benefit-Cost Ratio of Project:	1.00

Table A-5

Summary – Elasticity Sensitivity Analysis, Master Plan Phase 1 (millions of 2001 dollars)

	Benefits	Costs			Present Value					
Year	Project Benefits from Consumer Surplus	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Passenger Delay Savings	Downstream Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0	$0.0
2002	0.0	17.1	0.0	17.1	1.0700	0.0	0.0	0.0	16.0	(16.0)
2003	0.0	127.3	0.0	127.3	1.1449	0.0	0.0	0.0	111.2	(111.2)
2004	0.0	516.0	0.0	516.0	1.2250	0.0	0.0	0.0	421.2	(421.2)
2005	0.0	637.5	0.0	637.5	1.3108	0.0	0.0	0.0	486.4	(486.4)
2006	0.0	811.8	0.0	811.8	1.4026	0.0	0.0	0.0	578.8	(578.8)
2007	74.3	614.3	5.4	619.6	1.5007	49.5	0.0	49.5	412.9	(363.4)
2008	110.2	597.2	5.4	602.6	1.6058	68.7	0.0	68.7	375.3	(306.6)
2009	147.4	30.1	21.0	51.1	1.7182	85.8	0.0	85.8	29.8	56.0
2010	185.7	25.8	21.0	46.8	1.8385	101.0	0.0	101.0	25.5	75.5
2011	225.8	25.8	21.0	46.8	1.9672	114.8	0.0	114.8	23.8	91.0
2012	267.9	25.8	21.0	46.8	2.1049	127.3	0.0	127.3	22.2	105.0
2013	312.0	0.0	21.0	21.0	2.2522	138.5	0.0	138.5	9.3	129.2
2014	357.3	0.0	21.0	21.0	2.4098	148.3	0.0	148.3	8.7	139.5
2015	404.7	0.0	21.0	21.0	2.5785	157.0	0.0	157.0	8.1	148.8
2016	405.3	0.0	21.0	21.0	2.7590	146.9	0.0	146.9	7.6	139.3
2017	415.7	0.0	21.0	21.0	2.9522	140.8	0.0	140.8	7.1	133.7
2018	426.2	0.0	21.0	21.0	3.1588	134.9	0.0	134.9	6.6	128.3
2019	448.2	0.0	21.0	21.0	3.3799	132.6	0.0	132.6	6.2	126.4
2020	470.9	0.0	21.0	21.0	3.6165	130.2	0.0	130.2	5.8	124.4
2021	483.7	0.0	21.0	21.0	3.8697	125.0	0.0	125.0	5.4	119.6
2022	496.8	0.0	21.0	21.0	4.1406	120.0	0.0	120.0	5.1	114.9
2023	510.2	0.0	21.0	21.0	4.4304	115.2	0.0	115.2	4.7	110.4
2024	538.9	0.0	21.0	21.0	4.7405	113.7	0.0	113.7	4.4	109.3
2025	557.2	0.0	21.0	21.0	5.0724	109.8	0.0	109.8	4.1	105.7
2026	575.8	0.0	21.0	21.0	5.4274	106.1	0.0	106.1	3.9	102.2
2027	594.8	0.0	21.0	21.0	5.8074	102.4	0.0	102.4	3.6	98.8
2028	614.3	0.0	21.0	21.0	6.2139	98.9	0.0	98.9	3.4	95.5
2029	0.0	0.0	21.0	21.0	6.6488	0.0	0.0	0.0	3.2	(3.2)
2030	0.0	0.0	21.0	21.0	7.1143	0.0	0.0	0.0	3.0	(3.0)
2031	0.0	0.0	21.0	21.0	7.6123	0.0	0.0	0.0	2.8	(2.8)
2032	0.0	0.0	21.0	21.0	8.1451	0.0	0.0	0.0	2.6	(2.6)
Total	$8,623.5	$3,428.8	$514.6	$3,943.4		$2,567.3	$0.0	$2,567.3	$2,608.6	($41.3)
Plus: Salvage Value	$44.6							$2,611.9	$2,608.6	$3.2

Benefit-Cost Ratio of Project:	**1.00**

Table A-6

Summary – Future Demand Sensitivity Analysis, OMP Phase 1 Airfield (millions of 2001 dollars)

	Benefits	Costs			Present Value				
Year	Project Benefits from Consumer Surplus	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0
2002	0.0	17.1	0.0	17.1	1.0700	0.0	0.0	16.0	(16.0)
2003	0.0	127.3	0.0	127.3	1.1449	0.0	0.0	111.2	(111.2)
2004	0.0	505.1	0.0	505.1	1.2250	0.0	0.0	412.3	(412.3)
2005	0.0	604.6	0.0	604.6	1.3108	0.0	0.0	461.3	(461.3)
2006	0.0	535.4	0.0	535.4	1.4026	0.0	0.0	381.8	(381.8)
2007	170.5	329.2	4.8	334.0	1.5007	113.6	113.6	222.5	(108.9)
2008	332.3	316.1	4.8	320.9	1.6058	206.9	206.9	199.8	7.1
2009	124.5	20.0	15.6	35.6	1.7182	72.4	72.4	20.7	51.7
2010	285.8	0.0	15.6	15.6	1.8385	155.5	155.5	8.5	147.0
2011	454.4	0.0	15.6	15.6	1.9672	231.0	231.0	7.9	223.1
2012	12.1	0.0	15.6	15.6	2.1049	5.8	5.8	7.4	(1.7)
2013	180.5	0.0	15.6	15.6	2.2522	80.1	80.1	6.9	73.2
2014	137.5	0.0	15.6	15.6	2.4098	57.1	57.1	6.5	50.6
2015	317.5	0.0	15.6	15.6	2.5785	123.1	123.1	6.1	117.1
2016	59.9	0.0	15.6	15.6	2.7590	21.7	21.7	5.7	16.0
2017	70.6	0.0	15.6	15.6	2.9522	23.9	23.9	5.3	18.6
2018	81.1	0.0	15.6	15.6	3.1588	25.7	25.7	4.9	20.7
2019	148.9	0.0	15.6	15.6	3.3799	44.1	44.1	4.6	39.4
2020	219.0	0.0	15.6	15.6	3.6165	60.6	60.6	4.3	56.2
2021	245.4	0.0	15.6	15.6	3.8697	63.4	63.4	4.0	59.4
2022	272.5	0.0	15.6	15.6	4.1406	65.8	65.8	3.8	62.0
2023	300.6	0.0	15.6	15.6	4.4304	67.8	67.8	3.5	64.3
2024	400.6	0.0	15.6	15.6	4.7405	84.5	84.5	3.3	81.2
2025	454.5	0.0	15.6	15.6	5.0724	89.6	89.6	3.1	86.5
2026	509.7	0.0	15.6	15.6	5.4274	93.9	93.9	2.9	91.0
2027	566.4	0.0	15.6	15.6	5.8074	97.5	97.5	2.7	94.8
2028	624.3	0.0	15.6	15.6	6.2139	100.5	100.5	2.5	98.0
2029	0.0	0.0	0.0	0.0	6.6488	0.0	0.0	0.0	0.0
2030	0.0	0.0	0.0	0.0	7.1143	0.0	0.0	0.0	0.0
2031	0.0	0.0	0.0	0.0	7.6123	0.0	0.0	0.0	0.0
2032	0.0	0.0	0.0	0.0	8.1451	0.0	0.0	0.0	0.0
Total	$5,968.6	$2,454.9	$322.1	$2,777.0		$1,884.6	$1,884.6	$1,919.6	($35.1)
Plus: Salvage Value	$44.6						$1,929.1	$1,919.6	$9.5

Benefit-Cost Ratio of Project:	**1.00**

Table A-6

Summary –Demand Sensitivity Analysis, Master Plan Phase 1 (millions of 2001 dollars)

	Benefits	Costs			Present Value				
Year	Project Benefits from Consumer Surplus	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0
2002	0.0	17.1	0.0	17.1	1.0700	0.0	0.0	16.0	(16.0)
2003	0.0	127.3	0.0	127.3	1.1449	0.0	0.0	111.2	(111.2)
2004	0.0	516.0	0.0	516.0	1.2250	0.0	0.0	421.2	(421.2)
2005	0.0	637.5	0.0	637.5	1.3108	0.0	0.0	486.4	(486.4)
2006	0.0	811.8	0.0	811.8	1.4026	0.0	0.0	578.8	(578.8)
2007	170.5	614.3	5.4	619.6	1.5007	113.6	113.6	412.9	(299.3)
2008	332.3	597.2	5.4	602.6	1.6058	206.9	206.9	375.3	(168.3)
2009	124.5	30.1	21.0	51.1	1.7182	72.4	72.4	29.8	42.7
2010	285.8	25.8	21.0	46.8	1.8385	155.5	155.5	25.5	130.0
2011	454.4	25.8	21.0	46.8	1.9672	231.0	231.0	23.8	207.2
2012	220.1	25.8	21.0	46.8	2.1049	104.5	104.5	22.2	82.3
2013	393.7	0.0	21.0	21.0	2.2522	174.8	174.8	9.3	165.5
2014	357.1	0.0	21.0	21.0	2.4098	148.2	148.2	8.7	139.5
2015	541.9	0.0	21.0	21.0	2.5785	210.1	210.1	8.1	202.0
2016	290.8	0.0	21.0	21.0	2.7590	105.4	105.4	7.6	97.8
2017	306.1	0.0	21.0	21.0	2.9522	103.7	103.7	7.1	96.6
2018	321.5	0.0	21.0	21.0	3.1588	101.8	101.8	6.6	95.1
2019	393.2	0.0	21.0	21.0	3.3799	116.3	116.3	6.2	110.1
2020	219.0	0.0	21.0	21.0	3.6165	60.6	60.6	5.8	54.8
2021	245.4	0.0	21.0	21.0	3.8697	63.4	63.4	5.4	58.0
2022	272.5	0.0	21.0	21.0	4.1406	65.8	65.8	5.1	60.7
2023	300.6	0.0	21.0	21.0	4.4304	67.8	67.8	4.7	63.1
2024	400.6	0.0	21.0	21.0	4.7405	84.5	84.5	4.4	80.1
2025	454.5	0.0	21.0	21.0	5.0724	89.6	89.6	4.1	85.5
2026	509.7	0.0	21.0	21.0	5.4274	93.9	93.9	3.9	90.0
2027	566.4	0.0	21.0	21.0	5.8074	97.5	97.5	3.6	93.9
2028	624.3	0.0	21.0	21.0	6.2139	100.5	100.5	3.4	97.1
2029	0.0	0.0	21.0	21.0	6.6488	0.0	0.0	3.2	(3.2)
2030	0.0	0.0	21.0	21.0	7.1143	0.0	0.0	3.0	(3.0)
2031	0.0	0.0	21.0	21.0	7.6123	0.0	0.0	2.8	(2.8)
2032	0.0	0.0	21.0	21.0	8.1451	0.0	0.0	2.6	(2.6)
Total	$7,784.9	$3,428.8	$514.6	$3,943.4		$2,568.0	$2,568.0	$2,608.6	($40.6)
Plus: Salvage Value	$44.6						$2,612.6	$2,608.6	$4.0

Benefit-Cost Ratio of Project:	**1.002**

Table A-7

Summary –Value of Time Sensitivity Analysis, OMP Phase 1 Airfield (millions of 2001 dollars)

	Benefits	Costs			Present Value				
Year	Project Benefits from Consumer Surplus	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0
2002	0.0	17.1	0.0	17.1	1.0700	0.0	0.0	16.0	(16.0)
2003	0.0	127.3	0.0	127.3	1.1449	0.0	0.0	111.2	(111.2)
2004	0.0	505.1	0.0	505.1	1.2250	0.0	0.0	412.3	(412.3)
2005	0.0	604.6	0.0	604.6	1.3108	0.0	0.0	461.3	(461.3)
2006	0.0	535.4	0.0	535.4	1.4026	0.0	0.0	381.8	(381.8)
2007	267.4	329.2	4.8	334.0	1.5007	178.2	178.2	222.5	(44.3)
2008	394.1	316.1	4.8	320.9	1.6058	245.4	245.4	199.8	45.6
2009	525.3	20.0	15.6	35.6	1.7182	305.7	305.7	20.7	285.0
2010	657.8	0.0	15.6	15.6	1.8385	357.8	357.8	8.5	349.3
2011	795.5	0.0	15.6	15.6	1.9672	404.4	404.4	7.9	396.4
2012	938.4	0.0	15.6	15.6	2.1049	445.8	445.8	7.4	438.4
2013	1,086.9	0.0	15.6	15.6	2.2522	482.6	482.6	6.9	475.6
2014	1,240.1	0.0	15.6	15.6	2.4098	514.6	514.6	6.5	508.1
2015	1,399.7	0.0	15.6	15.6	2.5785	542.8	542.8	6.1	536.8
2016	1,401.0	0.0	15.6	15.6	2.7590	507.8	507.8	5.7	502.1
2017	1,435.3	0.0	15.6	15.6	2.9522	486.2	486.2	5.3	480.9
2018	1,470.1	0.0	15.6	15.6	3.1588	465.4	465.4	4.9	460.4
2019	1,544.6	0.0	15.6	15.6	3.3799	457.0	457.0	4.6	452.4
2020	1,621.3	0.0	15.6	15.6	3.6165	448.3	448.3	4.3	444.0
2021	1,664.7	0.0	15.6	15.6	3.8697	430.2	430.2	4.0	426.2
2022	1,709.2	0.0	15.6	15.6	4.1406	412.8	412.8	3.8	409.0
2023	1,754.7	0.0	15.6	15.6	4.4304	396.1	396.1	3.5	392.5
2024	1,851.4	0.0	15.6	15.6	4.7405	390.5	390.5	3.3	387.2
2025	1,912.8	0.0	15.6	15.6	5.0724	377.1	377.1	3.1	374.0
2026	1,975.5	0.0	15.6	15.6	5.4274	364.0	364.0	2.9	361.1
2027	2,039.6	0.0	15.6	15.6	5.8074	351.2	351.2	2.7	348.5
2028	2,105.0	0.0	15.6	15.6	6.2139	338.8	338.8	2.5	336.2
2029	0.0	0.0	0.0	0.0	6.6488	0.0	0.0	0.0	0.0
2030	0.0	0.0	0.0	0.0	7.1143	0.0	0.0	0.0	0.0
2031	0.0	0.0	0.0	0.0	7.6123	0.0	0.0	0.0	0.0
2032	0.0	0.0	0.0	0.0	8.1451	0.0	0.0	0.0	0.0
Total	$29,790.2	$2,454.9	$322.1	$2,777.0		$8,902.6	$8,902.6	$1,919.6	$6,983.0
Plus: Salvage Value	$44.6						$8,947.2	$1,919.6	$7,027.5

Benefit-Cost Ratio of Project:	4.66

Table A-8

Summary –Value of Time Sensitivity Analysis, Master Plan Phase 1 (millions of 2001 dollars)

	Benefits	Costs			Present Value				
Year	Project Benefits from Consumer Surplus	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0
2002	0.0	17.1	0.0	17.1	1.0700	0.0	0.0	16.0	(16.0)
2003	0.0	127.3	0.0	127.3	1.1449	0.0	0.0	111.2	(111.2)
2004	0.0	516.0	0.0	516.0	1.2250	0.0	0.0	421.2	(421.2)
2005	0.0	637.5	0.0	637.5	1.3108	0.0	0.0	486.4	(486.4)
2006	0.0	811.8	0.0	811.8	1.4026	0.0	0.0	578.8	(578.8)
2007	267.4	614.3	5.4	619.6	1.5007	178.2	178.2	412.9	(234.7)
2008	394.1	597.2	5.4	602.6	1.6058	245.4	245.4	375.3	(129.9)
2009	525.3	30.1	21.0	51.1	1.7182	305.7	305.7	29.8	275.9
2010	657.8	25.8	21.0	46.8	1.8385	357.8	357.8	25.5	332.4
2011	795.5	25.8	21.0	46.8	1.9672	404.4	404.4	23.8	380.6
2012	938.4	25.8	21.0	46.8	2.1049	445.8	445.8	22.2	423.6
2013	1,086.9	0.0	21.0	21.0	2.2522	482.6	482.6	9.3	473.3
2014	1,240.1	0.0	21.0	21.0	2.4098	514.6	514.6	8.7	505.9
2015	1,399.7	0.0	21.0	21.0	2.5785	542.8	542.8	8.1	534.7
2016	1,401.0	0.0	21.0	21.0	2.7590	507.8	507.8	7.6	500.2
2017	1,435.3	0.0	21.0	21.0	2.9522	486.2	486.2	7.1	479.1
2018	1,470.1	0.0	21.0	21.0	3.1588	465.4	465.4	6.6	458.7
2019	1,544.6	0.0	21.0	21.0	3.3799	457.0	457.0	6.2	450.8
2020	1,621.3	0.0	21.0	21.0	3.6165	448.3	448.3	5.8	442.5
2021	1,664.7	0.0	21.0	21.0	3.8697	430.2	430.2	5.4	424.8
2022	1,709.2	0.0	21.0	21.0	4.1406	412.8	412.8	5.1	407.7
2023	1,754.7	0.0	21.0	21.0	4.4304	396.1	396.1	4.7	391.3
2024	1,851.4	0.0	21.0	21.0	4.7405	390.5	390.5	4.4	386.1
2025	1,912.8	0.0	21.0	21.0	5.0724	377.1	377.1	4.1	373.0
2026	1,975.5	0.0	21.0	21.0	5.4274	364.0	364.0	3.9	360.1
2027	2,039.6	0.0	21.0	21.0	5.8074	351.2	351.2	3.6	347.6
2028	2,105.0	0.0	21.0	21.0	6.2139	338.8	338.8	3.4	335.4
2029	0.0	0.0	21.0	21.0	6.6488	0.0	0.0	3.2	(3.2)
2030	0.0	0.0	21.0	21.0	7.1143	0.0	0.0	3.0	(3.0)
2031	0.0	0.0	21.0	21.0	7.6123	0.0	0.0	2.8	(2.8)
2032	0.0	0.0	21.0	21.0	8.1451	0.0	0.0	2.6	(2.6)
Total	$29,790.2	$3,428.8	$514.6	$3,943.4		$8,902.6	$8,902.6	$2,608.6	$6,294.0
Plus: Salvage Value	$44.6						$8,947.2	$2,608.6	$6,338.6

Benefit-Cost Ratio of Project:	**3.43**

Table A-9

Summary –Fare Sensitivity Analysis, OMP Phase 1 Airfield (millions of 2001 dollars)

	Benefits	Costs			Present Value				
Year	Project Benefits from Consumer Surplus	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0
2002	0.0	17.1	0.0	17.1	1.0700	0.0	0.0	16.0	(16.0)
2003	0.0	127.3	0.0	127.3	1.1449	0.0	0.0	111.2	(111.2)
2004	0.0	505.1	0.0	505.1	1.2250	0.0	0.0	412.3	(412.3)
2005	0.0	604.6	0.0	604.6	1.3108	0.0	0.0	461.3	(461.3)
2006	0.0	535.4	0.0	535.4	1.4026	0.0	0.0	381.8	(381.8)
2007	240.7	329.2	4.8	334.0	1.5007	160.4	160.4	222.5	(62.1)
2008	356.6	316.1	4.8	320.9	1.6058	222.1	222.1	199.8	22.3
2009	475.7	20.0	15.6	35.6	1.7182	276.8	276.8	20.7	256.1
2010	598.2	0.0	15.6	15.6	1.8385	325.4	325.4	8.5	316.9
2011	726.4	0.0	15.6	15.6	1.9672	369.3	369.3	7.9	361.3
2012	860.5	0.0	15.6	15.6	2.1049	408.8	408.8	7.4	401.4
2013	1,000.7	0.0	15.6	15.6	2.2522	444.3	444.3	6.9	437.4
2014	1,143.4	0.0	15.6	15.6	2.4098	474.5	474.5	6.5	468.0
2015	1,292.3	0.0	15.6	15.6	2.5785	501.2	501.2	6.1	495.1
2016	1,295.4	0.0	15.6	15.6	2.7590	469.5	469.5	5.7	463.8
2017	1,328.8	0.0	15.6	15.6	2.9522	450.1	450.1	5.3	444.8
2018	1,362.9	0.0	15.6	15.6	3.1588	431.5	431.5	4.9	426.5
2019	1,432.0	0.0	15.6	15.6	3.3799	423.7	423.7	4.6	419.1
2020	1,503.1	0.0	15.6	15.6	3.6165	415.6	415.6	4.3	411.3
2021	1,543.4	0.0	15.6	15.6	3.8697	398.8	398.8	4.0	394.8
2022	1,584.6	0.0	15.6	15.6	4.1406	382.7	382.7	3.8	378.9
2023	1,626.8	0.0	15.6	15.6	4.4304	367.2	367.2	3.5	363.7
2024	1,716.4	0.0	15.6	15.6	4.7405	362.1	362.1	3.3	358.8
2025	1,773.4	0.0	15.6	15.6	5.0724	349.6	349.6	3.1	346.5
2026	1,831.5	0.0	15.6	15.6	5.4274	337.5	337.5	2.9	334.6
2027	1,890.9	0.0	15.6	15.6	5.8074	325.6	325.6	2.7	322.9
2028	1,951.6	0.0	15.6	15.6	6.2139	314.1	314.1	2.5	311.5
2029	0.0	0.0	0.0	0.0	6.6488	0.0	0.0	0.0	0.0
2030	0.0	0.0	0.0	0.0	7.1143	0.0	0.0	0.0	0.0
2031	0.0	0.0	0.0	0.0	7.6123	0.0	0.0	0.0	0.0
2032	0.0	0.0	0.0	0.0	8.1451	0.0	0.0	0.0	0.0
Total	$27,535.4	$2,454.9	$322.1	$2,777.0		$8,210.7	$8,210.7	$1,919.6	$6,291.1
Plus: Salvage Value	$44.6						$8,255.3	$1,919.6	$6,335.7

Benefit-Cost Ratio of Project:	4.30

Table A-10

Summary –Fare Sensitivity Analysis, Master Plan Phase 1 (millions of 2001 dollars)

	Benefits	Costs			Present Value				
Year	Project Benefits from Consumer Surplus	Project Construction Costs	Incremental O&M Expenses	Total Project Costs	Discount Rate Factor	Passenger Delay Savings	Total Project Benefits	Total Project Costs	Annual Net Present Value (Benefits-Costs)
2001	$0.0	$0.0	$0.0	$0.0	1.0000	$0.0	$0.0	$0.0	$0.0
2002	0.0	17.1	0.0	17.1	1.0700	0.0	0.0	16.0	(16.0)
2003	0.0	127.3	0.0	127.3	1.1449	0.0	0.0	111.2	(111.2)
2004	0.0	516.0	0.0	516.0	1.2250	0.0	0.0	421.2	(421.2)
2005	0.0	637.5	0.0	637.5	1.3108	0.0	0.0	486.4	(486.4)
2006	0.0	811.8	0.0	811.8	1.4026	0.0	0.0	578.8	(578.8)
2007	240.7	614.3	5.4	619.6	1.5007	160.4	160.4	412.9	(252.5)
2008	356.6	597.2	5.4	602.6	1.6058	222.1	222.1	375.3	(153.2)
2009	475.7	30.1	21.0	51.1	1.7182	276.8	276.8	29.8	247.1
2010	598.2	25.8	21.0	46.8	1.8385	325.4	325.4	25.5	299.9
2011	726.4	25.8	21.0	46.8	1.9672	369.3	369.3	23.8	345.5
2012	860.5	25.8	21.0	46.8	2.1049	408.8	408.8	22.2	386.6
2013	1,000.7	0.0	21.0	21.0	2.2522	444.3	444.3	9.3	435.0
2014	1,143.4	0.0	21.0	21.0	2.4098	474.5	474.5	8.7	465.7
2015	1,292.3	0.0	21.0	21.0	2.5785	501.2	501.2	8.1	493.1
2016	1,295.4	0.0	21.0	21.0	2.7590	469.5	469.5	7.6	461.9
2017	1,328.8	0.0	21.0	21.0	2.9522	450.1	450.1	7.1	443.0
2018	1,362.9	0.0	21.0	21.0	3.1588	431.5	431.5	6.6	424.8
2019	1,432.0	0.0	21.0	21.0	3.3799	423.7	423.7	6.2	417.5
2020	1,503.1	0.0	21.0	21.0	3.6165	415.6	415.6	5.8	409.8
2021	1,543.4	0.0	21.0	21.0	3.8697	398.8	398.8	5.4	393.4
2022	1,584.6	0.0	21.0	21.0	4.1406	382.7	382.7	5.1	377.6
2023	1,626.8	0.0	21.0	21.0	4.4304	367.2	367.2	4.7	362.5
2024	1,716.4	0.0	21.0	21.0	4.7405	362.1	362.1	4.4	357.6
2025	1,773.4	0.0	21.0	21.0	5.0724	349.6	349.6	4.1	345.5
2026	1,831.5	0.0	21.0	21.0	5.4274	337.5	337.5	3.9	333.6
2027	1,890.9	0.0	21.0	21.0	5.8074	325.6	325.6	3.6	322.0
2028	1,951.6	0.0	21.0	21.0	6.2139	314.1	314.1	3.4	310.7
2029	0.0	0.0	21.0	21.0	6.6488	0.0	0.0	3.2	(3.2)
2030	0.0	0.0	21.0	21.0	7.1143	0.0	0.0	3.0	(3.0)
2031	0.0	0.0	21.0	21.0	7.6123	0.0	0.0	2.8	(2.8)
2032	0.0	0.0	21.0	21.0	8.1451	0.0	0.0	2.6	(2.6)
Total	$27,535.4	$3,428.8	$514.6	$3,943.4		$8,210.7	$8,210.7	$2,608.6	$5,602.1
Plus: Salvage Value	$44.6						$8,255.3	$2,608.6	$5,646.7

Benefit-Cost Ratio of Project:	3.16

Appendix B

Phase 1 Project Costs
SMK PREPARE

Table B-1

Project Cash Flow Schedule (in 2001 dollars)

			2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
Project Analysis (millions of dollars)																
OMP-Phase 1 Airfield			$0.0	$49.5	$197.0	$505.1	$804.6	$535.4	$329.2	$316.1	$20.0	$0.0	$0.0	$0.0	$0.0	$2,557.0
Master Plan Phase 1			$0.0	$49.5	$197.0	$516.0	$837.5	$811.8	$614.3	$597.2	$30.1	$25.8	$25.8	$25.8	$0.0	$3,530.6
	OMP-Phase 1 Airfield	Master Plan Phase 1	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
Program Wide Requirements																
Program -wide Requirements			$0	$17,500,000	$21,607,000	$19,170,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$58,277,000
Preliminary Engineering			0	0	21,845,000	15,291,000	6,553,000	0	0	0	0	0	0	0	0	43,688,999
Wetlands mitigation			0	0	1,942,000	22,330,000	0	0	0	0	0	0	0	0	0	24,272,000
Noise Mitigation (OMP-Phase 1)			0	0	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	0	0	0	0	140,000,000
Land Acquisition			0	31,958,000	67,532,000	72,816,000	82,524,000	60,194,000	14,583,000	9,709,000	0	0	0	0	0	339,296,000
Subtotal - Program Wide Requirements			**$0**	**$49,458,000**	**$132,926,000**	**$148,007,000**	**$109,077,000**	**$80,194,000**	**$34,583,000**	**$29,709,000**	**$20,000,000**	**$0**	**$0**	**$0**	**$0**	**$606,533,999**
Airfield																
Design of Runway 9L-27R	X	X	$0	$0	$23,301,000	$11,650,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$34,951,000
Construction of Runway 9L-27R	X	X	0	0	0	114,132,000	199,730,000	199,730,000	0	0	0	0	0	0	0	513,591,999
Design of Runway 10L Extension	X	X	0	0	20,388,000	0	0	0	0	0	0	0	0	0	0	20,388,000
Construction of Runway 10L Extension	X	X	0	0	0	68,081,000	130,333,000	146,491,000	82,893,000	25,969,000	0	0	0	0	0	473,767,000
Design of Runway 10C-28C	X	X	0	0	20,389,000	20,388,000	0	0	0	0	0	0	0	0	0	40,777,000
Construction of Runway 10C-28C	X	X	0	0	0	121,251,000	165,469,000	109,034,000	211,763,000	260,445,000	0	0	0	0	0	867,962,000
Subtotal - Airfield			**$0**	**$0**	**$64,076,000**	**$355,502,000**	**$495,532,000**	**$455,255,000**	**$294,656,000**	**$286,433,999**	**$0**	**$0**	**$0**	**$0**	**$0**	**$1,951,456,999**
Western Terminal Complex																
Design of Western Airside Concourse		X	$0	$0	$0	$9,722,000	$12,964,000	$9,722,000	$0	$0	$0	$0	$0	$0	$0	$32,408,000
Construction of Western Airside Concourse		X	0	0	0	0	0	167,645,000	217,017,000	162,762,000	0	0	0	0	0	547,423,999
Design of Energy Plant		X	0	0	0	1,159,000	2,704,000	0	0	0	0	0	0	0	0	3,863,000
Construction of Energy Plant		X	0	0	0	0	0	16,633,000	33,266,000	5,545,000	0	0	0	0	0	55,444,001
Design of Fuel Storage and Distribution Improvements		X	0	0	0	0	3,672,000	0	0	0	0	0	0	0	0	3,672,000
Construction of Fuel Storage and Distribution Improvements		X	0	0	0	0	0	17,249,000	22,998,000	17,249,000	0	0	0	0	0	57,496,001
Subtotal - Western Terminal Complex			**$0**	**$0**	**$0**	**$10,881,000**	**$19,340,000**	**$211,249,000**	**$273,281,000**	**$185,556,001**	**$0**	**$0**	**$0**	**$0**	**$0**	**$700,307,001**
WGP Phase 1																
Taxiway A/B Relocation		X	$0	$0	$0	$0	$0	$0	$3,127,478	$14,790,148	$0	$0	$0	$0	$0	$17,917,626
T1/T2 Expansion		X	0	0	0	0	690,346	6,505,992	0	0	0	0	0	0	0	7,196,338
Concourse K - Allowance		X	0	0	0	0	0	7,028,981	7,028,981	56,221,391	0	0	0	0	0	70,279,353
Terminal 2 - Interior Upgrade		X	0	0	0	0	12,696,926	51,598,162	0	0	0	0	0	0	0	64,495,087
Taxiway November - Facility Relocations		X	0	0	0	0	0	0	1,600,348	22,499,016	0	0	0	0	0	24,099,364
Taxiway M		X	0	0	0	0	0	0	0	0	0	25,801,173	25,801,173	25,801,173	0	77,403,519
Taxiway November - New		X	0	0	0	0	0	0	0	2,008,280	10,146,000	0	0	0	0	12,154,280
Subtotal - WGP Phase 1			**$0**	**$0**	**$0**	**$0**	**$13,687,272**	**$65,133,135**	**$11,756,808**	**$95,518,835**	**$10,146,000**	**$25,801,173**	**$25,801,173**	**$25,801,173**	**$0**	**$273,545,568**

Source: O'Hare Partners, based on cost estimate analyses by TOK, LLC, and AOR.
Prepared by: Ricondo & Associates, Inc.

Table B-2

Incremental Operating & Maintenance Expense Impacts (millions of 2001 dollars)[1/]

		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	203
Project Analysis																																
Phase 1 OMP Airfield	[A]	$0.0	$0.0	$0.0	$0.0	$0.0	$4.6	$4.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$15.6	$0.0	$0.0	$0.0	$0.0
Master Plan Phase[1/]	[B]	$0.0	$0.0	$0.0	$0.0	$0.0	$5.4	$5.4	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0	$21.0

		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	203
Incremental O&M Impact by Proposed Runway																																
Runway 9L-27R	[A,B]	$0.0	$0.0	$0.0	$0.0	$0.0	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6	$4.6
Runway 10L-28R Extension	[A,B]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Runway 10C-28C	[A,B]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1
Total Incremental O&M Impact	**[A,B]**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$4.6**	**$4.6**	**$15.6**	**$15.6**	**$15.6**	**$15.6**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**	**$31.7**
OMP-Phase 1 Terminal Incremental O&M Impact																																
Satellite Concourse	[B]	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7	$4.7
WGP-Phase 1 Projects Incremental O&M Impact																																
Concourse K	[B]	$0.0	$0.0	$0.0	$0.0	$0.0	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)	($0.6)
Terminal 2 FIS Facility [2/]	[B]	0.0	0.0	0.0	0.0	0.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Total OMP & WGP-Phase 1 DBO Projects	**[B]**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$0.6**	**$0.6**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**	**$5.4**

Note:
1/ Totals may not add due to rounding.
2/ Source: Table 2-2 Terminal Functional Area Summary published in the Final Environmental Assessment for the World Gateway Program dated February 8, 2001.

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Analysis of the 2004 O'Hare Master Plan Cost Estimates for the O'Hare Modernization Environmental Impact Statement

Prepared by:

Crawford, Murphy and Tilly, Inc.
for the

FEDERAL AVIATION ADMINISTRATION

Table of Contents

Introduction

The following three (3) memoranda to file summarize the review of the City of Chicago cost estimates presented in the 2004 Chicago O'Hare Master Plan (MP). This analysis of the MP cost estimates was conducted for NEPA purposes and is not intended to prejudge separate agency processes related to Letter of Intent (LOI) or Passenger Facility Charge (PFC) applications. This analysis was performed on each individual component contained within the MP and was provided to the FAA. These components include:

1) O'Hare Modernization Program (OMP);
2) Capital Improvement Projects (CIP);
3) World Gateway Program (WGP).

Memo To: File
From: Michael Doerfler
Subject: Analysis of Reasonableness in OMP Costs presented in the O'Hare Master Plan
Date: July 22, 2005

The FAA requested that CMT review the City of Chicago Master Plan Costs. This particular analysis reviews the costs associated with the O'Hare Modernization Program (OMP). The OMP, as presented in the Master Plan, was estimated at $6.6 billion in 2001 dollars. The original cost estimates were prepared by the City of Chicago's construction management team in January 2003 as stated in a June 1, 2005 memo to Mr. Phil Smithmeyer of the FAA from Ricondo & Associates. Included in this June 1, 2005 memo, was a summary of total costs inclusive of project and program contingencies as follows:

Summary of Total Costs in 2001 Dollars

Construction Costs	$5,146,200,080
Planning, Design, CM & PM	$589,000,795
Project Contingency	$686,083,349
Subtotal	$6,421,284,223
Program Contingency	$178,715,777
Total	**$6,600,000,000**

The documents provided by the City at FAA's request were helpful in providing a greater level of detail concerning the description of the component parts of the OMP portion of the overall project. The information provided was titled "O'Hare Modernization Program – Project Rollup", consisting of approximately 65 pages which summarized projected costs for the various major airfield development components of the OMP (conveyed in the June 1, 2005 email to Mr. Phil Smithmeyer of FAA from Shawn Kinder of Ricondo and Associates). Each component was further broken down into identified sub-component projects showing associated costs. The sub-component projects had supplementary breakdowns of the total Project Budget shown in the Project Rollup as well as "Estimate Detail" which identified what work items had been included in the cost estimate. CMT's analysis included reviewing the data for completeness and comprehensiveness followed by independent cost checks of selected project elements. Approximately 50 line items from "Estimate Summaries" were checked with approximate quantities and conservative unit prices based upon professional expertise, to determine reasonableness of the City's estimate. These line items represented approximately 50% of the total estimated OMP construction costs.

Initially, review of the information provided by the City involved analyzing the completeness and comprehensiveness of the listed program components and project work items. This review effort indicated that the opinion of probable cost, as presented, was sufficiently detailed and that the major work components and projects associated with the O'Hare Modernization Program were included in the opinion of probable cost provided by the City. Sufficient detail outlining the cost considerations for each major construction component was evidenced in the summary of total cost and validated the legitimacy of the projected costs. Further, a review of the cost summaries indicated that the estimated costs for the major work elements as presented in the Project Rollup Summary are comprehensive and reasonable with

expectations of upward adjustments due to annual cost escalations subsequent to the 2001 base year used for the estimates.

Subsequent to the review for completeness and comprehensive inclusion of components, individual projects were analyzed for reasonableness of cost by order of magnitude cost estimate calculations. Order of magnitude cost checks were performed for various components to evaluate the reasonableness of the estimated costs for various components. Approximate quantity calculations and conservative unit prices were used for these checks of the reasonableness of the costs presented in the back-up cost information provided by the City.

Nearly 50 key components of the proposed construction were analyzed side by side. Of those components, CMT specifically analyzed several of the runways, which are essential components of the entire OMP and around which most other components are developed. Some buildings, jetways, roadways and specialty work items were analyzed to provide a wider spectrum to extrapolate the reasonableness and the validity of the estimate. The review was based on historical unit prices for similar airport and roadway construction work in the 2001 time period or other reasonable comparables. Below is a sampling, in tabular form, of some of the major project components comparing the OMP construction cost estimate with the order of magnitude checks done by CMT.

Side-by-Side Comparison of Key OMP Construction Cost Components

Airfield Geographic Area	Work Element	Budget Component	OMP Project Rollup Budget Component Est. Const. Cost	CMT Review
OMP North Airfield	Runway 9L/27R & Assoc. Taxiways	Runway Pavement & Shoulders	$20,934,000	$19,285,000
		Runway Blast Pads	1,173,000	1,116,900
		Runway Edge Lighting System	1,722,000	1,563,000
		Runway Centerline Lighting System	1,859,000	1,245,000
		Runway TDZ Lighting System	1,770,000	1,652,000
		Runway Guidance Signs	230,000	205,000
		Runway NAVAIDS	9,800,000	9,560,000
		New Taxiways	29,349,000	23,987,000
		Taxi Guidance Sign	216,000	457,000
		Taxi Edge Lighting Systems	3,816,000	3,210,000
		ATCT & Utilities	21,449594	26,910,000
	Runway 9C/27C & Assoc. Taxiways	Runway 9C Related Components	197,449,370	202,765,000
		Runway 9C/27/C Pavement & Shoulders	38,371,000	36,585,000
		Runway Centerline Lighting System		
		Runway Edge Lighting System	2,437,000	2,343,500
		Taxiway Pavement & Shoulders	97,698,000	100,417,000
		Taxiway Edge Light System	11,761,000	11,550,000
		Taxiway Guidance Signs	2,456,850	2,220,000
	Runway 9R/27L & Assoc. Taxiways	Earthwork	20,427,000	13,740,000
		General Drainage	12,310,000	6,650,000
		Runway Pavement & Shoulders	9,895,000	10,264,000
		Blast Pads	586,000	583,456
		Runway Edge Light System	1,139,000	756,000
		Runway Centerline Lighting System	785,000	690,000
		Runway TDZ Lighting System	1,008,000	916,000
		Runway NAVAIDS	6,995,000	7,010,000
		Taxiway Pavement & Shoulders	22,668,000	22,443,000
		North Airfield Subtotal	518,314,814	508,728,856
OMP South Airfield	Runway 10L/28R & Assoc. Taxiways	Relocate Irving Park Road & York Road Construction	33,228,000	34,377,500
	Runway 10C/28 C Related	Cargo & Maintenance Facility Relocation	147,510,660	130,712,880
	Runway 10C/28C & Assoc. Taxiways	Runway Pavement & Shoulders	37,435,000	37,654,000
		Runway Blast Pads	1,408,000	1,116,900
		Runway Edge Light System	2,418,000	2,417,000
		Runway Centerline Light System	1,924,000	2,184,000
		Runway TDZ Light System	1,770,000	1,652,000
		Runway Guidance Signs	366,000	500,000
		Runway NAVAIDS	8,872,000	9,560,000
		South Airfield Subtotal	234,931,660	220,174,280
OMP Western Terminal Complex	Western Terminal Complex Concourse & Apron	New Roadways & Related	55,228,000	41,500,000
		Earthwork	17,206,000	17,218,000
		Apron Pavement Section	52,836,000	49,552,100
		Edge Lights System	665,000	649,000
		Taxi Guidance Signs	63,000	160,000
	Narrow Body Concourse	Narrow Body Concourse Complete	247,003,550	237,553,000
		Passenger Loading Bridges	32,711,116	33,637,500
	Western Terminal-Terminal & Apron	Apron Pavement Section	63,918,000	59,674,000
		Terminal Wide Body Concourse	399,466,360	362,610,000
		Widebody Terminal T-7 Jet Bridges	8,696,840	9,750,000
	Parking Structure	Parking Garage	69,569,000	65,151,000
	People Mover	People Mover	311,363,000	496,780,000
		Western Terminal Complex Subtotal	1,258,725,866	1,374,234,600
Totals			**2,011,972,340**	**2,102,532,736**

In general, the cost breakdowns provided by the City appear to be reasonable and somewhat conservative in consideration of the magnitude of scale and relatively high production rates potentially achievable with large work areas and volume. For the line items examined, CMT's review for reasonableness is approximately 4.5% higher than the City's estimate. The City's estimate for the proposed people mover system was the major difference in the line by line analysis. CMT was able to find only a single comparable for review of this item.

The soft costs associated with the construction budget, the Design, Program Management, Construction Management/Field Supervision/Testing and Inspection represent a total of around 12.5% of the estimated construction cost on most work elements. One could expect a range from 12% to 15% for this soft cost depending on breakdown of projects and required effort by the program manager.

Project contingency factors as a percent of the construction budget varied from 10% on large paving projects, 15% on building related work, 20% on demolition and 30% for specialty construction. Due to the apparent level of effort and detail in preparing the program estimates, these contingencies appear reasonable.

A broad scale evaluation of the project costs for construction of the four new runways under the OMP was made comparing the OMP runways analyzed to new runways at five other large airports, Boston Logan, George Bush (Houston), Sea-Tac (Seattle), Hartsfield (Atlanta), and St. Louis Lambert.

Comparison of Estimated Project Costs for Similar Runway Projects at Other Airports

Airport	Major Runway Improvement	Project Cost Estimate (Runway and Taxiway Components)	Base Cost Year	Cost Per S.Y. of Runway Area
Boston Logan	5,000 x 150' Runway	$82,100,000	2002	$986
George Bush (Houston)	8,500' x 150' Runway	$144,000,000	2000	$1,017
Sea-Tac (Seattle)	8,500'x150' Runway	$364,000,000	1994	$2,569
Hartsfield Atlanta	9,000'x150'Runway	$653,366,000	2000	$4,356
St. Louis Lambert	9,000'x150' Runway	$376,000,000	2003	$2,507
Chicago O'Hare (OMP)	**Runway 10R/28L 7,500' x 150'**	**$232,164,896**	**2001**	**$1,858**
Chicago O'Hare (OMP)	**Runway 9C/27C 11,245' x 200'**	**$306,762,181**	**2001**	**$1,227**
Chicago O'Hare (OMP)	**Runway 9L/27R 7,500' x 150'**	**$400,533,743**	**2001**	**$3,205**
Chicago O'Hare (OMP)	**Runway 10C/28C 10,800' x 200'**	**$487,735,000**	**2001**	**$2,033**

Variations shown in the chart above could be the result of differences in supporting infrastructure such as drainage, fill material, or other ancillary project components. This variation can occur from airport to airport and also from runway to runway.

Based on the above numbers, costs for the runway components of the O'Hare OMP prepared by the City of Chicago appear to fall in the middle of the range of costs for large runway programs. The dollar estimates for OMP Runways, purely on a cost per square yard of runway to be built, would indicate that they are comparable to other programs.

In addition, CMT reviewed 1995 budgetary costs used for the Lambert St. Louis International Airport expansion as a comparison for some of the major terminal building and specialty work.

Overall, the City of Chicago OMP estimated costs for the base year 2001 appear to be reasonable and representative of the probable cost for the OMP in that year. For purposes of this review under NEPA, CMT has concluded that the estimated costs considered within this sample analysis are reasonable.

Memo to: File
From: Bruce Jacobson, Michael Doefler, Matt Demos
Subject: Review of Master Plan (MP) Capital Improvement Projects (CIP)
Date: July 20, 2005

The FAA requested that CMT review the City of Chicago MP costs. This particular analysis reviews the Capital Improvement Projects (CIP). This memo is developed to review the reasonableness of the City's representations in the MP for the CIP Costs for the OM EIS. **Attachment A** is a copy of page VII-24 from the Master Plan. The CIP costs are identified as follows:

(2003-2007) - $1,386,151,000
(2008-2020) - $2,742,121,000
Total $4,128,000,000

The City of Chicago provided a three volume set of the City's most recent CIP document entitled "Capital Improvement Program", O'Hare Cost Reports – Volumes 1,2, and 3, dated May 2005. These documents shall be referred to as CIP 5/05. These documents served as the basis for CMT's analysis of the CIP dollars presented in the MP. The proposed projects contained within the CIP 5/05 range in years from 1998 to as far out as 2012. An examination of the projects initiated in 2003 or later and planned through 2012 or sooner represents that the average annual CIP for O'Hare is approximately $114,000,000. See **Attachment B.**

This analysis is generated to compare the average annual CIP dollars set forth in CIP 5/05 against the CIP dollars presented in the MP. Because there is little specificity for the "Subsequent Years (2008 – 2022)" in the master plan, this analysis assumes that an ongoing program "essentially a repair and replacement program" will continue. Further, assuming that a build alternative is identified in the OM EIS and approved in the Record of Decision (ROD), the magnitude of an ongoing CIP, post OM development (2013), could likely be somewhat diminished because the airfield will be essentially new and requiring little, if any, repair or replacement.

The MP CIP for subsequent years (2008 – 2022) is presented as $2,742,121,000 and is escalated. An annual average for CIP would be approximately $183 million per year. Comparing the annual average CIP dollar amount presented in CIP 5/05 of $114 million against the $183 million per year presented in the Master Plan would suggest that the City has adequately budgeted for CIP in the Master Plan. Further, by extrapolating the average annual CIP dollars presented in CIP 5/05 of $114 million/year from 2008 – 2022 yields a total amount over the 15 year "Subsequent Years" (without escalation) of approximately $1.71 Billion. **Attachment C** has been added to reflect the average annual amount in 2004 dollars which could be available with escalation ranges from 1% to 4% applied to the $2,742,121,000 CIP Budget presented in the Master Plan.

When one examines the five year CIP (2003 – 2007) presented in the Master Plan there is some degree of specificity. However, as of the date of this memo there are only 17 months left on the five year CIP (2003 -2007) presented in the MP. In this analysis, it appears more prudent to consider the use of the information in the CIP 5/05 as more recent and representative of the actual value of the CIP as the City goes forward.

To conclude, the CIP dollars presented in the MP appear reasonable, if not somewhat high based upon more recent information presented in CIP 5/05. For purposes of this analysis under NEPA, CMT concludes that the estimated costs associated with the MP CIP are reasonable.

7.3.2 CIP Costs

The CIP addresses the Airport's facility needs and is essentially a repair and replacement program that ensures the Airport will be able to operate throughout the planning horizon. The 20-Year CIP includes the following types of projects: terminal support improvements, terminal improvements, airfield improvements, H&R system improvements, certain noise mitigation projects, fuel system improvements, and safety and security enhancements. The estimated cost for the 20-Year CIP is $4.1 billion in escalated dollars, as presented in **Table VII-3.**

Table VII-3

CIP Cost Estimates (Escalated Dollars)

	Project Cost ($000s)
Five-Year CIP (2003-2007)	
Terminal Support Improvements	$200,264
Terminal Improvements	425,622
Airfield Improvements	372,198
Heating and Refrigeration	102,761
Noise Mitigation Projects	37,305
Fueling System	98,934
Safety and Security	145,734
Planning and Other Projects	3,333
Subtotal – Five-Year CIP	$1,386,151
Subtotal – Subsequent Years (2008-2022)	$2,742,121
Total 20-Year CIP Cost (escalated dollars) 1/	$4,128,274

1/ Total may not add due to rounding.

Source: City of Chicago, Department of Aviation.
Prepared by: Ricondo & Associates, Inc.

7.3.3 WGP Costs

The WGP was conceived to expand gate capacity through construction of new terminal complexes and enabling projects and provide additional improvements within the Terminal Core Area. In December 2000, the City commenced work on the formulation of WGP Phase 1. In September 2002, in light of changed conditions in the industry and the economy, the City and the airlines agreed to suspend work on the WGP. The City's design-build contractor for the Terminal 6 Complex was directed to complete its 30 percent design submittal and demobilize. All other formulation work was suspended. Work will resume consistent with demand. The WGP is comprised of the following two phases:

- *Phase 1:* (1) construction of a new Terminal 6 Complex (including terminal and concourse facilities, curbfront and circulation roads, parking structure, realignment of terminal access roadways); (2) realignment of the ATS; (3) construction of a Concourse K extension; (4) Terminal 2 interior upgrades; and (5) reconfiguration of Taxiway A/B and construction of new Taxiway N.

CIP ATTACHMENT B

City of Chicago - Department of Aviation - Capital Improvement Program Active Projects as of May 2005				
No.	Approved Budget	Planning Start	Construction Complete	Approximate Cost/Year Over a Typical 5-Year Period(a)
1	$16,449,276	Jan-05	Jan-06	$3,289,855
2	$3,600,000	Nov-97	Dec-03	
3	$250,000	Oct-02	Dec-04	
4	$185,000	Jan-00	Jan-00	
5	$48,121,836	Apr-02	Oct-07	
6	$55,444,404	Mar-99	Mar-07	
7	$139,080,811	Aug-02	Jan-07	
8	$67,000	May-04	Oct-04	$13,400
9	$84,103,673	Sep-04	Feb-08	$16,820,735
10	$4,824,841	Jan-02	Sep-06	
11	$7,856,000	Apr-02	Jul-05	
12	$9,596,317	Nov-02	Jun-07	
13	$8,185,199	Aug-02	Sep-05	
14	$1,634,612	Apr-02	Jun-05	
15	$3,877,913	May-03	Feb-08	$775,583
16	$50,000	Jun-03	Apr-05	$10,000
17	$14,459,347	Dec-03	Dec-06	$2,891,869
18	$35,000,000	Apr-03	Aug-05	$7,000,000
19	$9,500,000	Nov-04	Nov-05	$1,900,000
20	$23,599,840	Jul-03	Feb-08	$4,719,968
21	$1,041,521	Oct-04	Feb-08	$208,304
22	$2,403,335	Jan-00	Dec-04	
23	$732,600	Jan-05	Nov-06	$146,520
24	$702,103	Jul-04	Nov-05	$140,421
25	$3,362,045	Aug-98	Jul-05	
26	$12,500,000	Jan-02	Dec-05	
27	$1,292,000	Feb-99	Nov-05	
28	$3,263,000	Sep-98	Sep-04	
29	$1,720,445	Feb-01	Dec-04	
30	$8,868,160	Oct-04	Jan-08	$1,773,632
31	$2,796,552	Jul-04	Nov-05	$559,310
32	$3,114,540	Oct-04	Dec-07	$622,908
33	$61,050	Jan-05	Apr-05	$12,210
34	$7,900,000	Apr-99	Dec-04	
35	$10,117,746	Jan-01	Dec-04	
36	$1,713,824	Jan-01	Dec-04	
37	$4,675,615	Aug-03	Aug-05	$935,123
38	$962,973	Apr-04	Jul-05	$192,595
39	$7,745,726	Oct-03	Oct-05	$1,549,145
40	$11,675,640	Jan-05	Dec-05	$2,335,128
41	$14,149,872	Feb-02	Sep-06	
42	$2,227,926	Jul-02	Jul-05	
43	$5,185,538	Jun-04	Feb-07	$1,037,108
44	$851,678	Jan-05	Oct-06	$170,336
45	$2,910,131	Oct-04	Jan-07	$582,026
46	$943,296	Jan-05	Oct-06	$188,659
47	$11,246,832	Dec-00	May-05	
48	$2,738,728	Apr-03	Sep-04	$547,746
49	$214,929	Apr-00	Dec-04	
50	$2,025,623	Apr-02	Jun-05	
51	$9,025,460	Aug-04	Apr-06	$1,805,092
52	$380,000	Jan-05	Dec-05	$76,000
53	$16,920,151	Dec-04	Dec-12	$3,384,030
54	$22,615,426	Feb-04	Dec-12	$4,523,085
55	$2,718,170	Feb-04	Dec-12	$543,634
56	$1,758,893	Feb-04	Dec-12	$351,779
57	$1,500,000	Feb-04	Dec-12	$300,000
58	$522,726	Feb-04	Dec-12	$104,545
59	$9,043,190	Feb-04	Dec-12	$1,808,638
60	$2,090,900	Feb-04	Dec-12	$418,180
61	$2,524,765	Feb-04	Dec-12	$504,953
62	$1,148,022	Feb-04	Dec-12	$229,604
63	$152,949,523	Mar-05	Dec-12	$30,589,905
64	$47,260,082	Feb-03	Dec-12	$9,452,016
65	$37,450,800	Feb-03	Dec-06	$7,490,160
66	$21,630,000	Dec-02	Dec-08	
67	$43,908,900	Jan-02	Dec-08	
68	$128,293,000	Oct-01	Jan-06	
69	$2,440,000	Oct-03	Dec-04	$488,000
70	$16,060,000	Oct-03	Dec-04	$3,212,000
TOTAL =	$1,115,268,905			$113,704,202

Notes: (a) Only the CIP projects initiated in 2003 or later, and planned through 2012 or sooner, were considered.
(b) Although some projects are planned to extend beyond a 5-year period, the total estimated CIP costs per year over a typical 5-year period yields a higher figure and was used for a more conservative approach.

Total number of CIP projects initiated in 2003 or later, and planned through 2007 or sooner =	28
Total estimated cost of CIP projects initiated in 2003 or later, and planned through 2007 or sooner =	$214,497,327
Total estimated cost per year of CIP projects initiated in 2003 or later, and planned through 2007 or sooner =	$42,899,465 /year (5-year period)
Total number of CIP projects initiated in 2003 or later, and planned through 2012 or sooner =	42
Total estimated cost of CIP projects initiated in 2003 or later, and planned through 2012 or sooner =	$568,521,008
Total estimated cost per year of CIP projects initiated in 2003 or later, and planned through 2012 or sooner =	$56,852,101 /year (10-year period)
Total estimated cost per year of CIP projects initiated in 2003 or later, and planned through 2012 or sooner =	$113,704,202 /year (5-year period)

OMP VALUE OF 2008-2022 CAPITAL IMPROVEMENT PROJECTS IN 2004 DOLLARS

YEAR	RATE	COMPOUNDED RATE	ESCALATED AMOUNT
2004	1.04		
2005	1.04	1.04	
2006	1.04	1.0816	
2007	1.04	1.124864	
2008	1.04	1.16985856	$136,938,497
2009	1.04	1.216652902	$142,416,037
2010	1.04	1.265319018	$148,112,679
2011	1.04	1.315931779	$154,037,186
2012	1.04	1.36856905	$160,198,673
2013	1.04	1.423311812	$166,606,620
2014	1.04	1.480244285	$173,270,885
2015	1.04	1.539454056	$180,201,720
2016	1.04	1.601032219	$187,409,789
2017	1.04	1.665073507	$194,906,181
2018	1.04	1.731676448	$202,702,428
2019	1.04	1.800943506	$210,810,525
2020	1.04	1.872981246	$219,242,946
2021	1.04	1.947900496	$228,012,664
2022	1.04	2.025816515	$237,133,170
		23.4247654	$2,742,000,000
ESCALATED AMOUNT		$2,742,000,000	
2004 AVERAGE ANNUAL AMOUNT		$117,055,601	
2004 AMOUNT		$1,755,834,020	0.640

YEAR	RATE	COMPOUNDED RATE	ESCALATED AMOUNT
2004	1.03		
2005	1.03	1.03	
2006	1.03	1.0609	
2007	1.03	1.092727	
2008	1.03	1.12550881	$147,427,964
2009	1.03	1.159274074	$151,850,803
2010	1.03	1.194052297	$156,406,327
2011	1.03	1.229873865	$161,098,516
2012	1.03	1.266770081	$165,931,472
2013	1.03	1.304773184	$170,909,416
2014	1.03	1.343916379	$176,036,699
2015	1.03	1.384233871	$181,317,799
2016	1.03	1.425760887	$186,757,333
2017	1.03	1.468533713	$192,360,053
2018	1.03	1.512589725	$198,130,855
2019	1.03	1.557967417	$204,074,781
2020	1.03	1.604706439	$210,197,024
2021	1.03	1.652847632	$216,502,935
2022	1.03	1.702433061	$222,998,023
		20.93324144	$2,742,000,000
ESCALATED AMOUNT		$2,742,000,000	
2004 AVERAGE ANNUAL AMOUNT		$130,987,836	
2004 AMOUNT		$1,964,817,543	0.717

YEAR	RATE	COMPOUNDED RATE	ESCALATED AMOUNT
	1.02		
	1.02	1.02	
	1.02	1.0404	
	1.02	1.061208	
	1.02	1.08243216	$158,557,445
	1.02	1.104080803	$161,728,594
	1.02	1.126162419	$164,963,166
	1.02	1.148685668	$168,262,429
	1.02	1.171659381	$171,627,678
	1.02	1.195092569	$175,060,231
	1.02	1.21899442	$178,561,436
	1.02	1.243374308	$182,132,664
	1.02	1.268241795	$185,775,318
	1.02	1.29360663	$189,490,824
	1.02	1.319478763	$193,280,641
	1.02	1.345868338	$197,146,253
	1.02	1.372785705	$201,089,178
	1.02	1.400241419	$205,110,962
	1.02	1.428246248	$209,213,181
		16.71895063	$2,742,000,000
		$2,742,000,000	
		$146,482,570	
		$2,197,238,554	0.801

YEAR	RATE	COMPOUNDED RATE	ESCALATED AMOUNT
2004	1.01		
2005	1.01	1.01	
2006	1.01	1.0201	
2007	1.01	1.030301	
2008	1.01	1.04060401	$170,343,405
2009	1.01	1.05101005	$172,046,839
2010	1.01	1.061520151	$173,767,308
2011	1.01	1.072135352	$175,504,981
2012	1.01	1.082856706	$177,260,031
2013	1.01	1.093685273	$179,032,631
2014	1.01	1.104622125	$180,822,957
2015	1.01	1.115668347	$182,631,187
2016	1.01	1.12682503	$184,457,499
2017	1.01	1.13809328	$186,302,074
2018	1.01	1.149474213	$188,165,094
2019	1.01	1.160968955	$190,046,745
2020	1.01	1.172578645	$191,947,213
2021	1.01	1.184304431	$193,866,685
2022	1.01	1.196147476	$195,805,352
		16.75049404	$2,742,000,000
ESCALATED AMOUNT		$2,742,000,000	
2004 AVERAGE ANNUAL AMOUNT		$163,696,664	
2004 AMOUNT		$2,455,449,964	0.895

Memo to: File
From: Matt Demos
Subject: Review of Master Plan (MP) World Gateway Program (WGP) Cost Estimate
Date: July 23, 2005

The FAA requested that CMT review the City of Chicago Master Plan Costs. This particular analysis reviews the costs associated with the World Gateway Program (WGP). CMT conducted an order of magnitude review of the WGP cost estimate summary (in 1999 dollars) provided in Table VII-4, on page VII-25, of the City of Chicago's 2004 Master Plan for O'Hare International Airport (see **Attachment A).** The review by CMT indicated that the costs presented appear reasonable and representative of the probable costs for WGP in 1999, with expectations of upward adjustment due to annual cost escalations.

This review of the City's cost estimate was based on broad scale historical unit prices for similar construction work. Additionally, a comparison was made to similar projects (i.e., terminal buildings and associated facilities) at other major airports that have recently been constructed or are in the planning stages.

Upon review of the WGP project description and costs presented in the City's 2004 Master Plan, and in the 2001 Request for Letter of Intent (LOI) Funding Application (Section D.1 of Appendix D) for the WGP and related improvements, a cost comparison was made to other terminal building/facility projects currently planned or constructed at other major airports throughout the country (see **Attachment B).** Based on the comparison of average total cost/gate of WGP to these other terminal projects, which in almost all cases the WGP terminal project cost estimates were 2 to 8 times higher, it would appear that the City has adequately budgeted the WGP terminal projects in the Master Plan. Additionally, when a comparison was made to estimated total cost/square foot of terminal space, the results also suggest that the estimated WGP project costs were reasonable, if not conservatively high.

Two separate WGP cost estimates were presented, one in the 2004 Master Plan, and the other in the 2001 LOI application. However, the cost estimate presented in the 2004 Master Plan is more recent, and appears to more adequately reflect the current project components of the WGP. This is primarily due to the reduction in scope of the WGP since the LOI application, most significantly, the exclusion of the re-development of Terminal 2. However, the cost estimates in each document utilized the same project contingency rates as stated in the City's July 20, 2005 letter (see **Attachment C**), and included all applicable soft costs (i.e., architectural/engineering design, construction management, etc). A 20 percent contingency factor was used for *Hard Construction Costs* (measured quantities), and an approximate 15 percent contingency factor was used for *Delivery/Scope* contingencies.

Based upon the information provided by the City of Chicago in the 2004 Master Plan, the 2001 LOI Application, and the information presented herein, CMT concludes that for purposes of this analysis under NEPA, the estimated costs associated with the WGP (1999 dollars) are reasonable and representative of the probable cost for the WGP in that year.

- *Phase 2:* (1) construction of a new Terminal 4 including an FIS facility and (2) construction of a Terminal 2 FIS facility.

The WGP design included a reconfigured Terminal 2 with a new FIS facility. For the purpose of the Master Plan, this component of the WGP is not included (as discussed in Section 5.2) and the program cost is adjusted accordingly. However, such improvements to Terminal 2 are not precluded from future development.

The estimated cost of the WGP is approximately $2.6 billion in 1999 dollars, as shown in **Table VII-4**. The first full year of operation is assumed to be 2013.

Table VII-4

WGP Cost Estimates (1999 Dollars)

	Project Cost ($000s)
Airport-wide, Airfield, and Airside Projects	$243,830
Terminal 2 FIS Facilities	$78,680
Terminal 4:	
Enabling Projects	$99,130
Apron and Fueling	88,680
Roadway/Access/ATS	79,030
Terminal	639,490
Utilities	62,050
Subtotal – Terminal 4	$968,380
Terminal 6	
Enabling Projects	$70,560
Apron and Fueling	48,340
Northern Extension	108,980
Parking Structure	114,220
Roadway/Access/ATS	244,450
Tenant Relocations	35,510
Terminal	546,550
Utilities	184,300
Subtotal – Terminal 6	$1,352,910
Total WGP Cost (1999 dollars)	$2,643,800

Source: Landrum & Brown; Project components included in OMP Master Plan selected by Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

7.4 Financial Feasibility

This section demonstrates the City's ability to fund the Master Plan development. The implementation schedule contained in Table VII-1 was utilized for the purposes of demonstrating financial viability; however, actual financial strategies and plans will be determined during the implementation process. The following topics are presented in this section:

Costs of Planned/Constructed Terminal Building/Facilities Projects at Other Airports							
Airport	Terminal Project	Year of Opening	Estimated Cost	Number of Gates	Area (Square Feet)	Estimated Cost/Gate	Estimated Cost/SF
Atlanta Hartsfield (ATL)	East International Terminal	2006	$982,000,000	10	1,200,000	$98,200,000	$818
O'Hare - WGP	**Terminal 6**	—	**$1,352,910,000**	**16**	**570,000**	**$84,556,875**	$2,374
O'Hare - WGP	**Terminal 4**	—	**$968,380,000**	**12**	**608,000**	**$80,698,333**	$1,593
Dallas-Fort Worth (DFW)	Terminal D - American/ International	2005	$1,200,000,000	28	2,000,000	$42,857,143	$600
New York (JFK)	Terminal 5 - jetBlue	2006	$875,000,000	26	625,000	$33,653,846	$1,400
New York (JFK)	Terminal 8/9 - American	2006	$1,400,000,000	56	2,200,000	$25,000,000	$636
Chicago-Midway (MDW)	New Terminal	2004	$927,000,000	43	N/A	$21,558,140	—
Boston Logan	Terminal A - Delta	2005	$500,000,000	22	686,000	$22,727,273	$729
Detroit Metro (DTW)	North Terminal	2008	$443,000,000	27	685,000	$16,407,407	$647
Detroit Metro (DTW)	McNamara Terminal/ Northwest World Gateway	2002	$1,200,000,000	97	N/A	$12,371,134	—
Baltimore (BWI)	Terminal A - Southwest	2005	$264,000,000	26	510,000	$10,153,846	$518

RICONDO & ASSOCIATES

MEMORANDUM

VIA E-MAIL

Date: July 20, 2005

To: Bruce Jacobson
Crawford, Murphy, & Tilly, Inc.

From: Shawn M. Kinder [ORIGINAL SIGNED]

Subject: WGP Cost Estimates

The Master Plan for O'Hare International Airport details those elements of the long-planned World Gateway Program (WGP) that are currently being proposed for implementation by the City of Chicago. These WGP elements are also illustrated on the October 2003 Airport Layout Plan. The costs for these currently-planned WGP elements are listed in Table VII-4 of the Master Plan.

As you are aware, the City of Chicago originally announced the WGP several years ago, and this program was the subject of an Environmental Assessment (EA). In addition to the EA, the City of Chicago submitted to the Federal Aviation Administration in February 2001 a Request for Letter of Intent (LOI) Funding for the WGP and related improvements. This Request for LOI funding document details the cost estimates for WGP and describes the soft cost assumptions, including contingencies, utilized in the estimates.

Appendix D of the February 2001 Request for LOI funding document describes the cost estimate assumptions. As stated in Section D.1, the *Hard Construction Costs* include quantities estimated with a 20 percent contingency. In addition, the various components include Delivery Contingency of approximately 6 percent and Scope Contingency of approximately 9 percent. In other words, the WGP costs estimates, as described in the February 2001 Request for LOI funding document, include contingencies of approximately 15 percent in addition to the unit quantity contingency of 20 percent. Figure D.1 of the Request for LOI funding document further describes the components of this cost estimate. Also, please note that the unit costs utilized in this cost estimate were based on historical costs of work at O'Hare International Airport, factoring in those costs relative to the Chicago market.

The WGP cost estimates described in the Master Plan are based on those cost estimates utilized in the February 2001 Request for LOI funding. The cost estimates in the Master Plan utilize the same contingency rates as those described in the Request for LOI funding document. As you are aware, some elements of the original WGP have been removed from the plans, and, thus, the overall scope has been reduced (most significantly, the Master Plan

RICONDO & ASSOCIATES

and the October 2003 ALP do not include the re-development of Terminal 2). Note, the Master Plan costs are listed in 1999 while the Request for LOI funding document lists the total costs in escalated terms.

The WGP costs listed in the Master Plan include all applicable soft costs and contingencies Thus, escalation of the Master Plan's $2,643,800,000 (1999) to current year dollars would include an escalation of the contingencies as well as all other hard and soft costs.

Please let us know if you have any questions or require additional information.

cc: M. Boland, OMP
P. Smithmeyer, FAA
M. Schneiderman, OMP
02-01-0215-01-4120
Read File

Crawford, Murphy & Tilly, Inc.

CMT has provided a full range of airport engineering and planning services to airports since 1946. The firm has performed such work at over 100 civilian and military airports in 20 states throughout the country. *Engineering News Record* (ENR) has ranked CMT among the top 25 aviation engineering firms in the nation since 1999.

CMT provides services to airport facilities of all sizes and is experienced in both civilian and military airport design. CMT's military experience includes being selected five times in a row by the U.S. Army Corps of Engineers to provide Indefinite Delivery Services for airfield pavements worldwide since 1992.

The 65 staff members of CMT's Aviation Services group consist of professional engineers focused exclusively on airport design and construction. Detailed cost estimates are a key element of project services provided by these individuals in the planning and design of airport projects. In addition to providing design and cost estimating services for several hundred airport projects over the past few years, these professionals assist several airports in the development of their 5-year capital improvement plans on an annual basis.

CMT's excellent track record of estimating construction costs for airfield-related development has been gained by focusing on logistical factors affecting construction phasing. This is especially critical at busy large hub or reliever airports where construction activities must be fine-tuned to minimize operational disruptions.

Familiarity with airfield construction and the ability to anticipate operational sensitivities have been factors leading to many awards for airfield-related projects.

CMT Facts

Established: 1946
Staff: 250
Offices: 9
Headquarters: Springfield, Illinois
Primary Business Organizational Units:

- Aviation
- Highways and Bridges
- Land Development
- Water and Wastewater

SUMMARY REVIEW--OMP FINANCIAL PLAN

BACKGROUND—LARGE HUB AIRPORT PROJECT FINANCING

Large hub airports in the United States (i.e., the largest 25-30 airports in the country) account for a majority share of nationwide passenger traffic, are therefore critical to the efficient operation of the nationwide air transportation system, and require periodic major investments in facility modernization and enhancement to accommodate growth in air transportation demand. Large hub airports in the United States are generally financially self-sustaining, requiring revenue generation to support both operating costs and capital costs. As a result, major investments in facility modernization and enhancement must be supported by an economic justification and a financially feasible funding plan.

Large hub airports utilize a variety of funding sources for capital improvement programs, including federal grants, retained earnings, passenger facility charges, and bonds. Because there are limitations on the amount of grants and other equity funding sources, large hub airports must rely on debt to fund the majority of major capital investments. This debt is most typically in the form of airport revenue bonds, or bonds that are issued by the airport sponsor and backed by the revenues generated at the airport.

Large hub airports generate revenues from a variety of sources. The most important revenue source for most large hub airports is revenue derived from airline rates and charges (e.g., terminal rentals and landing fees). As a result, airline revenues typically provide the key security for debt that large hub airports issue to finance major facility modernization and enhancement.

Since deregulation of the airline industry in 1978, airlines are free to enter and leave markets at will. As a result, in evaluating the ability of an airport to support the issuance of debt to fund major capital improvements, the financial community places less importance on individual airlines and more importance on the quality and characteristics of the aviation market--in terms of ability to attract passenger demand, airline service, and airline revenues. While it is true that airports serving as connecting hubs rely substantially on airline strategic decisions to operate hubs in those locations, it is also true that the largest connecting hubs in the United States (e.g., those in Atlanta, Chicago, and Dallas-Ft. Worth) have developed in locations that have very large local passenger markets and geographic advantages that would be attractive to a variety of major airlines. Thus, even in the case of large connecting hubs, the characteristics of the local market are key considerations for the financial community in evaluating the issuance of debt and, therefore, the financial viability of the overall funding plan for a particular airport capital development program.

FINANCIAL PLAN FOR OMP

The City of Chicago has developed a financial plan for OMP that includes consideration of investments required for OMP and required or anticipated for other capital improvements during the same time horizon. In particular, the City has considered the required funding of, and sources of funding for, (1) OMP, (2) World Gateway, and (3) other Capital Improvement Program projects. The City's financial plan is summarized in the February 2004 ORD Master Plan report.

Amount of Total Funding Required

The amount of funding required for the combined OMP, Gateway, and CIP projects at O'Hare is large—a total of about $14.3 billion in 2004 dollars, as presented in the EIS document. However, O'Hare is one of the largest airports in the United States, and one of the major connecting hubs for the national transportation system. Therefore, it is not considered unusual or unreasonable that required investments would be significant in order to accommodate future growth in activity.

Most of the largest airports in the United States either have, or will soon have, developed plans for significant investment in future capacity to accommodate anticipated growth in future aviation demand. It is not possible to present a comprehensive comparison of large airport capital programs, because many airports have not yet finalized and/or published the results of their long-term plans. Furthermore, the total size of a capital improvement program is not necessarily the most relevant comparison, because airports are very different in the amount and type of demand that they accommodate. As will be explained and presented later in this summary, the resulting average airline cost per enplaned passenger is a more relevant comparison metric.

Sources of Funding

In preparing the financial plan for OMP and other capital improvements, the City estimated the potential availability of funds from various sources. The table below summarizes the assumed sources of funds for the OMP and other capital improvements at O'Hare.

Source of Funds	Percent of Total
FAA Grants	6%
PFC Funds	22%
Revenue Bonds	62%
3rd Party Financing	10%
Total	100%

FAA has reviewed the sources of funds assumed by the City to be available to fund improvements at O'Hare, and believes that these funding sources are appropriate for this type of airport development program, and reasonably consistent with the sources of funds that are used for large hub airport capital programs at other U.S. airports. In particular, the largest sources of funds are in the form of borrowing—PFC bonds and airport revenue bonds—which is typical of large hub airport finance plans.

PFC bonds are supported by the per-passenger PFC revenue that is collected by airlines and remitted to airport sponsors. Thus, the primary security for this type of debt is the forecast of annual enplaned passengers. The passenger forecast for O'Hare used in preparing the City's Master Plan finance plan is generally consistent with the passenger forecast for O'Hare prepared by FAA (the 2003 TAF) and used for the ORD OMP EIS.

The single-largest source of capital funds is intended to be provided via the issuance of airport revenue bonds (as opposed to PFC bonds), which is typical of the financing plans for other large hub airports in the United States. Future airport revenues at O'Hare will provide the security for the airport revenue bonds (i.e., ability to pay principal and interest on the bonds). In turn, airline user charges at O'Hare are expected to represent the largest source of future airport revenue at O'Hare. Therefore, the reasonableness of required future airline user charges at O'Hare is the key consideration in evaluating the reasonableness of the City's financial plan. This is discussed in more detail in the following sections.

With any large, long-term capital program, there is uncertainty regarding the sources of funds that have been assumed to provide for full implementation. In the event that certain funds are not available in the amounts assumed (e.g., federal grant funding), the City would need to make certain adjustments during implementation, including:

1. Deferred Improvements—Certain elements of the overall development program could be deferred in the event there is a shortfall in funding.
2. Use of Contingency—The cost contingency is available not only for an unanticipated increase in construction cost, but also for an unanticipated shortfall in funding.
3. Increased Borrowing—Increased borrowing (i.e., debt) could be used to make up a shortfall in the availability of other funds. This would be a decision made in consultation with airport users based on the circumstances at the time a decision is required.

AIRLINE COST PER ENPLANEMENT AT O'HARE

Average airline cost per enplanement—airline payments of airport rates and charges divided by the number of enplanements at the airport—is an industry-accepted metric of airport "competitiveness" in terms of the costs charged to airlines by airport sponsors. The following sections present information on airline cost factors nationwide, and specific comparisons of the airline costs at O'Hare with other large hub airports.

Airline Operating Expenses

The table below presents data on the percentage distribution of operating expenses by type, for all major airlines, nationwide. As shown, airport costs represent 6.5% of total operating expenses for major airlines nationwide. In contrast, labor and fuel together represent more than 50% of airline operating expenses.

Category of Expense	Percent of Total
Labor	40.2%
Fuel	14.3
Outside Services	9.3
Facilities Depreciation	6.6
Airport Costs	6.5
Aircraft Rent	5.3
Maintenance	5.2
Other	12.8
Total	100.0%

Source: Airline Monitor.

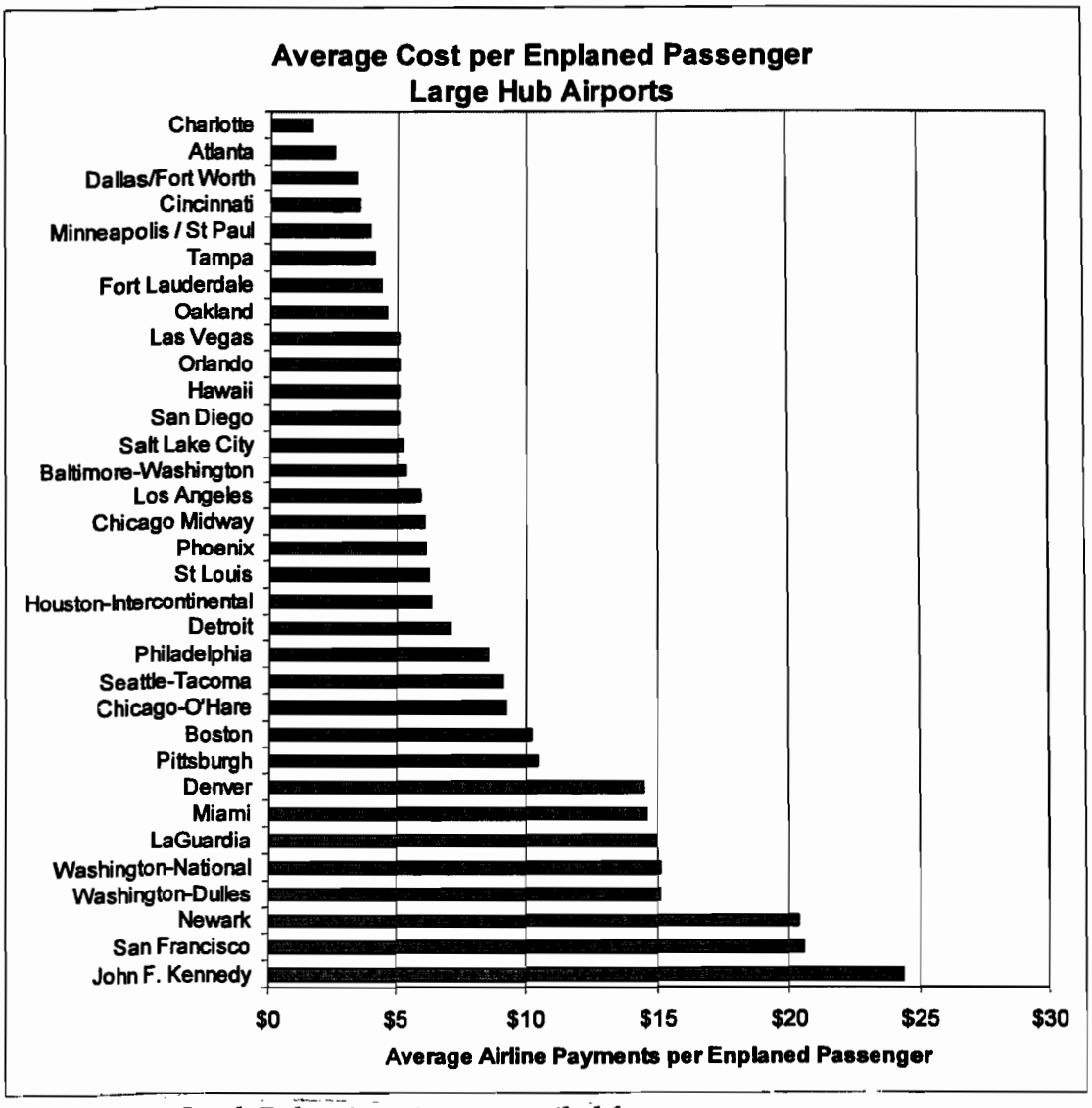
While airport rates and charges represent only 6.5% of total airline system costs (with other airline costs such as fuel and labor representing much larger shares), airlines are sensitive to increases in airport costs.

When major capital investments result in significant increases in average cost per enplanement at an airport, there is concern that this can potentially adversely impact the level of activity at the airport—for example, due to airline decisions to reduce the amount of service provided, or due to lower passenger demand in association with increased airfares. As further explained below, there are many factors to consider in evaluating the level of either current or future average airline cost per enplanement at a particular airport.

Current Airline Cost Per Enplanement

Exhibit 1 illustrates the current average cost per enplanement at O'Hare and other large hub airports in the United States, using recently available data from years 2001 to 2004. As shown, the current cost per enplanement at O'Hare is within the range that is currently or recently experienced at other large hub airports.

Exhibit 1: Average Airline Cost Per Enplanement

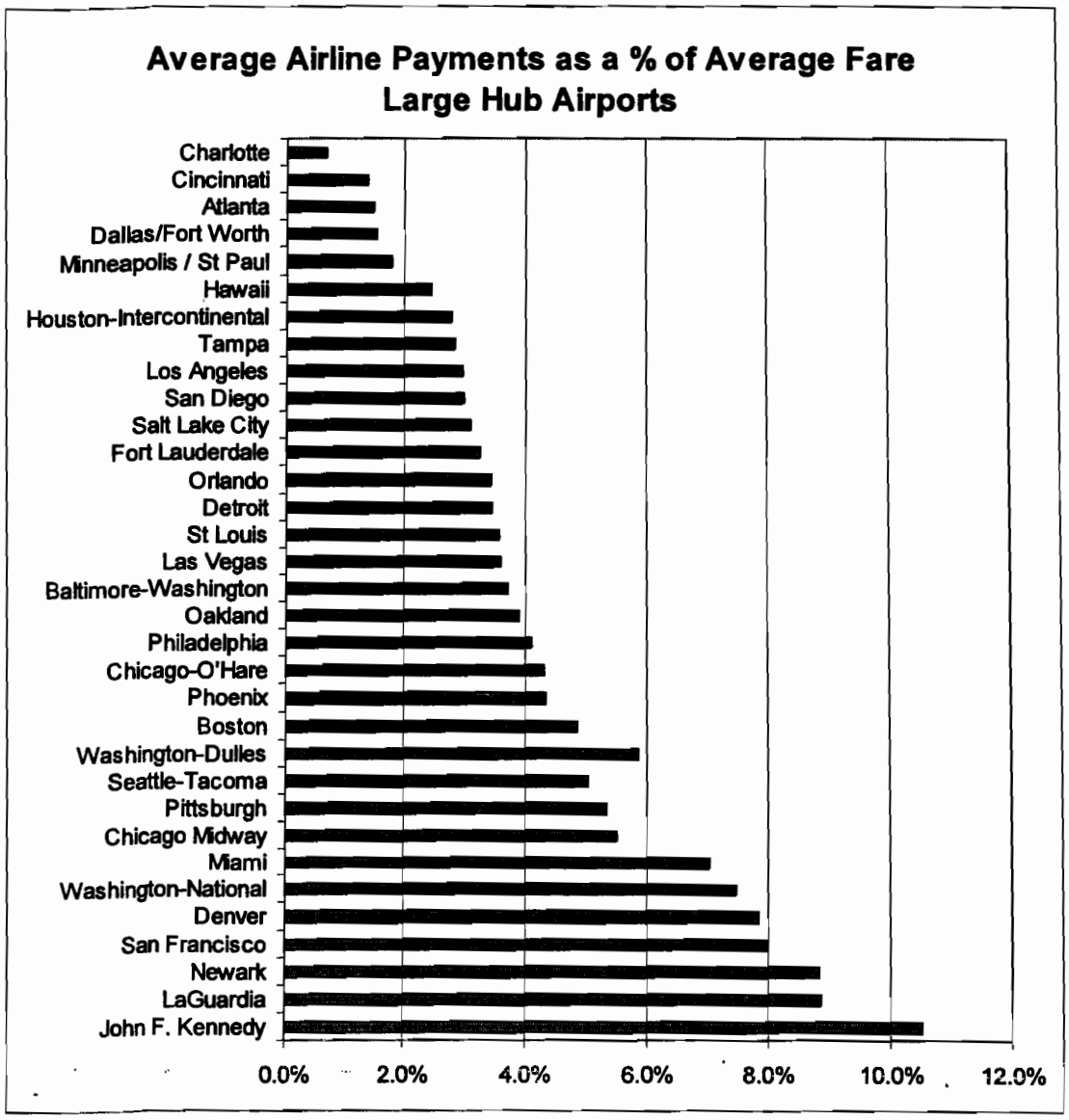


Source: Leigh Fisher Associates, compiled from various sources.

Airline Cost Per Enplanement in Relation to Average Fares

In addition to comparing the absolute level of cost per enplanement among airports, it is also important to consider the level of cost per enplanement relative to the average airfares that airlines are able to realize by serving the various airports. In a market with relatively higher average airfares (or, airline revenue per passenger), it is reasonable to expect that airlines might be willing to accept paying relatively higher average airport charges. As shown on Exhibit 2, O'Hare is currently "in the middle of the range" for large hub airpors.

Exhibit 2: Cost per Enplanement Relative to Average Fare



Source: Leigh Fisher Associates, compiled from various sources.

Future Cost Per Enplanement

As reported in the O'Hare Master Plan, it is projected that the implementation of OMP and other anticipated capital improvements (World Gateway and the CIP) will require an increase in the amount of airline revenue to pay operating and capital expenses, and thereby increase the average cost per enplanement at O'Hare. Specifically, it was projected in the O'Hare Master Plan that the average cost per enplanement for airlines at O'Hare will increase from about $9 in 2004 to about $20 in 2012 and about $27 in 2022. In terms of the forecast horizon for the ORD OMP EIS (2018), this projection can be interpolated to a result of about $24 in 2018.

The increase in cost per enplanement projected for O'Hare is important to consider in the context of what is likely to occur at other large airports during the same time period. For example, when the new Denver International Airport was constructed, there was concern that the resulting costs to airlines would make the new airport "uncompetitive"; as it has turned out, the airline costs at the new Denver International Airport are increasingly competitive relative to large hub airports that are now faced with investing in major capital improvement programs.

Over the time horizon covered by the ORD OMP EIS analysis (i.e., through 2018), many other comparable large hub airports in the United States will also require major capital investments in order to accommodate growth in aviation demand. For some of these other airports, long-term capital programs have been defined, with associated cost estimates and financing plans. For others, long-term capital programs have not yet been defined or not yet taken to the point at which appropriate financial plan data (e.g., future airline cost per enplanement) are available for comparison. Therefore, it is not possible to provide a comprehensive review of the future cost per enplanement at O'Hare with all other large hub airports.

Examples of other airports which have defined long-term capital development programs in a manner which is comparable include:

1. Miami International Airport: In an Official Statement for bonds issued in 2004, it was projected that average airline cost per enplanement at Miami International Airport would increase to $32.83 in 2015 as a result of implementation of the capital program.
2. Washington Dulles: In an Official Statement for bonds issued in 2004, it was projected that average airline cost per enplanement at Washington Dulles would increase to $20.63 in 2012 as a result of implementation of the capital program.

These examples indicate that average cost per enplanement at some other large hub airports (specifically engaged in long-term capital development programs) will be increasing in the future, and to levels that are comparable to the level projected at O'Hare. While these data are not available for all large hub airports, it is reasonable to expect that, as capital programs are defined, there will be other large hub airports that will be projected to require increases in average cost per enplanement to levels that are in the same range as those projected for O'Hare.

There are many large hub airports either implementing or planning to implement major capital improvement programs in order to accommodate future growth in aviation demand. The costs to airlines at these airports will increase as a result of these investments. Airports that are expected to be required to undertake major capital improvement programs (or not accommodate forecast demand), but which have not yet finalized and published comparable long-range financial plans include those in: Philadelphia, Phoenix, San Diego, and San Francisco.

It is reasonable to expect that, over the time horizon of the OMP (that is, through 2018), the average cost per enplanement at O'Hare (as presented in the O'Hare Master Plan), while relatively high by current standards, will be within the range that is experienced at large hub airports nationwide, for the following reasons:

1. There are some large hub airports that have recently experienced average cost per enplanement at levels near the future levels projected for O'Hare
2. There are some large hub airports that have initiated capital programs and developed financial plans that indicate future cost per enplanement near or above the future levels projected for O'Hare
3. There are other large hub airports that have not yet finalized development of capital programs and associated financial plans, but are likely to require investments that will increase average cost per enplanement, and in some cases to levels comparable to the future levels projected for O'Hare.

FINANCIAL COMMUNITY ACCEPTANCE OF OMP FINANCING PLAN

As stated above, the City's financing plan for OMP and related capital investments includes a significant amount of borrowing in the form of airport revenue bonds, as is typical for large hub airports. Thus, an important consideration in evaluating the financing plan is the anticipated "reaction" or "acceptance" of the financial community; e.g., the ability to obtain an investment-grade bond rating and attract investors in bonds and insurers of bonds.

Bond rating agencies (i.e., Standard & Poors, Moody's, Fitch) evaluate the potential of airports to generate sufficient revenues to repay bond debt service,

and on this basis assign ratings to bond issuers. These ratings are key considerations for investors in the bonds and insurers of the bonds, and in turn influence the cost of capital (i.e., the interest rate on debt that is issued).

The City of Chicago has issued bonds for preliminary phases of OMP. The documents associated with these bond issuances have contained projections of costs associated with the initial phase of OMP implementation, along with disclosures that OMP will be implemented in phases, and other key considerations that have been noted as risks. Examples of disclosures contained in recent Official Statements for the issuance of bonds by the City of Chicago include:

- Capital Program – there has been full disclosure that the City intends to implement OMP in phases, along with investment in other capital improvements
- Capital Program Uncertainties – there has been disclosure that there is uncertainty regarding the cost and timing of OMP implementation
- Airline Industry Uncertainties – there has been disclosure that there are uncertainties regarding the future state of the airline industry, and in particular the financial health of major airlines serving O'Hare

In connection with the recent issuance of bonds by the City of Chicago, and considering the types of disclosures identified above, bond rating agencies have chosen to assign investment-grade ratings to the bonds issued by the City of Chicago. Most recently, Moody's has rated the City's bonds A2, Standard & Poor's has rated the City's bonds A-, and Fitch has rated the City's bonds A. These investment-grade ratings are an indication that the financial community has accepted the City's financial plan as reasonable, in relation to the benefits of such investment.

As noted above, the City has to-date only issued bonds for preliminary phases of OMP. It is typical that large, long-term capital programs are implemented and financed in phases. It is not necessary, and not financially prudent, to borrow money significantly in advance of the need for such money for construction – to do so would result in undue interest costs. Thus, the City has developed a financial plan that assumes issuance of bonds in phases consistent with the need to have funds available to finance construction. The financial community will evaluate each proposed new series of bonds at the time these bonds are required to be issued, and in the context of the then-current set of circumstances.

CONCLUSION

On the basis of the information presented herein, the review of the City's financial plan, and an understanding of airport financing in general, FAA has no reason to believe that the City's financial plan cannot be implemented as

generally presented in the ORD Master Plan. Further, FAA has no reason to believe that the resulting costs to airport users (most significantly, major airlines serving ORD) will significantly adversely affect the ability to finance the capital projects and realize the projected aviation demand, particularly in the context of future investments that will be required at other large hub airports in the United States. All projections and forecasts are subject to uncertainty, and future events may result in changes or adjustments to the FAA conclusions.

Leigh Fisher Associates has, for more than 50 years, provided a full scope of consulting services to airport management regarding airport business operations and the planning and financing of airport facilities. LFA has provided services to the sponsors of more than 80% of the large-hub and medium-hub airports in the United States. LFA has extensive experience assisting airport operators in the financing of airport improvements, and has prepared financial feasibility studies associated with over 250 airport bond issuances representing over $37 billion in airport bond debt. Mr. Mark Taylor, an LFA Director, has 18 years experience in airport economic and financial analysis, and specifically financial feasibility studies. Mr. Taylor has directed the development of financial feasibility studies and capital program affordability studies at airports throughout the United States, including those in Austin, Denver, Las Vegas, Miami, New York (JFK, LaGuardia, and Newark), Orlando, Philadelphia, Sacramento; he has assisted in the preparation of and due diligence review of such studies at numerous other airports, including those in Atlanta, Cleveland, Dallas-Ft. Worth, El Paso, Ft. Lauderdale, Houston, Indianapolis, Los Angeles, Manchester, Pittsburgh, Portland, Salt Lake City, and Seattle.