Presentation to

The Federal Aviation Administration

In Regard to

The City of Chicago Benefit-Cost Analysis
In Support of Its Proposed O'Hare Modernization Program

By

THE
CAMPBELL-HILL
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Overview

- Errors in the City's BCA modeling
  - Structure
  - Cost understatements
  - Benefit overstatements
  - Missing elements
- City's BCA ignores the fundamental question of whether the OMP satisfies future regional needs
- The City failed to follow the FAA's prescribed guidance for BCA, including evaluation of alternatives
- Campbell-Hill's corrections and adjustments to the City's BCA
  - Methodology
  - Findings
- Q & A

The City's BCA Results Are Vastly Overstated

	Benefit-Cost Ratio				
		Campbell-Hill (2003 TAF)		Campbell-Hill (2002 TAF)	
	City of Chicago	Delay-Based Adjustment	Full BCA Model	Delay-Based Adjustment	Full BCA Model
OMP-Phase 1 Airfield	2.13	-1.68	-0.60	-1.06	-0.29
Total Master Plan	1.04	-0.40	-0.24	0.27	0.13

About The Campbell-Hill Aviation Group

- Aviation economic consultants since 1968
- Balanced practice – airlines and airports
- Regulatory and public policy experts
- Experience with significant recent benefit-cost analyses
  - ICAO CAEP5
  - JFK Rail Link
- Multiple Airport Demand Forecasting and Traffic Allocation
  - New York/Newark
  - Washington/Baltimore – FAA
    – COG
    – MWAA
  - San Francisco/Oakland/San Jose
- New entrant/low fare airlines
  - Midway I: 1979
  - Others
- Firm is Washington based

CHICAGO'S BENEFIT-COST ANALYSIS IS FAULTY AND INCOMPLETE

Purpose of BCA

- Evaluate and rank all reasonable alternatives relative to:
  1) Net Benefits – Costs (NPV)
  2) Benefit/Cost Ratio
- Select best alternative
- City short circuited the process
  - It evaluated just one plan (Alternative C)
  - It ignored all other reasonable blended solutions including:
    - On-airport configurations
    - Capacity management alternatives
    - The role of alternative airports
    - Airline strategies for dealing with capacity constraints

Chicago's Transparent Motives

- Seeking fast track approval (LOI for OMP-Phase 1 Airfield without supporting infrastructure)
- Frontload the overstated benefits
- Backload the understated costs (Master Plan)
- Ignore major costs (e.g. western access system)
- End-run the process
  - BCA not in compliance with FAA Guidance and established principles of Benefit-Cost Analysis
- Seek quick approval of initial LOI without a comprehensive analysis tied to the stated purpose and need (DEIS)
- Plant the hook for federal funding
- Remainder of Master Plan fails B/C tests by City's own unadjusted numbers (BC ratio = 0.55)[1]

1/ See Table 4-10, page 80

Structural Failures of the City's BCA

- Failed to evaluate alternatives
- Used illogical and unsupportable supply-based limit (974,000 annual operations)
  - Leads to "do nothing" NO ACTION base case contrary to BCA requirements
- FAA BCA Guidance requires "do something" definition of base case
  - "It is especially important that the base case not be defined as a 'do nothing' course of action" (FAA, BCA Guidance, p. 17)
  - Incorporate airport and airline strategies to deal with capacity constraints, including greater utilization of other airports, use of new technologies, larger aircraft, adjusted schedules among others
  - Incorporate consideration of demand management options
- Didn't measure delay at beginning, middle, and end of the life of the project and failed to use proper evaluation period
- Should have based BCA evaluation on identical maximum delay across scenarios (demand-based limit)
  - Campbell-Hill used City/FAA 15.9 minute AAAW delay for this purpose
- Failed to account for significant uncertainty (UAL failure)
- City BCA fails to comply with every analytical requirement in the FAA Guidance

Further Structural Failures

- Model is entirely static
  - OMP costs have no impact on ORD traffic or operations False!
  - BCA must adjust TAF values for impact of very large OMP costs
- City analysis fails to include costs of new terminals for OMP-Phase 1 Airfield and access/egress systems for OMP-Phase 1 Airfield and Total Master Plan
- City's analysis fails to include (or model) ever-increasing access/egress and terminal facilitation times – without new facilities
- As FAA Guidance says, terminals and access systems integral to handling greater traffic (purpose of the OMP) must be included in the BCA
- City tries to have it both ways:
  - No increase in passenger access/egress or terminal facilitation times
  - No costs to ground handle more passengers and aircraft

Costs Are Understated by 30% to 33%

- Insufficient cost contingency
  - 0% OMP-Phase 1 Airfield
  - 6% Total Master Plan
- FAA Guidance recommends 17% to 35%
- Campbell-Hill's analysis uses 27.6%
- City BCA ignores cost of capitalized interest during construction
  - Required for airport to recover in rates and charges base
  - Supported by FASB as Generally Accepted Accounting Principle[1]
  - Mandated in other federal programs (Corps of Engineers)
- Cost adjustment (NPV – 2001 Dollars; 2002 TAF):

	Billions of Dollars	
	OMP-Phase 1 Airfield	Total Master Plan
City BCA Cost	$ 1.9	$ 6.2
C-H Adjustments:		
- Contingency	0.5	1.2
-Cap. Interest	0.4	1.5
Total	$ 2.8	$ 8.9
City BCA Understatement	33%	30%

1/ "If an asset requires a period of time in which to carry out activities necessary to bring it to that condition and location, the interest cost incurred during the period as a result of expenditures for the asset is a part of the historical cost of acquiring the asset." (FASB, Statement of Financial Accounting Standards No. 34, p. 5)

Benefits Are Overstated

- Structural model flaw - Operations cap rather than delay cap
  - City's claimed BCA benefits would run forever
  - In real world both OMP-Phase 1 Airfield and Total Master Plan reach 15.9 minute delay well before 20-year life
  - Using delay cap, the added taxi times exceed delay savings resulting in negative benefits
- City used low-ball 2002 TAF instead of 2003 or 2004 TAF
- Cost of OMP will reduce number of passengers benefited
- Value of passenger time is wrong
  - City used $32.10 per hour
  - FAA uses $28.60 per hour
- Downstream delay benefits are unsupported and erroneous

The City's Benefit/Cost Ratio for the *Total Master Plan* is Less Than 1.0 on its Face

- City produced a ratio of 1.04 by using "unconstrained" passenger forecast in Total Master Plan
  - Other three scenarios used constrained forecast
  - No western access system costs or other costs (congestion, etc.) so switching forecasts is erroneous
  - Benefit/cost ratio computed on basis consistent with other build scenarios = 0.93
- Additional projects to the OMP-Phase 1 Airfield produce a BC ratio of 0.55 (City's benefits and costs unadjusted)

CAMPBELL-HILL'S CORRECTIONS AND ADJUSTMENTS TO CHICAGO'S BCA

A. METHODOLOGY

Campbell-Hill's Adjusted BCA Methodology And Inputs

- Incorporates Realistic Market-driven Traffic and Delay Forecasts
- Modified Cost Assumptions
  - Construction cost contingency
  - Capitalized interest
- Modified Benefit Assumptions
  - Value of passenger time
  - Downstream delay benefits
- Risk and Sensitivity Analysis
  - Probability of ORD as one-carrier hub
  - More recent and representative forecast (2003 and 2004 TAF's)
- Caveats
  - Limited to reported TAAM model results
  - Constrained to City's pre-determined alternative
  - Influenced by numerous unstated City assumptions

Campbell-Hill's Traffic And Delay Forecast Adjustments

- Focus on Passenger Demand Growth Not Frozen Level of Operations
- Delay-Based Operations and Throughput Constraints
  - 15.9 minutes of average all-weather delay for all scenarios
- "No Action" Forecast
  - Replace "Do Nothing" forecast
  - Incorporate real-world market-driven adjustments and reasonable use of alternative airports (regional and mid-continent)
- "Build" Scenario Forecasts
  - Economic efficiency of OMP evaluated at projected traffic levels
  - Expose the impact of "taxi time" penalty for both OMP-Phase 1 Airfield and Total Master Plan
  - Incorporate impact of OMP costs on airport demand
  - Include additional ORD revenues for greater traffic
- Risk and Sensitivity Analysis
  - Possibility of loss of hub carrier
  - Impact of more recent TAF's
  - Conversion to 2004 constant dollars

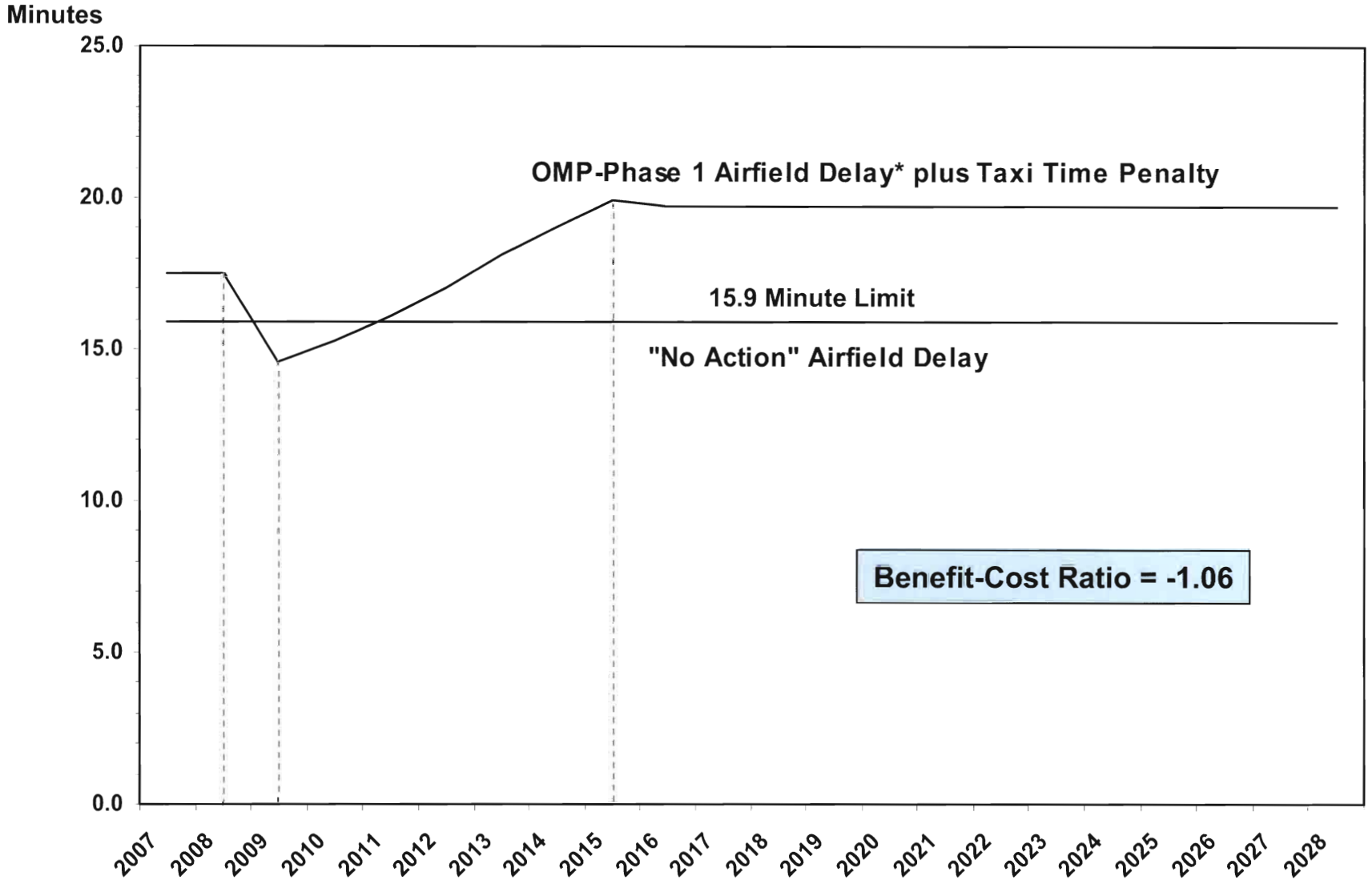
Campbell-Hill "No Action" Forecast Assumptions

- **Limiting Constraint**
  - **Use 15.9 minutes of delay at 974,000 annual operations for entire forecast period (according to TAAM for 2009)**
- **Real-World Adjustments by Airlines and Passengers Can Accommodate Most of Forecast Growth at ORD**
  - **Increasing aircraft size and load factors will increase average passengers per flight to historical levels (and minimal 1% annual growth thereafter)**
- **There Is Sufficient Capacity to Handle Any Residual Traffic at Alternative Airports**
  - **Up to 4 million local O&D passengers at regional airports (although all could utilize ORD while maintaining competitive local/connecting mix)**
  - **Several Mid-Continent hubs can accommodate more connecting traffic (e.g. St. Louis)**
  - **Assume same travel time for these passengers as at ORD (despite lower expected delays)**

Campbell-Hill's OMP "Build" Forecast Assumptions

- Limiting Constraint
  - Use maximum 15.9 minutes of delay
  - Growth in operations derived from TAF
  - Calculated delay derived from reported TAAM results
- Market-Based Adjustments by Airlines and Passengers
  - Same assumptions as "No Action"
- Cost-Related Passenger Reduction
  - Cost of OMP will reduce TAF passenger and flight demand
- Risk and Sensitivity Analysis
  - High probability ORD may lose one carrier hub must be considered as part of risk analysis
  - More recent TAF's hurt the City's case for the OMP

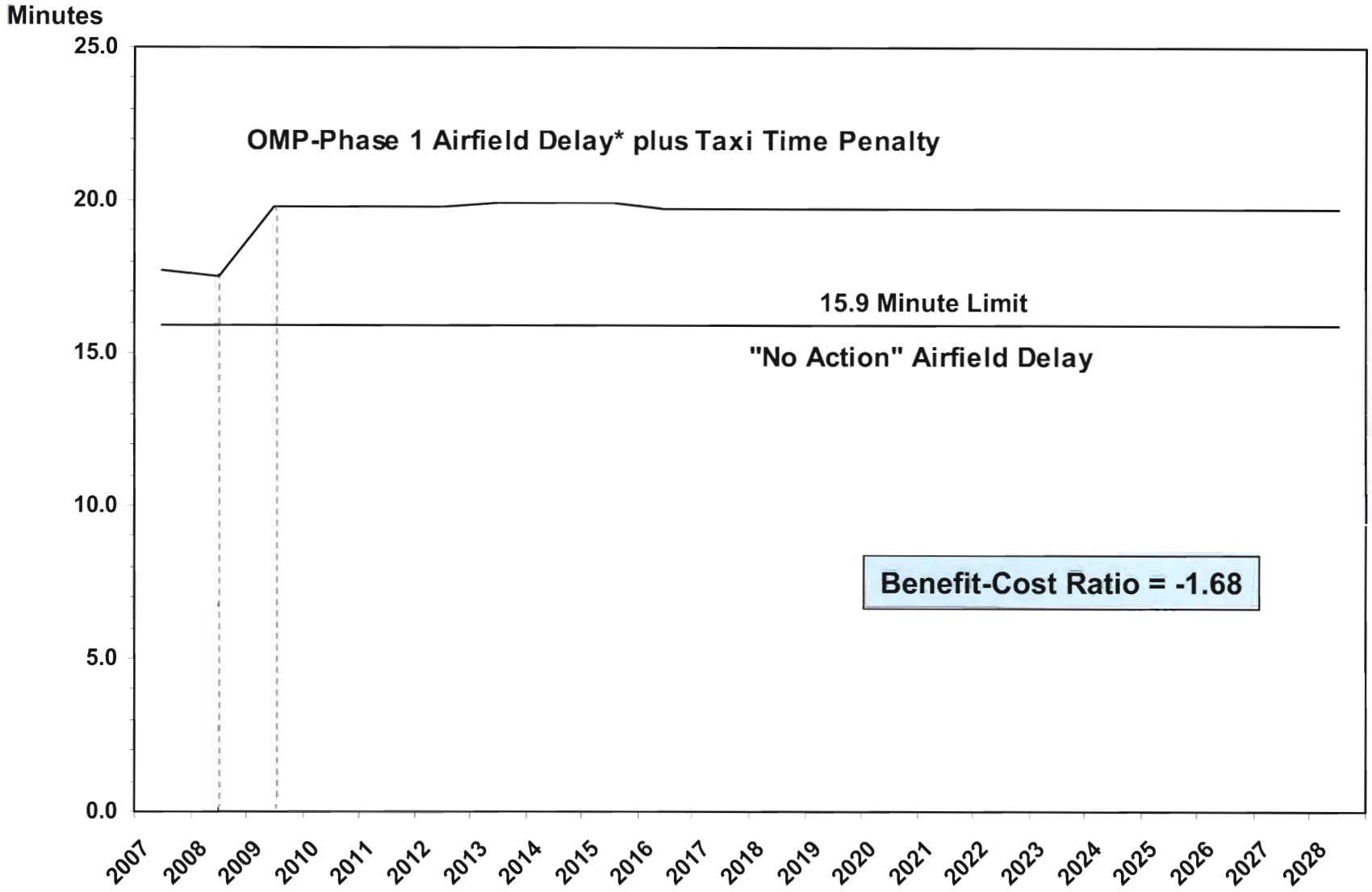
With Delay-based Constraint, *OMP-Phase 1 Airfield* Would Have Significant Travel Time Disbenefits (Based on 2002 TAF)



* Delay estimates are based on delay curves derived from TAAM model results with no adjustments.

Source: Exhibit 303

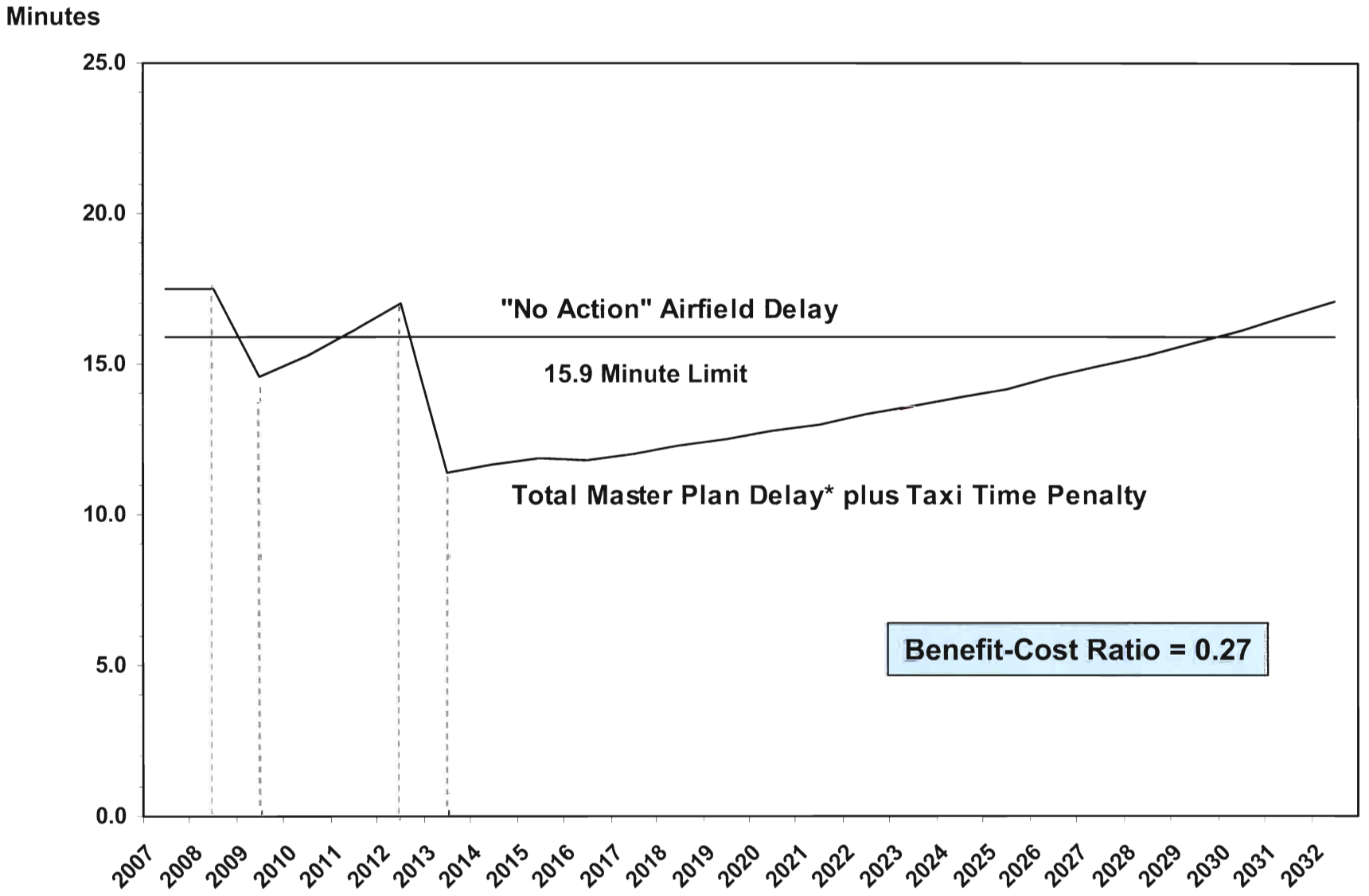
Using 2003 TAF, *OMP-Phase 1 Airfield* Would Have a Travel Time Disadvantage for the Entire Forecast Period



* Delay estimates are based on delay curves derived from TAAM model results with no adjustments.

Source: Exhibit 303

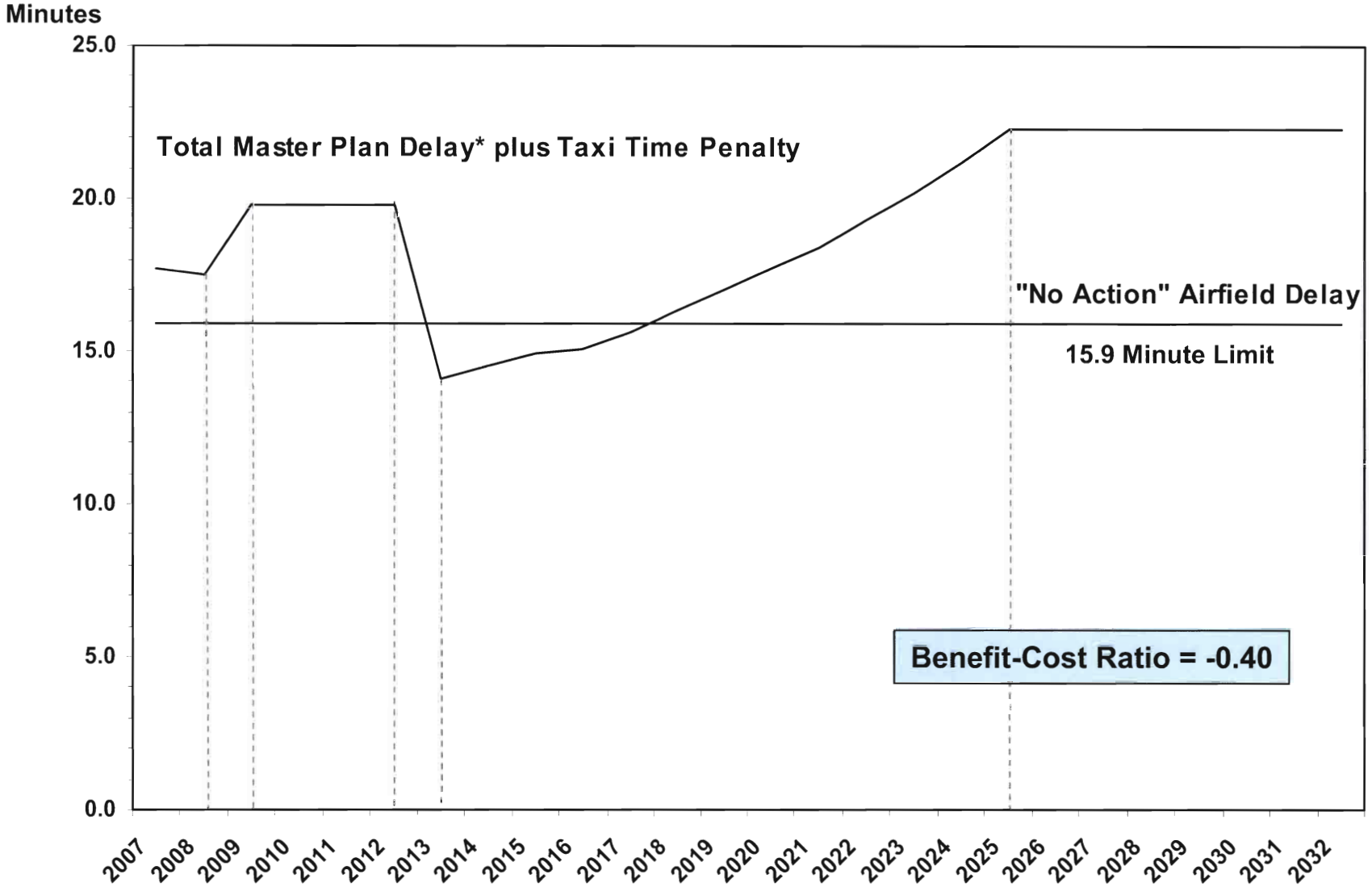
Using Delay-based Constraint, *Total Master Plan* Would Have a Limited Travel Time Advantage Over "No Action" Airfield (Based on 2002 TAF)



* Delay estimates are based on delay curves derived from TAAM model results with no adjustments.

Source: Exhibit 303

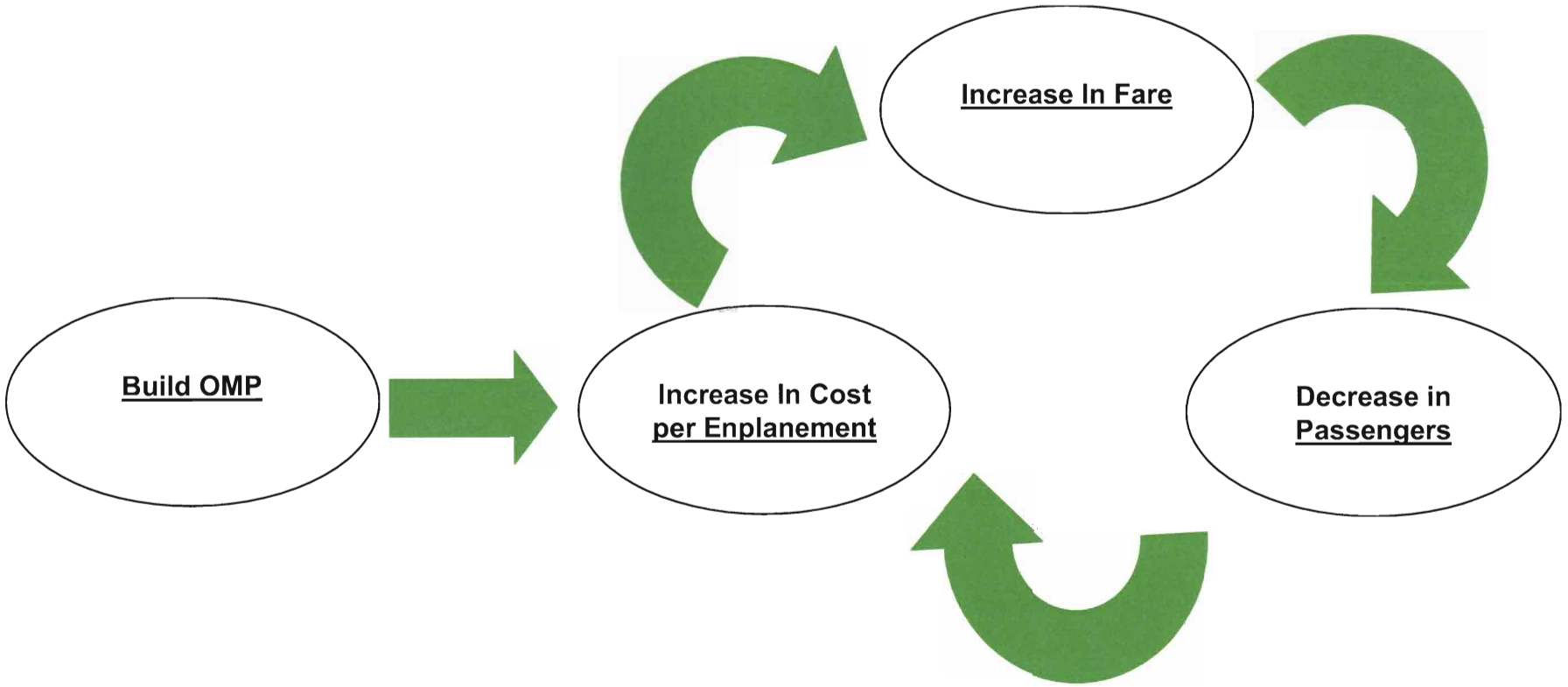
Using 2003 TAF, The *Total Master Plan* Would Have An Advantage Over "No Action" Airfield for Only 4 Out of 26 Years



* Delay estimates are based on delay curves derived from TAAM model results with no adjustments.

Source: Exhibit 303

The City's Forecasts Need to be Adjusted for the Cost-Related Passenger Reduction



The Costs of the OMP Will Decrease Annual Passengers by 1.7 to 7.7 Million

	Thousands of Passengers	
	OMP-Phase 1 Airfield 2009	Total Master Plan 2013
2002 TAF Unconstrained	78,298	87,824
Cost-Related Passenger Reduction Round 1	-1,620	-6,985
Cost-Related Passenger Reduction Round 2	-34	-694
2002 TAF Adjusted for the Cost-Related Passenger Reduction	76,645	80,145
Total Cost-Related Passenger Reduction	-1,654	-7,679

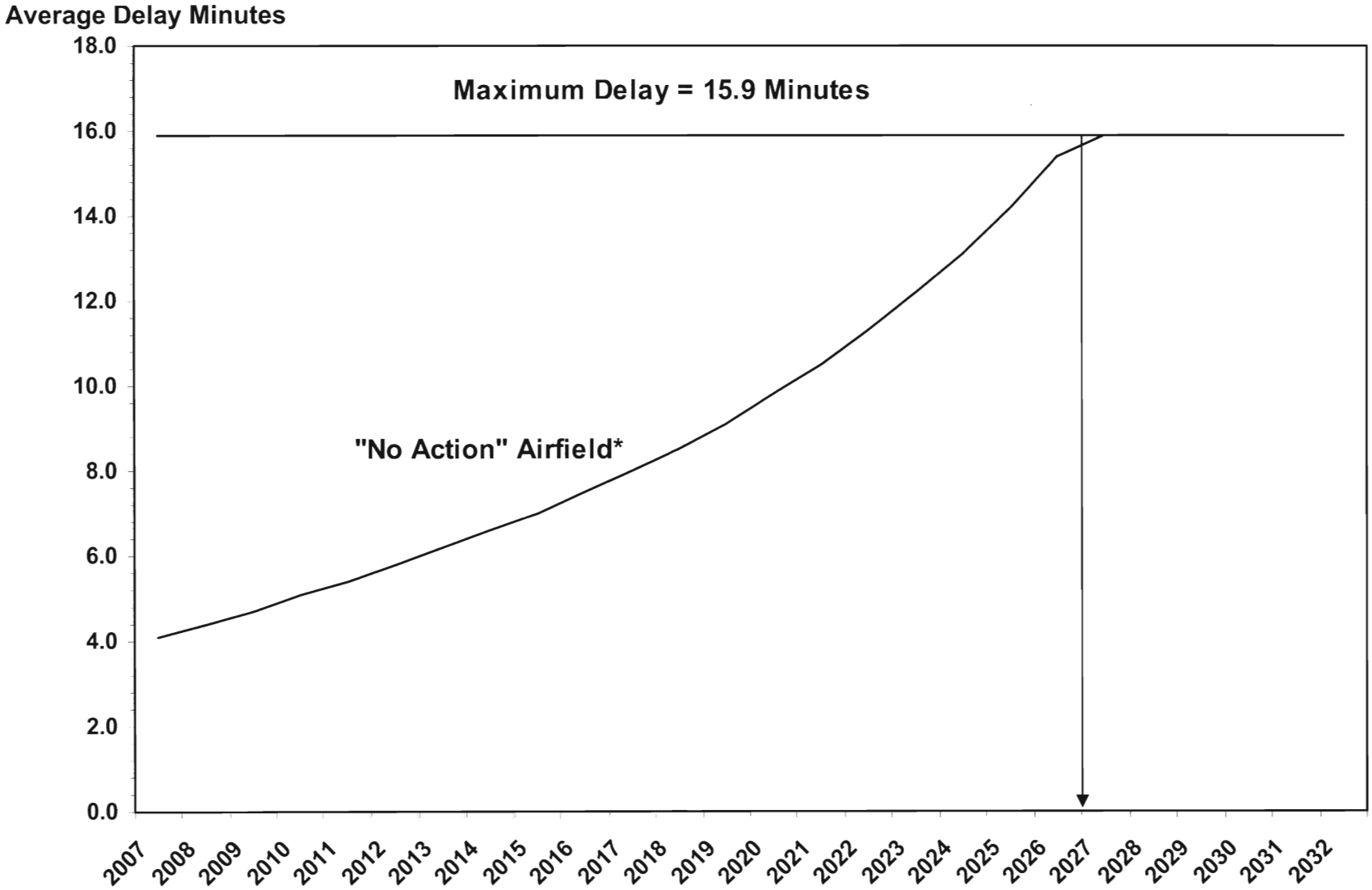
Note: Numbers may not add to totals due to rounding

Sources: Exhibits A-11, A-41, 300 and 301

The City Should Have Incorporated the Risk of a United Failure

- BCA Guidance states, "Clearly, if there is a reasonable possibility that the hub operation will be discontinued… the impact of this event on the forecast should be quantified (FAA BCA Guidance, p. 13)."
- The potential failure of a hub carrier should be quantified and incorporated in the BCA as a set of "expected values" for the benefits and cost streams.
- In its DEIS Comments, Campbell-Hill developed a forecast for O'Hare operations and enplanements in a situation where United fails
  - O'Hare will not reach 2003 passenger levels until 2021
  - Campbell-Hill believes that there is a 50% chance that United will fail

United's Failure Would Result in No Delay-Based Constraints Until 2027 Under "No Action" Scenario



* Based on delay curves derived from TAAM model results with no adjustments.

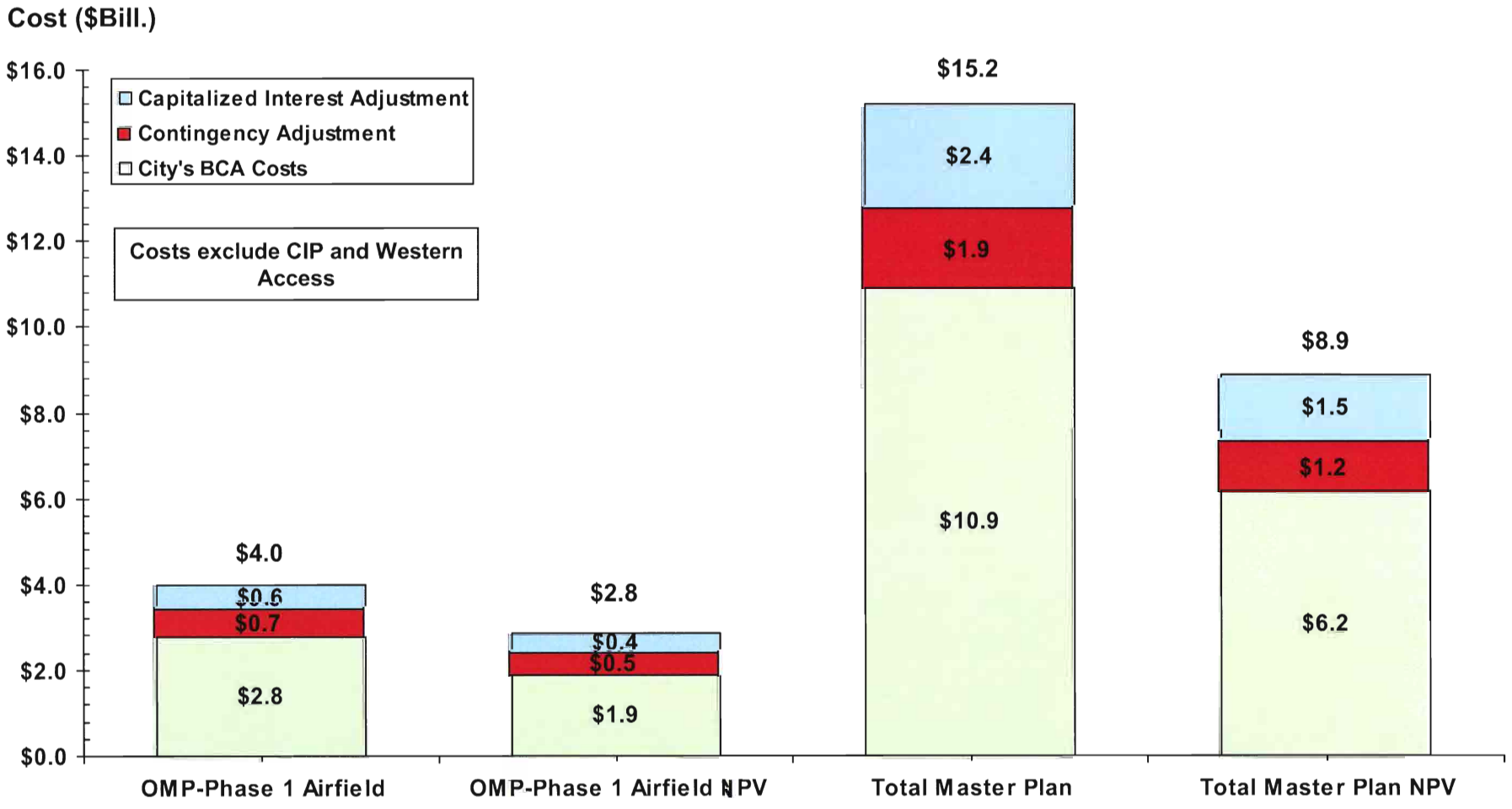
Source: Exhibit 303

Two Essential Cost Adjustments Must Be Made

1. **Construction Cost Contingency Adjustment**
   - The City included no contingency adjustment in its OMP-Phase 1 Airfield costs and only a 6% contingency in its Total Master Plan
   - Campbell-Hill used a more realistic 27.6% based on the average cost overrun of documented transportation infrastructure projects
   - The BCA Guidance recommends a contingency of 17% to 35% (FAA, BCA Guidance, p. 68)

2. **Capitalized Interest Adjustment**
   - The City's costs and the 7% discount rate do not include the interest on borrowed funds during construction
   - Adds to the principal that the airlines owe at the time of the project's completion
   - If these interest costs are excluded then the City would not recover them from the airlines through rates and charges

The *OMP-Phase 1 Airfield* Would Cost $4.0 Billion and the *Total Master Plan* Would Cost $15.2 Billion With Campbell-Hill Cost Adjustments (Based on 2002 TAF[1] and 2001 Constant Dollars)



1/ Use of different forecasts changes costs because the number of enplaned passengers determines the PFC shortfall. Capitalized interest would be accrued on this PFC Shortfall.

Sources: Exhibits 103 and 104 and the City's BCA

Campbell-Hill's Benefit Estimating Adjustments

1. Use appropriate demand (market) driven constraint
   - Maximum 15.9 AAAW delay; not fixed operations (974,000 annual)
   - Account for forecast differences in ORD revenue

2. Value of Passenger Time
   - BCA unit value ($32.10 per hour) is based on old 1997 survey data with no justification.
   - FAA's most recent O'Hare scheduling order (Docket No. FAA-2005-20704; Notice No. 05-03) uses $28.60 per hour

3. Downstream Delay Benefits Are Greatly Overstated
   - Use of 80% factor lifted from preliminary Lincoln Laboratory study is unsupported and ignores FAA's recommended process for an airport-specific application
   - High Density Rule study (May 1995) excluded these benefits as "preliminary" while estimating the factor at 8% to 22% for ORD
   - Factor should be applied only to flights delayed when <u>departing</u> ORD; not to all flights
     - Departure Delay Minutes = 18% of Total Delay Minutes (ORD TAAM results)
     - Maximum Downstream Factor = 15% (80% x 18%)
     - Mid-point of HDR study range

CAMPBELL-HILL'S CORRECTIONS AND ADJUSTMENTS TO CHICAGO'S BCA

B. FINDINGS

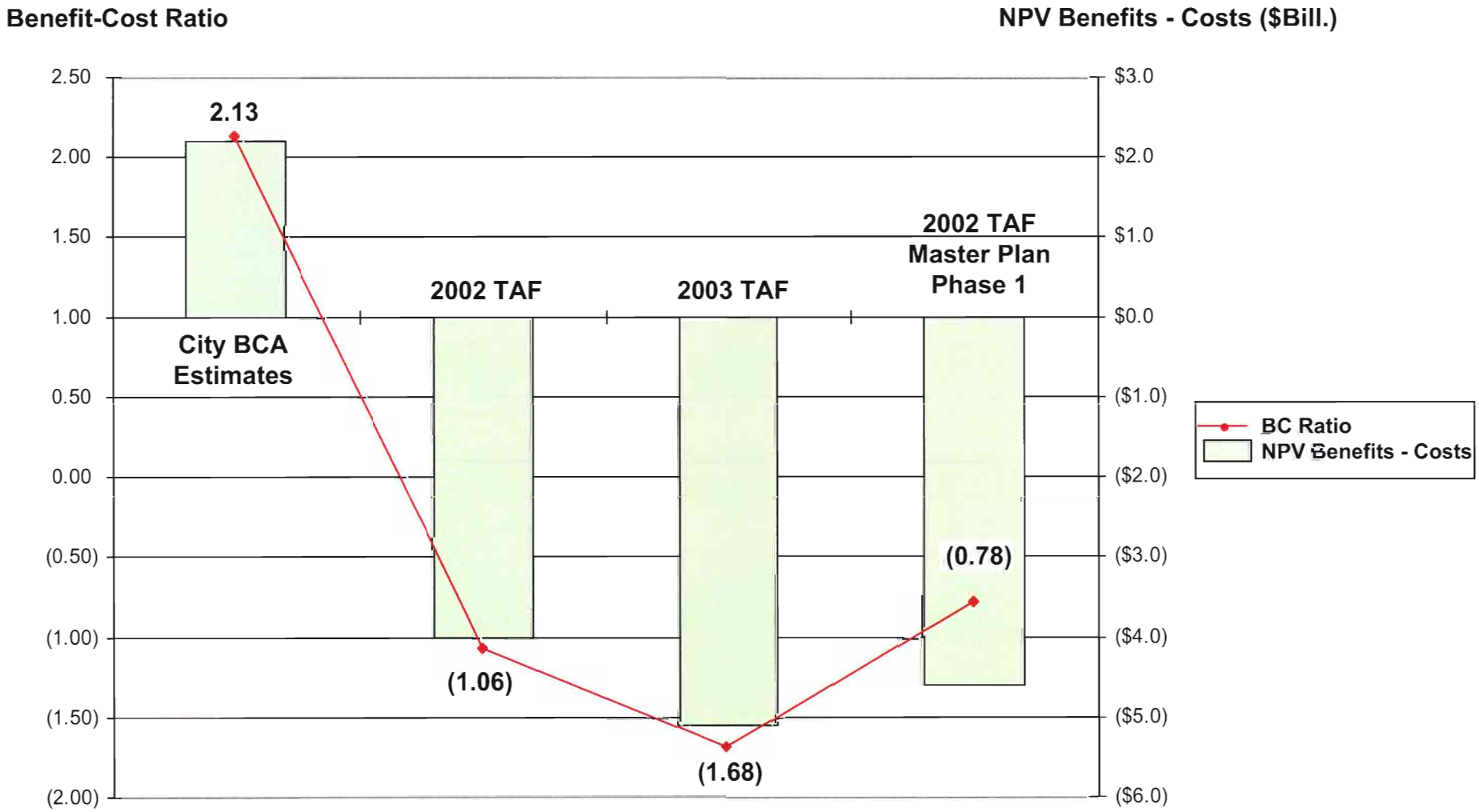
Campbell-Hill's Analytical Models and Framework

- Delay-Based Adjustment Model
  - Uses delay constraint and market adjustments (increased passenger loads and use of alternative airports)
  - No changes to benefit and cost inputs
- Campbell-Hill BCA Model
  - Delay-Based Adjustment forecasts including OMP cost-related passenger reduction
  - Benefit input adjustments (value of passenger time and downstream delay factor) plus airport revenue benefits
  - Cost input adjustments (contingency and capitalized interest costs)
- Primary Scenarios
  - OMP-Phase 1 Airfield
  - Total Master Plan
- Risk and Comprehensive Sensitivity Analysis

Campbell-Hill's Delay-Based Adjustment Model

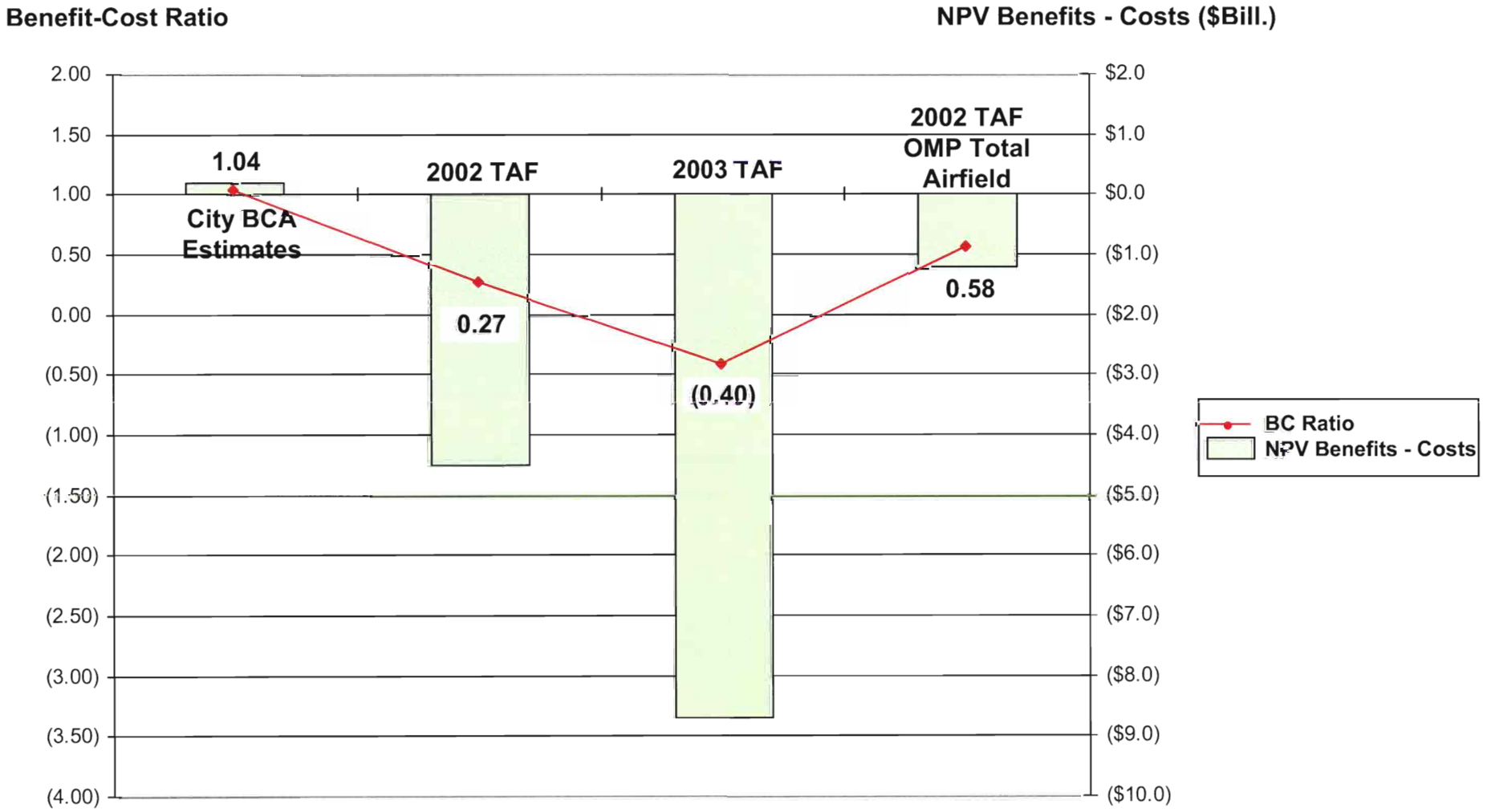
	No Action	Build Scenarios
Delay	Capped at 15.9 minutes	Exponential delay curves using TAAM model runs
Operations	974,000 per year for 2007-2032	TAF-Based growth until 15.9 minutes of delay
Passengers	Constrained by average load (99 passengers per operation) and diversion to other airports	Same As No Action
Unimpeded Travel Time	DEIS model estimates (interpolated)	Same As No Action
Costs	N/A	City's BCA Cost Estimates
Benefits	Calculated using the City's unit values: Passenger Travel Time = $32.10/hour, Downstream benefits = 80% of passenger benefits	Same As No Action

The Delay-Based Adjustment Model for *OMP-Phase 1 Airfield* Produces Negative Benefit-Cost Ratios



Source: Table 3-1

The Delay-Based Adjustment Model for the *Total Master Plan* Produces Benefit-Cost Ratios Between 0.27 and – 0.40

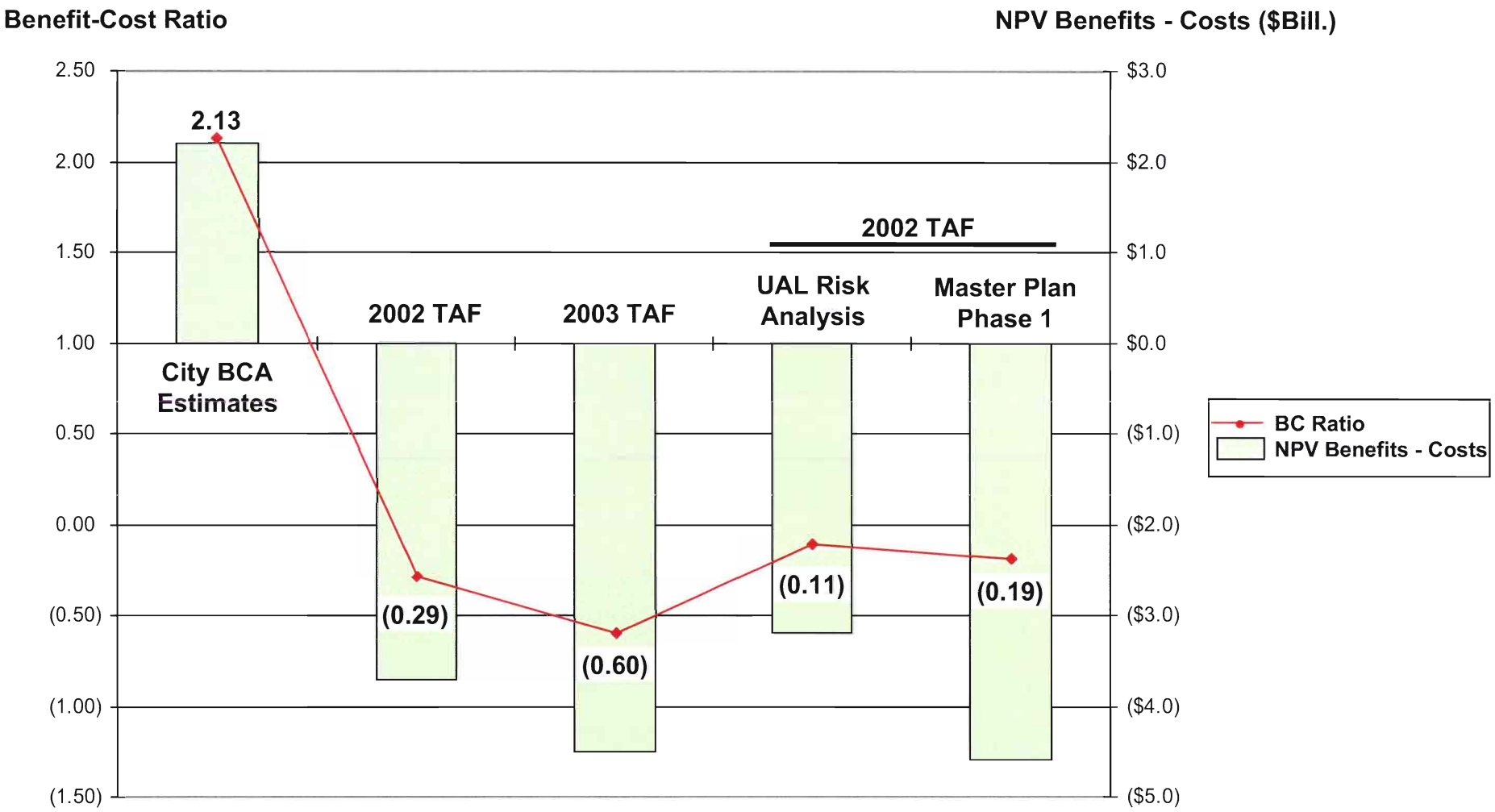


Source: Table 4-1

Campbell-Hill's BCA Model

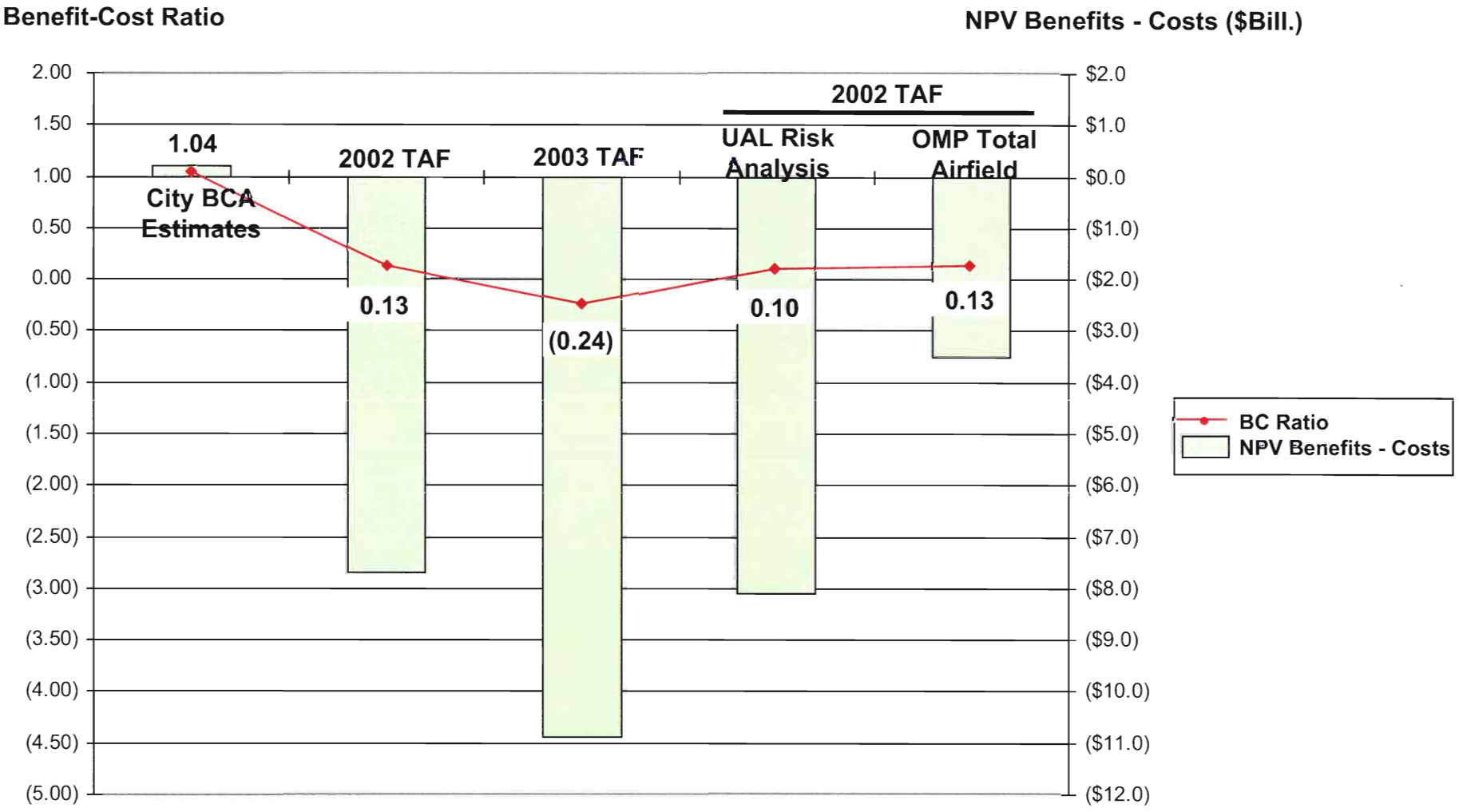
	No Action	Build Scenarios
Delay	Capped at 15.9 minutes	Exponential delay curves using TAAM Model Runs adjusted with capacity adjustment for Total Master Plan
Operations	974,000 per year for 2007-2032	Adjusted base forecast using the Cost-Related Passenger Reduction with TAF-based growth until 15.9 minutes of delay
Passengers	Constrained by average load (99 passengers per operation) and diversion to other airports	Same As No Action
Unimpeded Travel Time	DEIS model estimates (interpolated)	Same As No Action
Costs	N/A	City's BCA Cost's With contingency and capitalized interest adjustments
Benefits	Adjusted unit values: Passenger Travel Time = $28.60/hour, Downstream benefits = 15% of passenger benefits, Includes Airport Revenue Impacts	Same As No Action

The Campbell-Hill BCA Model for *OMP-Phase 1 Airfield* Produces Negative Benefit-Cost Ratios



Source: Table 3-8

The Campbell-Hill BCA Model for the *Total Master Plan* Produces Benefit-Cost Ratios Between 0.13 and – 0.24



Source: Table 4-8

Campbell-Hill Evaluated Over 96 Variations of the City's BCA Model and All Produced Benefit-Cost Ratios Significantly Less Than 1.0

- City-defined "build scenarios" (4): OMP-Phase 1 Airfield/ Master Plan Phase 1/ OMP Total Airfield/ Total Master Plan
- Relevant Constant Dollar Terms (2): 2001/ 2004
- Model Concepts (2): Delay-capped analysis; Full Campbell-Hill BCA Model
- Risk or Uncertainty Analysis (2): UAL survives; UAL does not survive
- Relevant TAF (3): 2002/ 2003/ 2004
- In addition, all four build scenarios were tested using only Campbell-Hill Benefit and Cost Input Adjustments (No structural modifications)

CONCLUSIONS

Conclusions

- The City's BCA is based on:
  - Faulty analytical and conceptual design
  - Overstated benefits
  - Understated costs
- The City's insufficient effort ignores all analytical requirements mandated by the FAA's Guidance and fundamental Benefit-Cost Analysis principles (Chart 35)
- The City's BCA must be rejected
- The FAA should not proceed toward a funding decision based on the BCA report
- FAA should not decide on the OMP until it has a clear picture of United's future
- The FAA should adopt a blended market-driven approach as it did in the LAX project (Chart 36)
- A blended solution at a fraction of the OMP costs will satisfy future regional needs better than the OMP
- ORD would maintain its role as a connecting hub without any portion of the OMP (Chart 37)

City BCA Fails to Comply with Every Analytical Requirement in the FAA Guidance

- BCA does not define or relate to program objectives
  - It erred in defining the base case as "do nothing"
- BCA fails to specify key assumptions, for example:
  - Future ground access and terminal facilitation times
  - Probability of United or American hub(s) failing
- BCA presents no alternatives for analysis
  - How does anyone know this is the best, or even an effective solution?
  - FAA Guidance requires alternative solutions to be analyzed
  - But "The City believes that the OMP is the best development option, therefore, alternatives are not analyzed as part of this BCA."
- BCA failed to determine proper evaluation period
  - Assumed 20 years; but OMP effectiveness is well short, e.g.
    - OMP-Phase 1 Airfield hits capacity in 2015 (2002 TAF)
    - OMP-Phase 1 Airfield hits capacity in 2009 (2003 TAF)

City BCA Fails to Comply with Every Analytical Requirement in the FAA Guidance

- BCA fails to identify and quantify all significant costs and benefits.
  - costs and benefits (discussed above)
  - increased airspace congestion costs
  - ground congestion and disruption costs during construction
  - third party environmental costs
- BCA fails to include relevant and significant uncertainty analysis
  - UAL/AMR hubs
  - must use "expected values" for benefits and cost streams
  - if United fails, ORD capacity is sufficient for more than 20 years
- BCA ignores other significant factors
  - local regional airports as part of the solution
  - mid-continent connecting hubs as part of the solution
  - Increase in aircraft size (50% of ORD is now RJ's)
- City BCA does not reflect a reasonable level of effort – given the complexity and massive costs of OMP.

The City's Faulty Analysis Conflicts with the FAA's Reasonable Approach in Its LAX Record of Decision

- Preferred LAX Alternative Embraces Blended Alternatives
  - " Alternative D more clearly reflects LAWA's efforts to encourage airlines to shift service to other airports in the Los Angeles region. Other airports in the Los Angeles region are relied upon to satisfy the portion of future demand that would not be accommodated at LAX" (LAX ROD at Page 15)
  - The preferred alternative anticipates traffic diversion to alternative airports
  - LAWA seeks an optimal role for LAX in regional airport system rather than forcing unlimited operations growth in a constrained airport and airways environment
- FAA Accepts Market-Driven Adjustments by Airlines and Passengers
  - "a certain amount of the demand projected for LAX would go elsewhere, consequently resulting in a lower activity level" (FAA, LAX ROD, page B2-78, May 20, 2005)
  - Alternative D was designed … "to create physical characteristics, such as a limited number of gates at the airport that are likely to produce market responses resulting in utilization of the airport at a level equivalent to the no-action alternative" (LAX ROD at Page 15)

ORD Will Be Able To Continue Its Role As A Hub Without Any Portion of the OMP

	Campbell-Hill Analysis: Thousands of Passengers - No Action		
	2013	2028	2032
Local			
ORD	45,350	62,598	67,683
Regional Airports	55	4,000	4,000
Connecting			
ORD	42,419	40,799	39,912
Mid-Continent Airports	0	15,704	20,905
Total			
ORD	87,769	103,396	107,595
Other Airports	55	19,704	24,905
ORD Share of Total Passengers	99.9%	84.0%	81.2%
Local Share of Total at ORD	51.7%	60.5%	62.9%

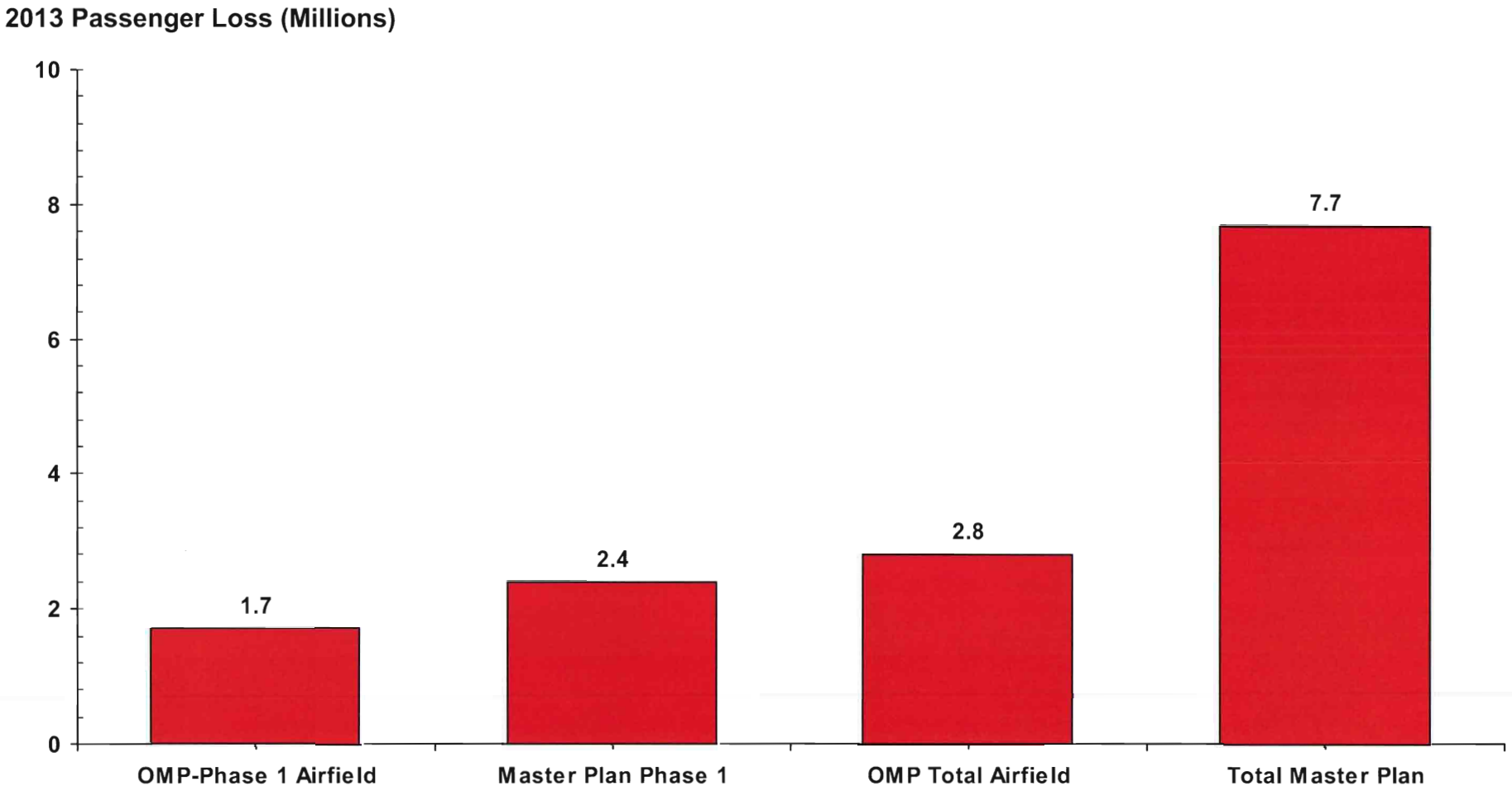
Local Share of Total at:	Year Ended June 2004
- JFK	66%
- LAX	64%
- IAD	67%
- SFO	66%
- PHL	67%
- EWR	73%

Source: Exhibit 302, Section A-1, Campbell-Hill Aviation Group, A Critical Assessment of the Draft Environmental Impact Statement for the O'Hare Modernization Program (OMP) Exhibit 400, April 6, 2005.

BACKUP SLIDES

Chart A

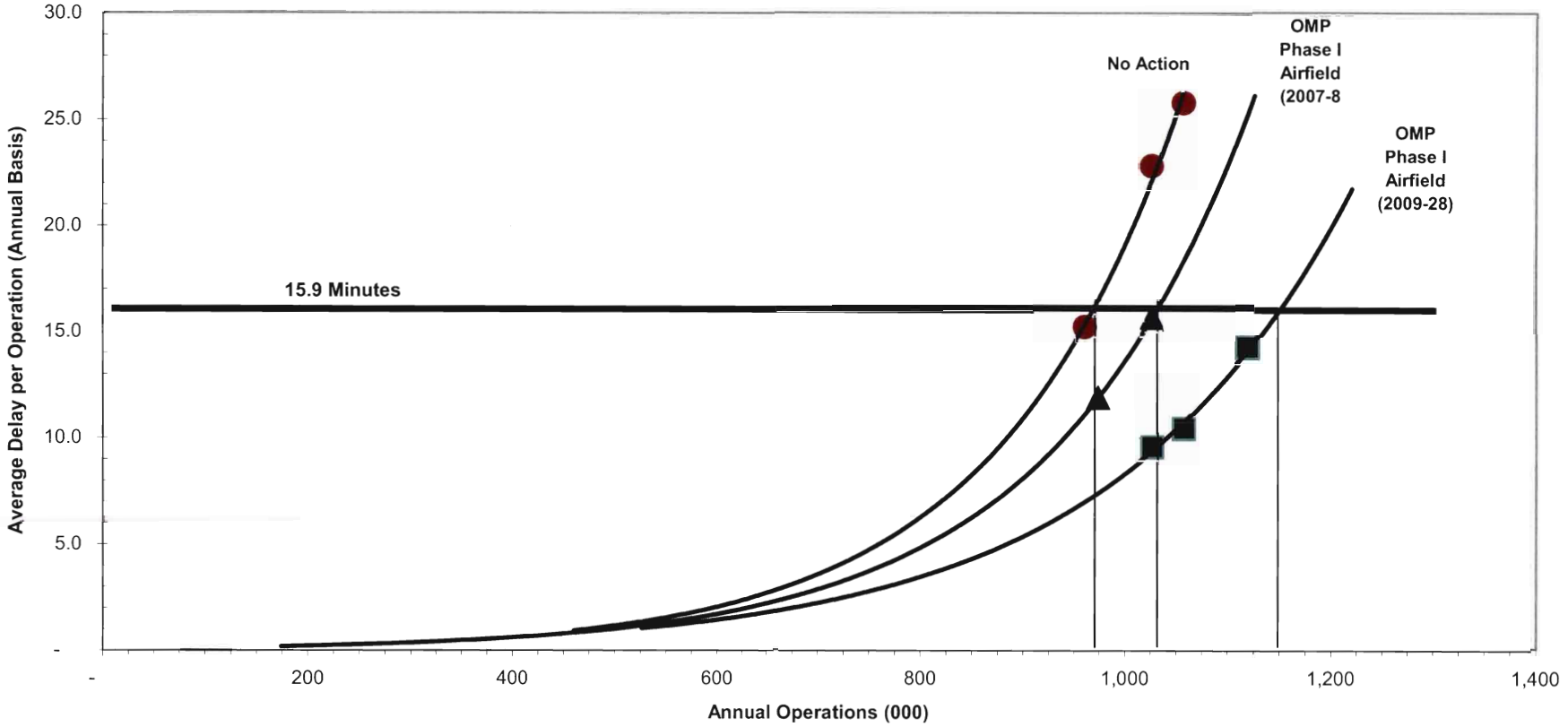
The Cost Of The OMP Will Decrease ORD Passengers By Up To 7.7 Million



Sources: Exhibits 300 and 301

Chart B

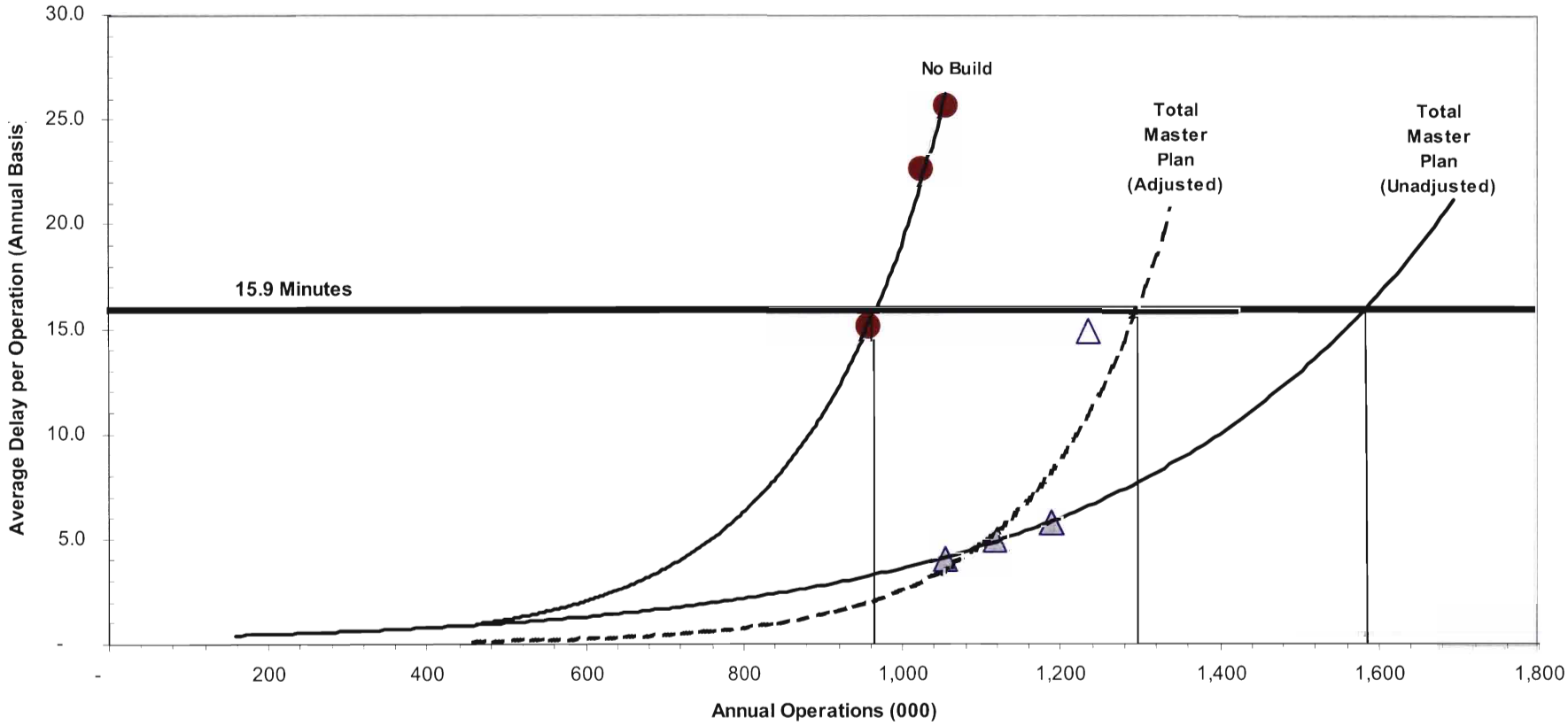
Delay Curves Derived From TAAM Model Results
OMP-Phase 1 Airfield



* Campbell-Hill adjused curve per DEIS comments

Chart C

Delay Curves Derived From TAAM Model Results
Total Master Plan



Campbell-Hill Cost Adjustment Methodology

1. Contingency Adjustment
   - Campbell-Hill increased the costs before the City's contingency to equal 27.6%
2. Capitalized Interest Adjustment
   - Campbell-Hill included two kinds of Capitalized Interest
     - GARB and Third Party Financing Capitalized Interest
       - Used % GARB and Third Party Financing from the FAA's DEIS and the City's BCA
       - Assumed 3 Bond Issues (2001, 2005, 2008)
       - Used a 5% yield for tax-free bonds
       - Interest expense accrued to Airport during the construction period
     - PFC Shortfall Capitalized Interest
       - Results from City's inability to pay for its planned PFC-backed debt and Pay As You Go PFC financing
       - This PFC shortfall would require the City to borrow additional funds during construction
       - Used % PFC financing from the FAA's DEIS and the City's BCA
       - Assumed a $4.50 PFC per eligible enplanement
       - Assumed a 5% yield for tax-free bonds
       - Varies with passenger forecasts (different by scenario)

American And United Have Made Statements About Capacity At O'Hare And The Ability Of Airlines To Shift Connecting Passengers To Other Hubs

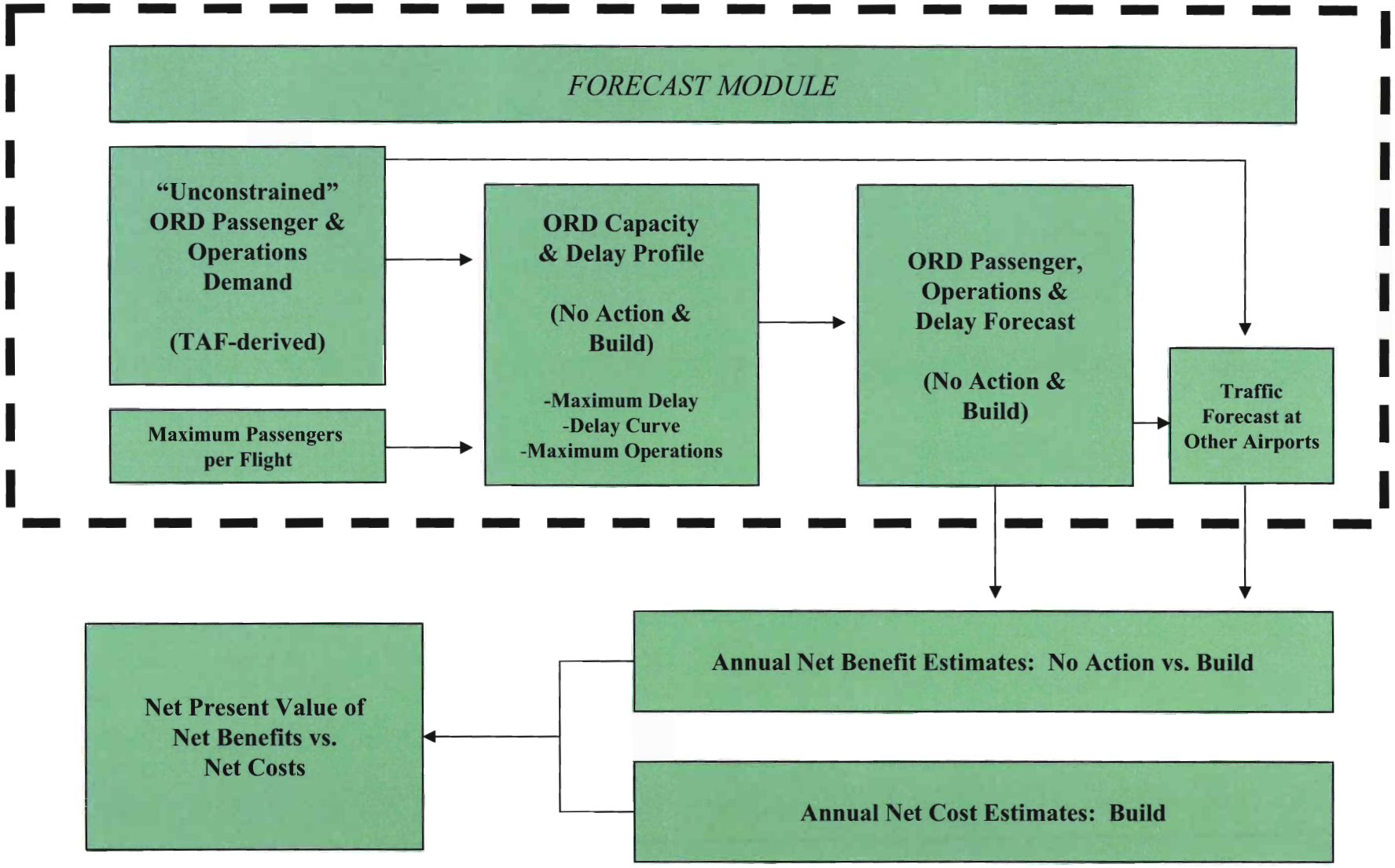
- **A Letter from American and United to Laurie Stone of the Greater O'Hare Association of Industry & Commerce states…**

  "Capacity at a hub airport is defined in terms of available seats, not flights. The myth that Chicago airports are nearing capacity has been proffered by uninformed groups and individuals who lack a basic understanding of the aviation industry's economics and operational methods."

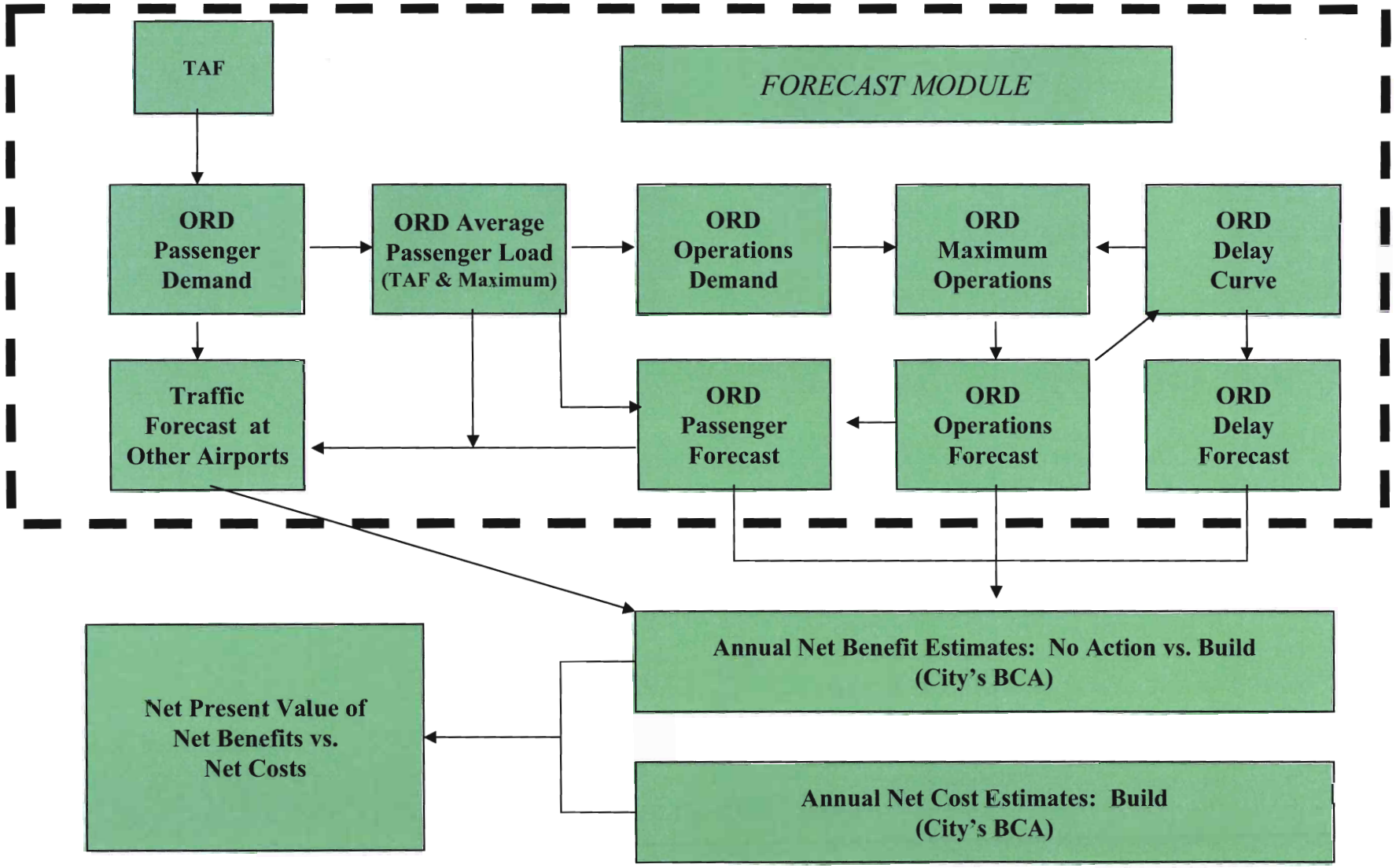
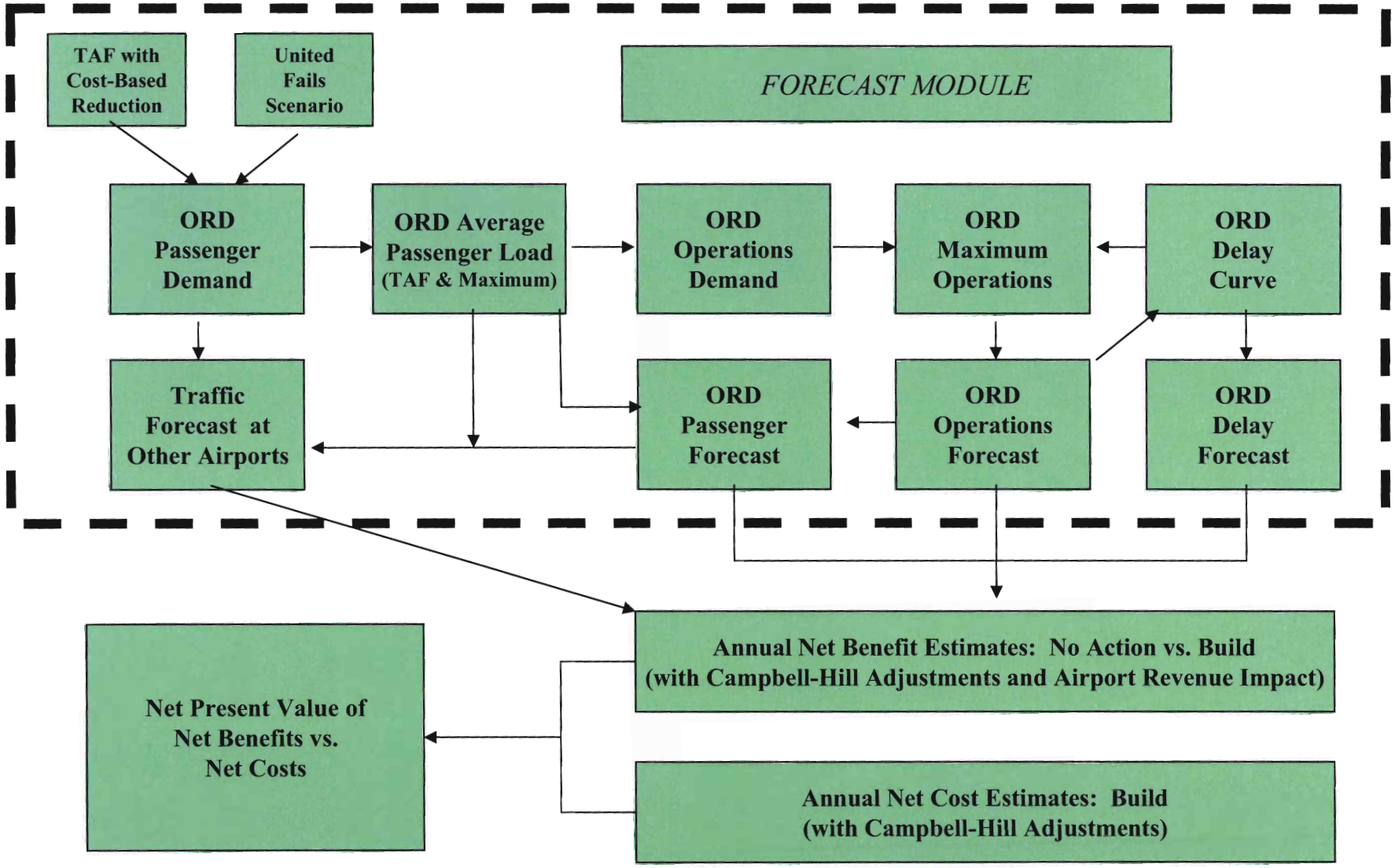
  "The airlines have the ability to route connecting passengers through other hubs thus accommodating local passengers or increase in local demand. Local passengers have the priority."

Note: For a copy of the letter quoted above see Campbell-Hill Aviation Group, A Critical Assessment of the Draft Environmental Impact Statement for the O'Hare Modernization Program (OMP) Exhibit 404, April 6, 2005.

Campbell-Hill Model Structure



Campbell-Hill Delay-Based Adjustment Model



Campbell-Hill BCA Model