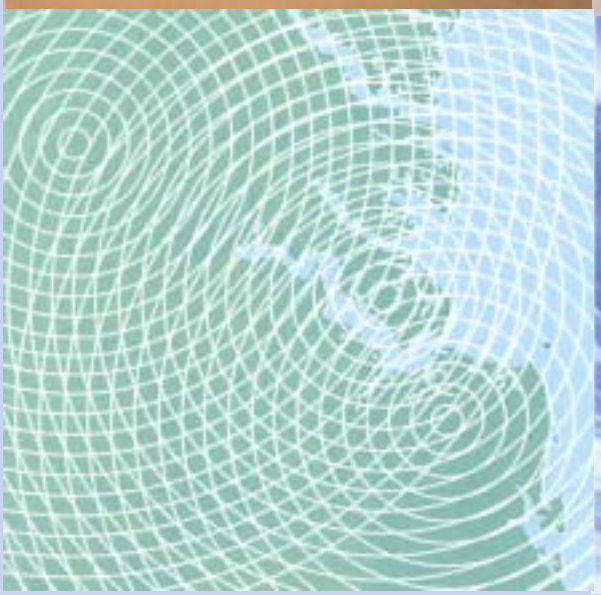
EASTERN VIRGINIA AIRPORT SYSTEM STUDY

EASTERN VIRGINIA AIRPORT SYSTEM STUDY-PHASE II



FINAL REPORT

PREPARED FOR VIRGINIA DEPARTMENT OF AVIATION

HNTB

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

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Chapter Ten
DESCRIPTION OF ALTERNATIVE AIRPORT SYSTEMS

10.1 STUDY BACKGROUND

The Eastern Virginia Airport System Study (EVASS) was an analysis designed to help the Commonwealth identify a system of airports to best meet eastern Virginia's air transportation needs in the year 2030 and beyond. EVASS findings provide guidance for enhancing the efficiency and competitiveness of air transportation in the region and will contribute to the economic vitality of not only eastern Virginia but the entire Commonwealth.

10.1.1 Phase I

Phase I of the study program determined the total commercial air traffic that would be generated in the eastern Virginia region by the year 2030 and examined a series of airport demand management alternatives for distributing future demand between the region's existing airports and a potential new regional airport. The alternatives were evaluated for efficiency, cost effectiveness, and levels of service. The concepts evaluated included various combinations of the three existing airports (Richmond International Airport (RIC), Norfolk International Airport (ORF), and Newport News-Williamsburg International Airport (PHF)) and a potential new commercial passenger airport. Following are the conclusions of Phase I:

- The anticipated air transportation demand can be met by the region's existing air carrier airports during the forecast period through continued development in response to market demand, **but at less than optimal levels of service and secondary economic benefits**.

- Consolidation of air service at a new, generally central regional airport should result in service to more domestic and international non-stop markets and reduced air travel time. Ground travel times and capital costs associated with this demand management alternative would be higher than those to maintain the existing three-airport system, but potential economic development opportunities would be enhanced.

- An option consolidating service at two airports—RIC and a new or existing regional airport in the eastern part of the region (PHF)—**would provide improvement in air service over the existing system without the increases in ground travel time associated with a single-airport system**. However, this option would not yield the full air service benefits associated with the single new regional airport demand management scenario, as presented above.

10.1.2 Phase II

Phase II determined the optimal system of airports with respect to economic, financial, and environmental feasibility, with the continued interim development of the existing airports based on market demand.

Key items to note include the following:

- The demand management options analyzed in Phase I did not consider locations for potential new regional airports. This factor is assessed in Phase II.

- The location and characteristics of the search area for a potential new regional airport were not examined. This locational factor is introduced in Phase II.

- The initial portion of Phase II was designed to further analyze and confirm the options that were determined in Phase I to be feasible and to identify the preferred airport system. This will identify either the one-airport, two-airport, or three-airport system as the system that best serves the long-term air transportation needs of the region, without specifying airport locations.

- The Phase II study then examined in more detail the preferred system options, including alternative general locations for a regional airport, which could include expansion of the Newport News airport.

- Following identification of the system that provides the best overall air service and associated benefits to the eastern Virginia region, the role of each airport and the facility requirements to fill that role were identified.

The Phase II study integrated selection of the preferred general locations for a new regional airport in possible future airport systems with the process of selecting the preferred system. This achieves three basic purposes of the study program:

1. It ensures that the selection of the preferred system considers all potential costs and benefits and that the selection of the best role and general location for a new regional airport is consistent with the optimum system of airports to serve the region.

2. It provides decision-makers with a free-standing description of the potential new regional airport, as well as documentation of its feasibility and the institutional arrangements necessary for its implementation.

3. It assesses the economic impact of altering the role of one, two, or all three existing airports as part of the cost/benefit assessment of the selected airport system.

The Phase II study examines a general region for possible sites to locate a new regional airport. This allowed analysis of environmental, transportation, and other feasibility factors to a level of detail adequate to select the optimal system.

The critical factors of cost, financial feasibility, and funding instruments were also addressed. The analysis examined innovative funding mechanisms and special opportunities for private investment resulting from ancillary economic developments.

The potential for a new regional airport was examined in the context of a multimodal system. The relationships between ground transportation modes, including rail, high-speed rail, highway, and the airport were considered. In addition, the proposed development of Craney Island as a multimodal facility was considered. The potential importance of ready access to port facilities is a factor in the ability of a new regional airport to attract economic development.

The feasibility of a new regional airport includes consideration of how far the airport can capture the incremental value in adjacent land that results from construction of the airport and the availability of improved air service. The concept of cross-subsidization of the airport from induced

industrial and commercial development is examined.

A future study is required to select the actual site, including detailed facility layout and planning. Once the appropriate management entity sponsor has been identified and approved by the FAA, the new sponsor may request that a site selection study (inclusive of EIS and Master Plan) be accomplished, detailing the recommendations developed in the Phase II study.

10.2 DESCRIPTION OF ALTERNATIVE SYSTEMS

10.2.1 Introduction

The Phase I study indicated that the most feasible alternatives examined in terms of the multiple objectives of the Commonwealth are a one-airport system, a two-airport system consisting of Richmond International and one airport in the eastern portion of the region, and a three-airport system. With other alternatives eliminated, these three alternatives are evaluated in this chapter.

The key factor in determining the potential and success of any given airport is its ability to handle current and future demand levels. In the Phase I study, an FAA-sponsored Capacity Task Force evaluated the region's current and future levels of demand. The following section highlights some of their findings. For detailed information, consult Chapter 5, *Regional System Plan Study for Eastern Virginia-Final Report*, published in May 1995.

10.2.2 Demand Levels

The FAA Capacity Task Force evaluated alternative capacity improvement actions under the following levels of activity:

- Baseline, 160,000 annual aircraft operations
- Future 1, 290,000 annual aircraft operations
- Future 2, 430,000 annual aircraft operations

The baseline demand level generally corresponds to the total current levels of aviation activity at the region's three air carrier airports. The Future 1 demand level represents an origin/destination (non-hubbing) demand scenario. The Future 2 level represents connecting hub airport operations in terms of total activity levels, types of aircraft or "fleet mix," and the hourly profile of activity.

10.2.3 Alternative Airport Systems

The systems alternatives examined in Phase II studies are described in terms of the following:

- Activity levels.
- Facility requirements.
- The range of locational options for the new site.

One-Airport System

Option A - Consolidated service at a New Central Site between Richmond International Airport and Hampton Roads.

In meetings prior to this study, VDOA and FAA made the decision that consolidated service at one of the existing airports was not feasible, therefore, it was not analyzed.

This demand management alternative assumes that air service is concentrated at a new centrally located airport capable of accommodating Future 2 activity.

Reasons for examining this demand management alternative include the following:

- A new site would allow "ground-up" construction of a state-of-the-art facility without the need to integrate existing facilities.

- A new site would be more centrally located with respect to the eastern Virginia region than any of the existing commercial airports.

- Activity concentrated at a single site would generate more non-stop service and would be more likely to attract an airline hub.

Facility Requirements

A new airport site would cover an area approximately 5 miles wide by 5 miles long, identified as search area 1. **Table 10.1** summarizes the facility requirements to serve demand at the Future 2 level. A new airport would ideally have at least three runways; two would be parallel and oriented to the prevailing winds and the other would cover crosswind conditions.

Table 10.1

Facility Requirements for New Airport

New Airport	Units	Total Req.
Terminal Building	sq. ft.	767,700
Terminal Auto Parking	spaces	4,862
Air Carrier Gates	gates	59
Regional Carrier Positions	positions	30
Apron Area	sq. yd.	414,000
Air Cargo Building	sq. ft.	155,550
Air Cargo Apron	sq. yd.	43,208
GA Terminal	sq. ft.	1,856
GA Auto Parking	spaces	29
GA Apron	sq. yd.	29,870
GA Conventional Hangars	sq. yd.	17,076
GA T-Hangars	hangars	45

Source: *Regional System Plan Study for Eastern Virginia Phase I - Final Report*, May 1995.

The separations between runway pairs should accommodate independent Instrument Flight Rules (IFR) operations. However, demand would dictate the phasing of airport construction.

A new airport should have at least one runway at this length, with the ability to expand it to 12,500 feet. This would accommodate departures by heavy aircraft, such as the B747-400, under extreme take-off conditions.

Previous analysis identified the high desirability of attracting a hub operation, which would demand a facility that has a high flow-through capacity, with dual taxiways, ample pushback areas, and independent operations for arrivals and departures. The terminal should minimize the walking distance for connecting passengers.

Ground Access

Ground access by road and rail must be convenient and connected to a major highway system to keep travel times to a minimum. For this study, 1 hour is considered a reasonable travel time. Ground access is a key factor in locating a new airport facility.

Two-Airport System

Option B - Consolidated service at Richmond International Airport and Newport News/Williamsburg International.

This demand management alternative assumes that regional commercial air service

is concentrated at RIC and PHF, and that these facilities would be expanded sufficiently to accommodate the expected increases in demand. It is assumed that both airports would be expanded to accommodate regional Future 2 levels of activity if the distribution and hubbing analyses indicated that this capacity is required.

Reasons for examining this demand management alternative include the following:

- The facilities are largely developed.
- Much of the required land acquisition and construction has been accomplished.
- The sites together have the potential to accommodate Future 2 levels of activity.
- This alternative provides access from an interstate highway within 5 miles of the Richmond and Hampton Roads areas.

Facility Requirements – Richmond International Airport (RIC)

Table 10.2 summarizes the estimated facility requirements for RIC under the Future 1 and Future 2 Cases. Total requirements show the facility size required to accommodate the forecast levels of activity. Net requirements show the magnitude of new construction required to meet the forecast needs. In many cases, the new construction is equal to the total demand, less the existing facility. However, in some instances, a change in airport configuration necessitates the relocation or demolition of an existing facility. In those cases, the net requirement exceeds the difference between the total requirement and existing facility.

Table 10.2

REGIONAL SYSTEM PLAN STUDY FOR EASTERN VIRGINIA

Facility Requirements for Richmond International Airport Under Two-Airport System

			Future 1		Future 2	
Richmond	**Units**	**Existing Facilities**	**Total Req.**	**Net Req.**	**Total Req.**	**Net Req.**
Terminal Building	sq. ft.	210,880	356,100	145,220	767,700	556,820
Terminal Auto Parking	spaces	5,109	2,374	0	4,862	0
Air Carrier Gates	gates	14	37	23	59	45
Regional Carrier Positions	positions	8	16	8	30	22
Apron Area	sq. yd.	101,000	254,000	153,000	414,000	313,000
Air Cargo Building	sq. ft.	91,400	155,550	64,150	155,550	64,150
Air Cargo Apron	sq. yd.	96,100	43,208	0	43,208	0
GA Terminal	sq. ft.	50,000	2,401	0	1,856	0
GA Auto Parking	spaces	250	42	0	29	0
GA Apron	sq. yd.	50,000	44,060	0	29,870	0
GA Conventional Hangars	sq. yd.	8,333	17,262	8,929	17,076	8,743
GA T-Hangars	hangars	0	82	82	45	45

Source: *Regional System Plan Study for eastern Virginia Phase I - Final Report*, May 1995, and June 1997 Airport Tour.

The Future 1 level of activity could be accommodated at Richmond without a major reconfiguration of the airport. At this demand level, the terminal building and ancillary facilities could remain in their existing locations and additional facility requirements could be met by expanding the existing structure.

Under the Future 1 demand level, the major expansion requirements include additional terminal building space, additional gates and apron area, and additional General Aviation (GA) hangar facilities. The Future 2 level of activity requires a 767,000-square-foot terminal building with 59 air carrier gates and 414,000 square yards of associated ramp area. Requirements for T-hangars are reduced from Future 1 levels because of the lower number of single-engine piston aircraft.

RIC has the longest runways in the system at 9,004 feet.

To accommodate a Future 2 level of activity while maintaining reasonable delay levels, a parallel runway should be considered.

Ground Access – Richmond International Airport (RIC)

Airport Drive is the primary access to the north side of the airport, and has direct access to I-295 (an interstate bypass road) and Williamsburg Road (U.S. 60) on the northern edge of the airport, as shown in **Figure 10-1**. An interchange is provided from I-64 on Airport Drive that remains the main access routing to the terminal building and airport parking. To the west, Eubank Road connects a high volume roadway, Laburnum Avenue, to the airport.

A future road improvement that will significantly impact the Airport will be the construction of I-895. It will connect Chippenham Parkway to I-295 just east of the airport, and will provide high volume passenger movements just south of the airport from Chesterfield County and south Richmond. A study was conducted to examine ways to provide direct access to I-64 and I-895.

Rail transportation exists immediately south of the airport (CSX Railroad) and to the north (Norfolk Southern Railway), near or adjacent to I-64. These rail systems extend into the city and intersect at or near Williamsburg Road. They stretch eastward toward Hampton and West Point. The potential exists to use these rail networks as high-speed passenger rail corridors. These two rail systems could be upgraded to provide a passenger rail link to the airport passenger terminal, providing a higher level of service to the user.

Facility Requirements – Newport News International Airport (PHF)

Table 10.3 summarizes the facility requirements for Newport News/Williamsburg International Airport. Several potential improvements are possible within the confines of the existing airport boundaries and adjacent city-owned land.

The FAA Capacity Task Force identified improvements that could accommodate Future 1 and Future 2 levels of activity. The most significant airfield improvements would be the addition of a new parallel runway, 7L-25R, and the extension of existing Runway 2-20. This would require the demolition of the old terminal building and air traffic control tower, including extensive environmental work. There is sufficient land available to expand the existing terminal building to accommodate Future 2 activity levels without requiring a relocation of the facility.

Airport layout Plan, Richmond International Airport

FIGURE 10-1

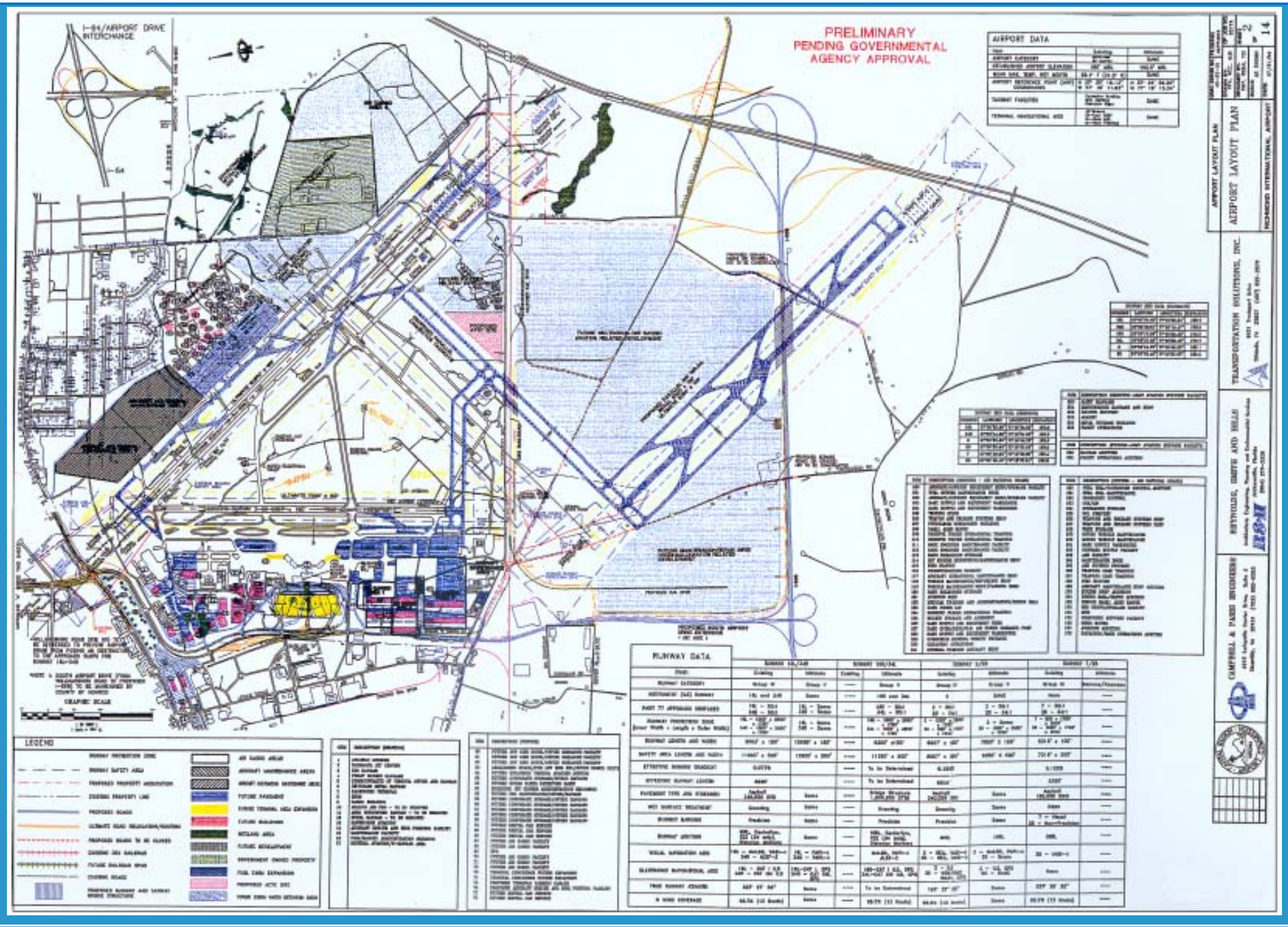


Table 10.3

REGIONAL SYSTEM PLAN STUDY FOR EASTERN VIRGINIA

Facility Requirements for Newport News/Williamsburg International Airport Under Two-Airport System

Newport News/ Williamsburg	Units	Existing Facilities	Future 1		Future 2	
			Total Req.	Net Req.	Total Req.	Net Req.
Terminal Building	sq. ft.	114,860	107,780	0	767,700	652,840
Terminal Auto Parking	spaces	676	634	0	4,862	4,186
Air Carrier Gates	gates	1	3	2	59	58
Regional Carrier Positions	positions	5	27	22	30	25
Apron Area	sq. yd.	59,000	72,000	13,000	414,000	355,000
Air Cargo Building	sq. ft.	0	293	293	155,550	155,550
Air Cargo Apron	sq. yd.	0	81	81	43,208	43,208
GA Terminal	sq. ft.	13,092	4,412	0	1,856	0
GA Auto Parking	spaces	1,108	98	0	29	0
GA Apron	sq. yd.	86,000	56,180	0	29,870	0
GA Conventional Hangars	sq. yd.	10,138	15,675	5,537	17,076	6,938
GA T-Hangars	hangars	43	65	22	45	2

Source: *Regional System Plan Study for Eastern Virginia - Final Report Phase I*, May 1995, and June 1997 Airport Tour.

PHF could accommodate Future 1 levels of activity with moderate improvements or expansion of the terminal apron, regional carrier positions, air cargo facilities, and GA hangars. If PHF were required to accommodate Future 2 levels of activity, significant expansion would be necessary for the terminal building, gates, parking, air carrier apron, and cargo facilities.

Ground Access – Newport News International Airport (PHF)

Primary access into PHF is provided by the Jefferson Avenue interchange off I-64, as shown in **Figure 10-2**. This interchange provides access to both air carrier and GA users approaching from the east or west. From I-64, traffic moves toward the terminal buildings via Jefferson Avenue and Bland Boulevard. Bland Boulevard splits to provide one-way access to the passenger terminal at Terminal Road and two-way access just beyond to the GA facility.

From the north, Denbigh Boulevard provides access to U.S. Route 17, the major north-south artery in this area. From Denbigh Boulevard, terminal traffic uses McManus Boulevard and GA traffic uses C Street or McManus Boulevard.

Movements around the airport to the north are provided by Oriana Road, which links to U.S. Route 17.

Existing rail is located to the west of the airport, approximately 6,000 feet from the terminal building. The Chesapeake & Ohio Railroad (now CSX) track runs just adjacent to I-64 on the west side of the Interstate. This rail system could be upgraded to provide a passenger rail link to the airport passenger terminal.

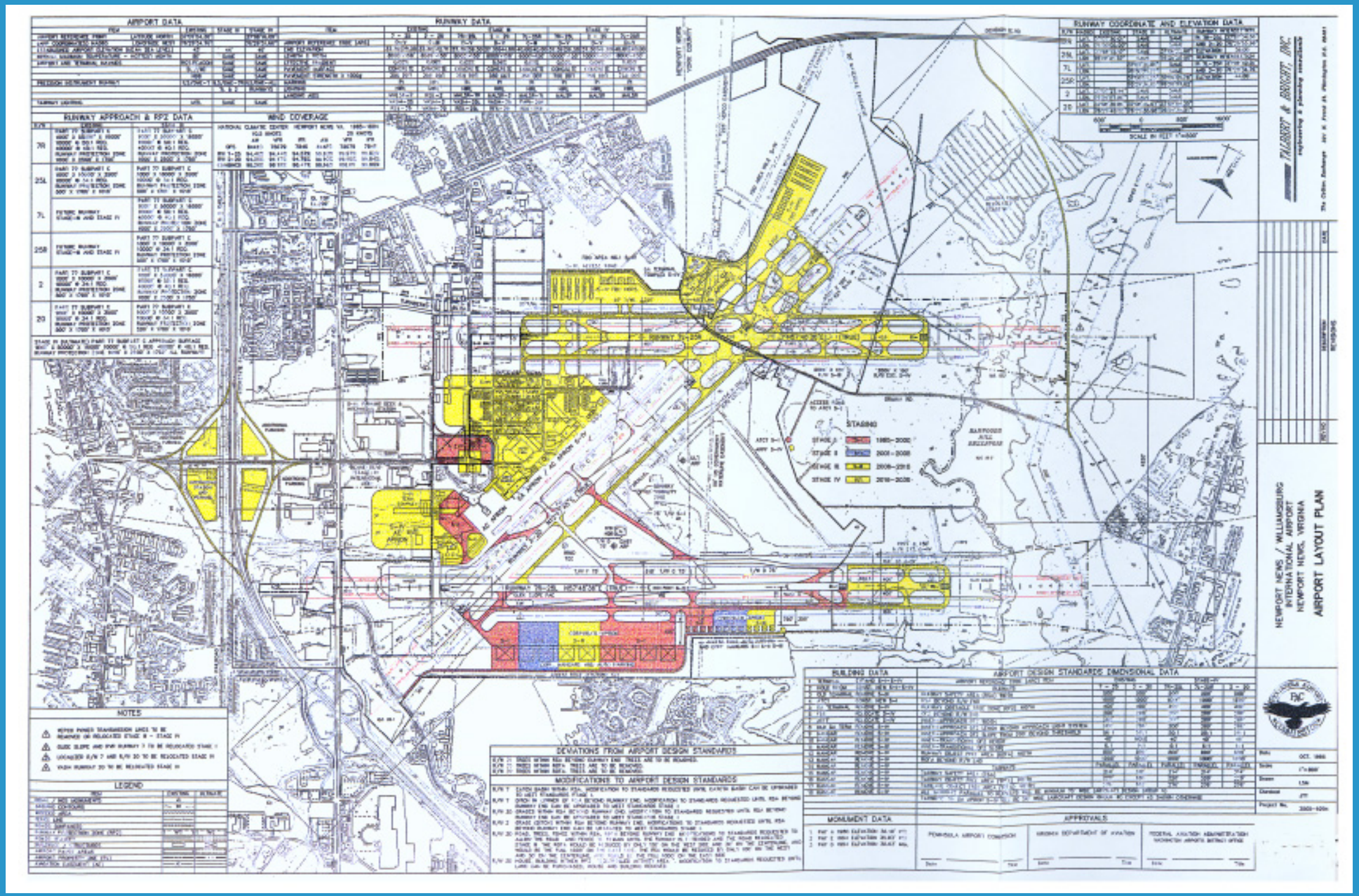
Option C - Consolidated Service at Richmond and a New Airport Site.

This demand management alternative is similar to proposed demand management Option 2, with the exception that the

Airport layout Plan, Newport News / Williamsburg International Airport

FIGURE 10-2

EASTERN VIRGINIA AIRPORT SYSTEM STUDY



Hampton Roads area would be served by a new airport. It is assumed that RIC and the new site would be built to together accommodate Future 2 levels of activity if the distribution and hubbing analyses indicate that this capacity is required.

Reasons for examining this demand management alternative include the following:

- It would reduce the required size of a new facility.

- A new site would allow "ground-up" construction of a state-of-the-art facility without the need to integrate existing facilities.

- A new site would need to be located near a major roadway to provide quality access.

- The alternative provides more convenient access to the Richmond and Hampton Roads metropolitan areas than could be provided by any single site.

Three-Airport System

Option D - Development of Richmond International Airport, Norfolk International, and Newport News/Williamsburg International to meet future demand levels.

This option assumes that a new airport will not be developed in the region and that the existing airports are developed to capacity. Long-range planning should look into the need for a new airport to supplement the system once the three airports reach their capacity. For reference purposes, Norfolk's airport layout is depicted in **Figure 10-3**.

Reasons for examining this demand management alternative include the following:

- Most of the facilities required to meet future demand levels are in place.

- Ground access to PHF must be improved to accommodate demand.

The proposed alternatives need to be compared to a Base Case.

10.3 REVIEW OF LONG-RANGE TECHNOLOGICAL CONDITIONS

10.3.1 New Technology

The following is a brief review of new technologies that could affect long-term travel demand and the feasibility of major new airport investment.

10.3.2 Aircraft Technology

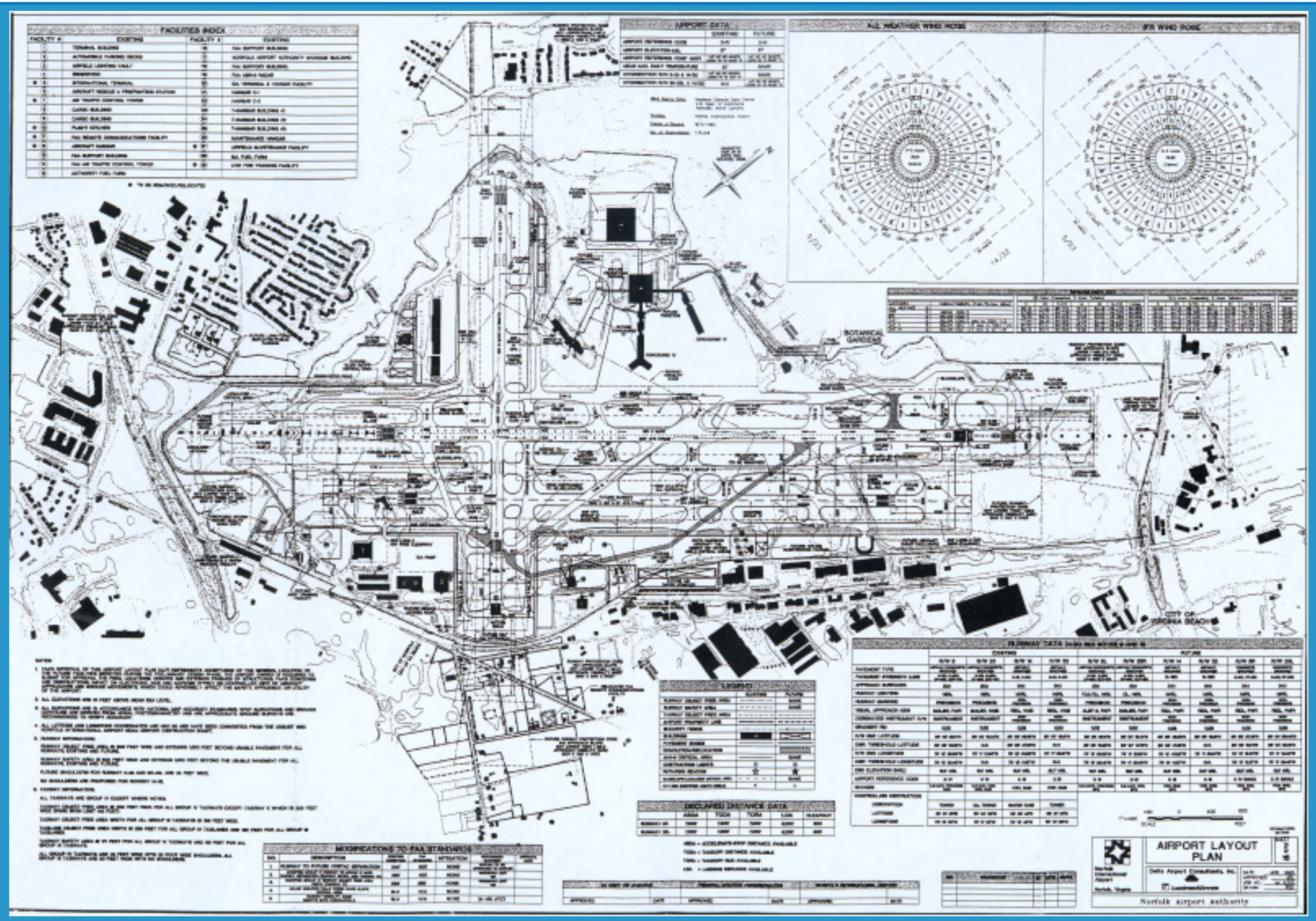
The configuration of airline fleets is unlikely to change radically in the next 30 years. The core aircraft–B-737, B-757, B767, A-320, A-340, MD-80 series, and MD11–are finely tuned to the requirements for length and density of today's air transportation system. Successor aircraft to these aircraft types will likely enter the fleet, but the core of the fleet will consist of aircraft essentially similar in size and technology to today's aircraft.

However, some specialized aircraft will likely occupy more important roles in the system. These specialized aircraft, with a general assessment of the significance of the new vehicles for the present study, include the following:

- Supersonic aircraft, which serve international, over-water flights in excess of 3,000 miles at 1,600 mph, or high-speed civil transport (HSCT). This aircraft comprises a relatively small component of total air travel and will not significantly affect the study. As documented in the

Airport layout Plan, Norfolk International Airport

FIGURE 10-3



EVASS Phase I Final Report, NASA does not foresee any civil applications in the current planning timeframe for the hypersonic transport, therefore, further planning considerations are not recommended at this time.

- New very large subsonic airliners (NLA), with 600+ seats and dimensions of approximately 260 feet by 260 feet. The NLA comprises a relatively small component of total air travel, but requires greater runway/taxiway dimensions and places extra demands on terminal facilities.

- Short take-off and landing vehicles (e.g., tilt-rotor). These are small vehicles, well-suited to intra-urban and short routes (less than 300 miles). Aircraft such as the Boeing Osprey would serve a small component of the total travel market, with no significant impact on the feasibility of a new/expanded airport.

- Regional jet (RJ) aircraft (50+ seats) are replacing smaller, propeller-driven aircraft in the commuter airline systems. RJs have larger seat capacities and higher speeds, with the potential to service direct non-stop routes as demand builds, whereas the propeller aircraft cannot. This is recognized in the feasibility analysis.

10.3.3 Airlines and Airports

Major changes in this area are not anticipated. Improving technology will move passengers through the airport more quickly, with less difficulty, and will improve travel security.

- Ticketless travel is quickly becoming standard practice. Together with associated baggage handling automation, it will become universal and refined to the point where lines at ticket counters do not occur. The curbside and interior configuration of terminal buildings will change to accommodate these developments, but travel demand and feasibility considerations will be minimally affected.

- Internet sale of tickets at heavy discounts, which will increase travel demand. This factor is considered in the feasibility study.

- Automated baggage handling will become the norm at major airports. Currently, the capacity of today's baggage systems constitutes one significant constraint on the maximum practical size of a single bank of incoming-outgoing aircraft at airline hubs. Further automation of baggage systems could potentially permit larger hubs and reduce the demand for secondary hubs on the part of the major airlines. This is considered in the forecasting component of the feasibility study.

- Airline security equipment. Installation of more sensitive, high-capacity baggage monitoring equipment will occur. This will reduce the concerns related to possible positive passenger/bag matching, which slows airline operations.

- Low-cost airlines will expand to provide transcontinental and intercontinental service. Airlines like Southwest would create additional travel demand and improve the potential for new or expanded airports to attract these carriers. This factor is considered in the feasibility study.

- Airport Surveillance Systems are under development to better monitor and manage the flow of aircraft on the ground to minimize runway incursions. This will improve the capacity of airfields under adverse weather conditions, and will improve safety. This factor is considered in calculations of airfield capacity and facility requirements.

Air Traffic Control Systems

The electronics industry is developing a wide range of new technologies aimed at, among other objectives, "free flight" and substantial increases in the capacity of the air transportation system.

- Global Positioning Satellite (GPS) navigation systems are rapidly becoming standard. International agreements that would establish GPS as the world standard for aircraft navigation and flight management systems can be anticipated over the next few years. Systems like GPS will help increase the capacity of the air transportation system. The capacity of airports could be improved by positioning aircraft and reducing separations. This is considered in the feasibility analysis.

10.3.4 Rail Travel

In recent years, the national trend has been for the elimination of passenger service. Washington-New York-Boston service has been maintained and provides a realistic alternative to air travel within this uniquely dense corridor. Its attractiveness lies partly in the downtown-to-downtown service offered; the time that is saved in the elimination of downtown-to-airport and airport-to-downtown travel compensates for the longer duration of the actual journey by rail compared to air. For longer journeys or journeys where the downtown-airport connection is of minor significance, the air mode is likely to retain its attractiveness over rail, given current and planned rail speeds of up to 155 mph.

- High-speed rail systems are in the planning stages at a number of locations in the U.S. One example is the Miami-Orlando-Tampa line (FOX), which is planned as a 200-mph system that would be directly competitive with air. High-speed rail may compete against short commuter flights due to downtown-to-downtown service and lower travel costs. The economics of the system have yet to be proven.

A high-speed rail system is at a competitive disadvantage to air travel in terms of the cost of the system, the environmental feasibility, flexibility, and speed. High-speed rail is not regarded as a viable substitute or as competitive to air travel in eastern Virginia due to market size and the significant capital costs involved.

10.3.5 Road Travel

New developments in highway technology are not anticipated to result in a system that is competitive with air, other than for distances of up to 150 miles.

- Trans-America Highway was conceived as a complete cross-continental facility, but has transformed into a Virginia-West Virginia corridor, with eastern terminals in eastern Virginia. The location of the terminals proximate to a major new or expanded airport could generate air travel demand.

Intelligent highway systems are under construction. Refinement and improvement can be anticipated to further increase speed, improve safety, and eliminate friction of travel. The "smart highways" have the potential to expand the service area for a proposed new or expanded airport in eastern Virginia, and to facilitate access to competing airports outside of the region, such as Dulles and Charlotte.

10.3.6 Information and Communication Technology

Development of equipment to ease communications, to remove the friction of distance, and to reduce the need for travel

proceeds apace, and can be anticipated to continue over the next 30 years.

Fax, modem, telephone, video-conferencing and other computer-based communication techniques continue to become an important part of the manner in which we do business. The extent to which these techniques will reduce the need for air travel (i.e., replacing an air trip for a meeting with a video conference call) has not been accurately established. The best estimates of the impact of this factor are in the range of 10 percent, however, some authorities claim that telecommunication contacts will generate follow-up visits and will result in a net increase in travel. The literature and the evidence will be reviewed. This factor is considered in the development of the forecasts of air travel.

10.4 REVIEW OF LONG-RANGE ECONOMIC CONDITIONS

The Phase I forecasts used demographic and economic projections from the U.S. Department of Commerce's *County Projections to 2040*. The forecasts were developed for the catchment area depicted in Figure 1 of the Phase I Executive Summary. These forecasts were adjusted upwards to account for revised U.S. Census Bureau population forecasts for the state of Virginia. Counties outside the Hampton Roads urban area were adjusted by the full difference between the revised Census Bureau Virginia population forecast and the original Department of Commerce's Virginia forecast. Counties within the Hampton Roads metropolitan area were adjusted upwards by 75 percent of the difference between the revised and previous forecasts based on the recommendations of the Hampton Roads Planning District Commission (PDC).

Since the Phase I forecasts, the Department of Commerce's Bureau of Economic Analysis (BEA) developed revised regional population and economic forecasts.[1] Unfortunately, these forecasts were not developed at the county level of detail. The BEA has developed separate forecasts for states, metropolitan areas, and BEA Economic areas, which roughly correspond to metropolitan areas but also include surrounding rural counties, so that every county in the United States is included as part of a BEA Economic Area. The BEA Economic Area projections can be separated into their respective urban and rural components.

In addition, the Virginia Employment Commission (VEC) completed a draft update of their population forecasts for Virginia. These forecasts include projections for each individual county and city and extend to 2010. The VEC statewide population projection for 2010 (7,716,100) is similar to the BEA projection for the same year (7,630,000), but the VEC projects more rapid growth in central and eastern Virginia and less rapid growth in northern Virginia. The VEC forecasts were extrapolated to 2030 and submitted to the PDCs for evaluation. PDC 23 (Hampton Roads) provided some additional adjustments within PDC 23 to reflect local conditions.

Since the VEC does not provide income forecasts, the BEA per capita income forecasts were applied to the VEC population forecasts to generate forecasts of total income.

Table 10.4 presents the revised county population and income projections used in the revised passenger forecasts. The following steps were applied to derive the

[1] **Bureau of Economic Analysis, *BEA Forecasts to 2045*, 1995.**

county forecasts for the EVASS catchment area from the VEC and BEA projections:

- The year 1994 was selected as the base year since it was the latest available year for which consistent income data were available for both Virginia and North Carolina counties.

- The population in each county and incorporated city outside of PDC 23 was assumed to grow according to the projections by the VEC through 2010. After 2010, population was extrapolated on a straight-line basis at the 2000-2010 growth rates.

- Jurisdictions within PDC 23 were assumed to grow according to the 2018 population forecasts developed by the Hampton Roads PDC. The PDC forecast for the entire PDC is similar to the VEC forecast, but the distributions between the jurisdictions differ. To generate 2020 and 2030 forecasts, it was assumed that the divergence between the PDC forecast and the VEC forecast for each jurisdiction would expand on a straight-line basis.

- The metropolitan area or rural portion of BEA Economic Area to which each county in the catchment area belonged was identified.

- Real per capita income in each county was assumed to grow, from 1994 base year levels, at the same rate as the metropolitan area or rural portion of BEA economic area to which it belonged.

- Total personal income was estimated by multiplying the BEA real per capita income forecast by the VEC population forecast.

Projections were developed for 2000, 2010, 2020, and 2030. The definition of the catchment area is the same as in Phase I.

As shown in Table 10.4, total population for the catchment area is projected to increase from 3.5 million in 1994 to over 4.9 million in 2030, an average annual increase of 1.0 percent. Real income is projected to increase from $73.6 billion in 1994 to $142.2 billion in 2030, an average annual increase of 1.8 percent. Per capita income is projected to increase from $20,969 in 1994 to $28,464 in 2030, an average annual increase of 0.85 percent.

In general, the BEA projects that the most rapidly growing parts of the catchment area will be located in the Richmond area and the fringe areas, in particular the northern and northwestern parts of the catchment area near Washington, D.C., and Charlottesville, and the southern part near Raleigh, North Carolina. The slowest-growing region is expected to be the southwestern part near Roanoke. The Norfolk, and Newport News/Williamsburg catchment areas are projected to experience slightly lower rates of population and income growth than the rest of the Richmond catchment area.

The BEA population and economic forecasts are based on an extrapolation of existing

Table 10.4

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

County and City Projections Adjusted for Revised VEC Projections (a)

	1994	2000	2010	2020	2030
ACCOMACK					
Income (000s of 96$)	559,395	605,762	684,670	749,017	825,232
Population	32,400	32,900	33,600	34,300	35,000
Per Capita Income	17,265	18,412	20,377	21,837	23,578
AMELIA					
Income (000s of 96$)	171,214	197,739	256,868	318,033	389,853
Population	9,500	10,700	12,700	14,700	16,700
Per Capita Income	18,023	18,480	20,226	21,635	23,345
BRUNSWICK					
Income (000s of 96$)	230,090	241,760	272,564	300,078	332,989
Population	16,200	16,600	17,100	17,600	18,100
Per Capita Income	14,203	14,564	15,939	17,050	18,397
BUCKINGHAM					
Income (000s of 96$)	218,362	256,383	318,013	380,187	453,412
Population	13,100	15,000	17,000	19,000	21,000
Per Capita Income	16,669	17,092	18,707	20,010	21,591
CAROLINE					
Income (000s of 96$)	361,146	410,138	513,615	618,627	741,636
Population	20,600	22,100	25,100	28,100	31,100
Per Capita Income	17,531	18,558	20,463	22,015	23,847
CHARLES CITY					
Income (000s of 96$)	116,591	124,443	156,879	189,989	229,038
Population	6,700	6,900	7,900	8,900	9,900
Per Capita Income	17,402	18,035	19,858	21,347	23,135
CHARLOTTE					
Income (000s of 96$)	185,183	193,025	221,562	248,020	279,513
Population	12,100	12,300	12,900	13,500	14,100
Per Capita Income	15,304	15,693	17,175	18,372	19,824
CHESTERFIELD					
Income (000s of 96$)	5,878,627	7,044,172	9,174,266	11,386,599	13,992,429
Population	231,800	268,000	317,000	366,000	415,000
Per Capita Income	25,361	26,284	28,941	31,111	33,717
CUMBERLAND					
Income (000s of 96$)	142,622	155,741	178,766	200,113	225,524
Population	7,700	8,200	8,600	9,000	9,400
Per Capita Income	18,522	18,993	20,787	22,235	23,992
ESSEX					
Income (000s of 96$)	173,767	187,864	224,685	260,745	303,368
Population	9,200	9,700	10,600	11,500	12,400
Per Capita Income	18,888	19,367	21,197	22,673	24,465
FLUVANNA					
Income (000s of 96$)	284,843	381,006	557,373	747,006	969,687
Population	15,200	19,700	26,000	32,300	38,600
Per Capita Income	18,740	19,340	21,437	23,127	25,121
GLOUCESTER					
Income (000s of 96$)	604,791	683,965	831,835	1,252,763	1,743,647
Population	32,700	34,850	38,350	53,640	68,900
Per Capita Income	18,495	19,626	21,691	23,355	25,307
GOOCHLAND					
Income (000s of 96$)	455,252	528,211	718,831	920,252	1,157,207
Population	15,900	17,800	22,000	26,200	30,400
Per Capita Income	28,632	29,675	32,674	35,124	38,066
GREENE					
Income (000s of 96$)	197,156	237,389	340,098	449,941	578,937
Population	12,600	14,700	19,000	23,300	27,600
Per Capita Income	15,647	16,149	17,900	19,311	20,976
HANOVER					
Income (000s of 96$)	1,650,102	2,013,954	2,791,646	3,618,146	4,590,066
Population	71,500	84,200	106,000	127,800	149,600
Per Capita Income	23,078	23,919	26,336	28,311	30,682

Table 10.4

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

County and City Projections Adjusted for Revised VEC Projections (a)

	1994	2000	2010	2020	2030
HENRICO					
Income (000s of 96$)	6,397,345	7,190,514	8,807,594	10,425,052	12,335,440
Population	229,600	249,000	277,000	305,000	333,000
Per Capita Income	27,863	28,878	31,796	34,180	37,043
ISLE OF WIGHT					
Income (000s of 96$)	542,134	635,569	764,838	886,933	1,029,217
Population	27,100	29,940	32,600	35,110	37,600
Per Capita Income	20,005	21,228	23,461	25,262	27,373
KING AND QUEEN					
Income (000s of 96$)	122,502	133,589	154,935	175,066	198,975
Population	6,300	6,700	7,100	7,500	7,900
Per Capita Income	19,445	19,939	21,822	23,342	25,187
KING GEORGE					
Income (000s of 96$)	336,816	387,651	517,726	653,949	813,853
Population	16,600	18,100	22,000	25,900	29,800
Per Capita Income	20,290	21,417	23,533	25,249	27,310
KING WILLIAM					
Income (000s of 96$)	255,061	289,638	378,502	470,662	578,845
Population	12,100	13,400	16,000	18,600	21,200
Per Capita Income	21,079	21,615	23,656	25,304	27,304
LANCASTER					
Income (000s of 96$)	298,654	320,034	368,379	413,422	467,002
Population	11,100	11,600	12,200	12,800	13,400
Per Capita Income	26,906	27,589	30,195	32,299	34,851
LOUISA					
Income (000s of 96$)	403,943	471,783	609,854	752,366	919,750
Population	22,300	25,400	30,000	34,600	39,200
Per Capita Income	18,114	18,574	20,328	21,745	23,463
LUNENBERG					
Income (000s of 96$)	166,340	193,614	218,629	241,055	267,868
Population	11,100	12,600	13,000	13,400	13,800
Per Capita Income	14,986	15,366	16,818	17,989	19,411
MADISON					
Income (000s of 96$)	206,419	229,169	270,316	309,792	356,110
Population	12,300	12,900	13,800	14,700	15,600
Per Capita Income	16,782	17,765	19,588	21,074	22,828
MATHEWS					
Income (000s of 96$)	192,072	217,557	270,815	324,298	386,837
Population	8,900	9,500	10,700	11,900	13,100
Per Capita Income	21,581	22,901	25,310	27,252	29,530
MECKLENBURG					
Income (000s of 96$)	518,641	554,556	631,825	702,466	786,704
Population	30,400	31,700	33,000	34,300	35,600
Per Capita Income	17,061	17,494	19,146	20,480	22,098
MIDDLESEX					
Income (000s of 96$)	198,680	221,441	278,711	337,014	405,604
Population	9,200	10,000	11,500	13,000	14,500
Per Capita Income	21,596	22,144	24,236	25,924	27,973
NELSON					
Income (000s of 96$)	230,437	245,107	287,557	328,234	376,446
Population	13,400	13,900	14,900	15,900	16,900
Per Capita Income	17,197	17,634	19,299	20,644	22,275
NEW KENT					
Income (000s of 96$)	240,448	291,105	400,661	516,843	653,488
Population	11,300	13,200	16,500	19,800	23,100
Per Capita Income	21,279	22,053	24,282	26,103	28,290
NORTHAMPTON					
Income (000s of 96$)	228,793	240,238	261,721	276,023	293,220
Population	13,000	12,800	12,600	12,400	12,200
Per Capita Income	17,599	18,769	20,772	22,260	24,034

Table 10.4

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

County and City Projections Adjusted for Revised VEC Projections (a)

	1994	2000	2010	2020	2030
NORTHUMBERLAND					
Income (000s of 96$)	238,822	262,537	321,138	379,670	448,689
Population	11,100	11,900	13,300	14,700	16,100
Per Capita Income	21,515	22,062	24,146	25,828	27,869
NOTTOWAY					
Income (000s of 96$)	251,070	259,129	290,971	319,121	352,841
Population	15,300	15,400	15,800	16,200	16,600
Per Capita Income	16,410	16,827	18,416	19,699	21,255
ORANGE					
Income (000s of 96$)	431,358	495,653	641,190	791,691	967,887
Population	23,400	25,400	29,800	34,200	38,600
Per Capita Income	18,434	19,514	21,516	23,149	25,075
POWHATAN					
Income (000s of 96$)	322,680	419,422	630,673	859,481	1,128,191
Population	18,100	22,700	31,000	39,300	47,600
Per Capita Income	17,828	18,477	20,344	21,870	23,701
PRINCE EDWARD					
Income (000s of 96$)	263,679	288,010	347,377	405,983	475,189
Population	18,400	19,600	21,600	23,600	25,600
Per Capita Income	14,330	14,694	16,082	17,203	18,562
RICHMOND					
Income (000s of 96$)	130,194	162,366	209,294	257,667	314,491
Population	7,400	9,000	10,600	12,200	13,800
Per Capita Income	17,594	18,041	19,745	21,120	22,789
STAFFORD					
Income (000s of 96$)	1,490,873	1,899,765	2,692,757	3,538,562	4,529,954
Population	77,700	93,800	121,000	148,200	175,400
Per Capita Income	19,188	20,253	22,254	23,877	25,826
SURRY					
Income (000s of 96$)	108,957	116,711	139,296	161,396	187,732
Population	6,400	6,600	7,100	7,600	8,100
Per Capita Income	17,024	17,684	19,619	21,236	23,177
SUSSEX					
Income (000s of 96$)	183,627	205,070	234,641	261,900	294,371
Population	10,100	11,000	11,500	12,000	12,500
Per Capita Income	18,181	18,643	20,404	21,825	23,550
WESTMORELAND					
Income (000s of 96$)	287,849	312,187	368,959	423,563	487,627
Population	16,300	16,700	17,900	19,100	20,300
Per Capita Income	17,659	18,694	20,612	22,176	24,021
CHESAPEAKE CITY					
Income (000s of 96$)	3,519,863	4,226,057	5,185,608	6,152,526	7,283,022
Population	180,600	204,340	226,870	249,990	273,100
Per Capita Income	19,490	20,681	22,857	24,611	26,668
HAMPTON CITY					
Income (000s of 96$)	2,477,193	2,632,233	3,090,821	3,602,534	4,200,440
Population	139,600	139,790	148,520	160,770	173,000
Per Capita Income	17,745	18,830	20,811	22,408	24,280
NEWPORT NEWS CITY					
Income (000s of 96$)	3,315,737	3,661,685	4,303,093	4,909,145	5,618,596
Population	179,100	186,390	198,190	209,990	221,800
Per Capita Income	18,513	19,645	21,712	23,378	25,332
NORFOLK CITY					
Income (000s of 96$)	4,514,386	4,526,084	5,155,967	5,935,579	6,847,458
Population	241,400	228,080	235,090	251,350	267,600
Per Capita Income	18,701	19,844	21,932	23,615	25,588
PORTSMOUTH CITY					
Income (000s of 96$)	1,834,824	1,888,694	2,201,940	2,578,645	3,019,988
Population	103,500	100,400	105,910	115,190	124,500
Per Capita Income	17,728	18,812	20,791	22,386	24,257

Table 10.4

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

County and City Projections Adjusted for Revised VEC Projections (a)

	1994	2000	2010	2020	2030
RICHMOND CITY					
Income (000s of 96$)	5,762,081	5,701,659	6,081,768	6,326,890	6,628,253
Population	201,100	192,000	186,000	180,000	174,000
Per Capita Income	28,653	29,696	32,698	35,149	38,093
SUFFOLK CITY					
Income (000s of 96$)	1,055,377	1,348,170	1,788,943	2,248,344	2,785,562
Population	54,900	66,090	79,350	92,620	105,900
Per Capita Income	19,224	20,399	22,545	24,275	26,304
VIRGINIA BEACH CITY					
Income (000s of 96$)	9,354,478	10,032,093	11,912,750	14,048,188	16,544,780
Population	430,300	434,880	467,250	511,740	556,200
Per Capita Income	21,739	23,069	25,495	27,452	29,746
ALBEMARLE + CHARLOTTESVILLE					
Income (000s of 96$)	2,930,750	3,268,502	4,038,638	4,805,477	5,707,051
Population	112,900	122,000	136,000	150,000	164,000
Per Capita Income	25,959	26,791	29,696	32,037	34,799
DINWIDDIE + COL. HTS + PTRSBRG					
Income (000s of 96$)	1,602,872	1,567,818	1,759,827	1,927,837	2,128,385
Population	81,800	77,200	78,700	80,200	81,700
Per Capita Income	19,595	20,309	22,361	24,038	26,051
GREENSVILLE + EMPORIA					
Income (000s of 96$)	265,359	280,246	328,114	373,862	428,104
Population	16,700	17,200	18,400	19,600	20,800
Per Capita Income	15,890	16,293	17,832	19,075	20,582
HALIFAX + SOUTH BOSTON					
Income (000s of 96$)	596,922	641,037	723,822	798,890	888,769
Population	37,300	38,500	39,700	40,900	42,100
Per Capita Income	16,003	16,650	18,232	19,533	21,111
JAMES CITY + WILLIAMSBURG					
Income (000s of 96$)	1,271,054	1,493,580	1,851,769	2,794,207	3,896,315
Population	51,600	57,140	64,100	89,830	115,600
Per Capita Income	24,633	26,139	28,889	31,105	33,705
PRINCE GEORGE + HOPEWELL					
Income (000s of 96$)	914,407	1,007,783	1,148,055	1,275,428	1,427,004
Population	48,900	52,000	53,800	55,600	57,400
Employment	18,700	19,380	21,339	22,939	24,861
SOUTHAMPTON + FRANKLIN					
Income (000s of 96$)	505,891	555,443	663,154	779,441	917,380
Population	25,600	27,060	29,120	31,620	34,100
Per Capita Income	19,761	20,526	22,773	24,650	26,903
SPOTSYLVANIA + FREDERICKSBRG					
Income (000s of 96$)	1,919,572	2,454,594	3,401,887	4,406,146	5,583,833
Population	87,500	106,000	133,700	161,400	189,100
Per Capita Income	21,938	23,157	25,444	27,300	29,528
YORK + POQUOSON					
Income (000s of 96$)	1,425,067	1,682,856	2,059,502	2,429,642	2,863,756
Population	63,800	71,000	78,620	86,140	93,700
Per Capita Income	22,336	23,702	26,196	28,206	30,563
North Carolina					
BEAUFORT					
Income (000s of 96$)	765,787	870,664	1,063,452	1,262,872	1,487,721
Population	43,900	46,855	51,051	55,589	59,806
Per Capita Income	17,444	18,582	20,831	22,718	24,876
BERTIE					
Income (000s of 96$)	330,746	358,257	422,457	488,739	566,903
Population	20,600	21,482	22,832	24,403	25,936
Per Capita Income	16,056	16,677	18,503	20,028	21,858

Table 10.4

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

County and City Projections Adjusted for Revised VEC Projections (a)

	1994	2000	2010	2020	2030
CAMDEN					
Income (000s of 96$)	101,672	110,129	129,864	150,239	174,267
Population	6,400	6,674	7,094	7,582	8,058
Per Capita Income	15,886	16,501	18,307	19,816	21,627
CHOWAN					
Income (000s of 96$)	246,015	266,477	314,231	363,532	421,672
Population	13,900	14,495	15,406	16,466	17,501
Per Capita Income	17,699	18,384	20,396	22,078	24,095
CURRITUCK					
Income (000s of 96$)	275,023	304,244	365,230	428,366	499,400
Population	15,800	16,472	17,891	19,489	20,968
Per Capita Income	17,407	18,471	20,414	21,980	23,817
DARE					
Income (000s of 96$)	487,128	553,841	676,477	803,330	946,359
Population	25,100	26,790	29,188	31,783	34,194
Per Capita Income	19,407	20,674	23,176	25,275	27,676
GATES					
Income (000s of 96$)	162,623	176,149	207,716	240,306	278,738
Population	9,700	10,115	10,751	11,491	12,213
Per Capita Income	16,765	17,414	19,320	20,913	22,824
HALIFAX					
Income (000s of 96$)	896,315	996,399	1,176,178	1,362,815	1,580,232
Population	57,100	59,366	63,010	67,336	71,575
Per Capita Income	15,697	16,784	18,667	20,239	22,078
HERTFORD					
Income (000s of 96$)	334,294	362,100	426,989	493,981	572,984
Population	22,700	23,672	25,160	26,891	28,580
Per Capita Income	14,727	15,297	16,971	18,370	20,048
HYDE					
Income (000s of 96$)	92,641	105,328	128,650	152,775	179,976
Population	5,300	5,657	6,163	6,711	7,220
Per Capita Income	17,479	18,620	20,874	22,764	24,926
MARTIN					
Income (000s of 96$)	451,285	513,090	626,702	744,222	876,727
Population	26,400	28,177	30,700	33,429	35,966
Per Capita Income	17,094	18,209	20,414	22,263	24,377
NORTHAMPTON					
Income (000s of 96$)	330,088	366,946	433,153	501,887	581,955
Population	20,700	21,521	22,842	24,411	25,947
Per Capita Income	15,946	17,050	18,963	20,560	22,428
PASQUOTANK					
Income (000s of 96$)	564,816	611,796	721,431	834,621	968,102
Population	33,500	34,934	37,130	39,685	42,178
Employment	16,860	17,513	19,430	21,031	22,953
PERQUIMANS					
Income (000s of 96$)	177,243	191,985	226,389	261,909	303,796
Population	10,700	11,158	11,859	12,675	13,472
Per Capita Income	16,565	17,206	19,089	20,663	22,551
TYRRELL					
Income (000s of 96$)	68,537	77,923	95,177	113,025	133,149
Population	3,900	4,163	4,535	4,938	5,313
Per Capita Income	17,574	18,720	20,986	22,887	25,061
WASHINGTON					
Income (000s of 96$)	251,125	285,517	348,739	414,134	487,869
Population	14,300	15,263	16,629	18,108	19,481
Per Capita Income	17,561	18,707	20,971	22,871	25,043
RICHMOND CATCHMENT AREA					
Income (000s of 96$)	36,296,201	40,921,791	50,900,736	60,985,719	72,873,085
Population	1,580,400	1,721,300	1,950,700	2,180,100	2,409,500
Per Capita Income	22,966	23,774	26,094	27,974	30,244

Table 10.4

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

County and City Projections Adjusted for Revised VEC Projections (a)

	1994	2000	2010	2020	2030
NORFOLK CATCHMENT AREA (VA PART)					
Income (000s of 96$)	21,067,116.2	22,867,099	27,191,599	31,988,323	37,599,262
Population	1,056,100.0	1,079,490	1,160,670	1,267,590	1,374,500
Per Capita Income	19,948	21,183	23,428	25,236	27,355
NORFOLK CATCHMENT AREA (NC PART)					
Income (000s of 96$)	5,535,337	6,150,845	7,362,835	8,616,753	10,059,851
Population	330,000	346,794	372,243	400,986	428,407
Employment	16,774	17,736	19,780	21,489	23,482
NORFOLK CATCHMENT AREA (Combined)					
Income (000s of 96$)	26,602,453	29,017,944	34,554,434	40,605,077	47,659,113
Population	1,386,100	1,426,284	1,532,913	1,668,576	1,802,907
Per Capita Income	19,192	20,345	22,542	24,335	26,435
NEWPORT NEWS CATCHMENT AREA					
Income (000s of 96$)	11,179,051	12,483,613	14,943,352	18,270,465	22,165,214
Population	566,200	595,770	644,300	727,100	809,900
Per Capita Income	19,744	20,954	23,193	25,128	27,368
COMBINED CATCHMENT AREA					
Income (000s of 96$)	74,077,705	82,423,347	100,398,522	119,861,260	142,697,412
Population	3,532,700	3,743,354	4,127,913	4,575,776	5,022,307
Per Capita Income	20,969	22,019	24,322	26,195	28,413

(a) Population projections for 2000 and 2010 obtained from draft revised VEC forecasts. Projections for 2020 and 2030 estimated by assuming straight line increase at 2000-2010 rate. Projections for PDC 23 adjusted on a percentage basis based on the difference of the PDC 23 population projections for 2018 as compared to the interpolated VEC projections for 2018.

Real income estimated by multiplying per capita income projections by population projections.

Per capita income assumed to increase at same rate as BEA projection for corresponding metropolitan or non-metropolitan portion of BEA economic area in which jurisdiction is located (from BEA Regional Projections to 2045 published in 1995.

Source: U.S. Department of Commerce, Bureau of Economic Analysis, and IMG analysis.

trends. New development, especially industrial, commercial, and infrastructure development that attracts business from outside the region, would change these projections, and these changes could be material. The increase in economic development that could emerge from a new regional airport will be explored in upcoming sections of Phase II.

10.5 DEFINING THE AVIATION ROLES OF EACH SYSTEM

The roles of each airport were defined in Phase I of the Eastern Virginia Regional System Study. These roles were re-evaluated as part of this study by considering the recent trends in the aviation industry. Following are the aviation segments that define the roles of each of the existing commercial airports:

- Domestic Passenger Role
- International Passenger Role
- General Aviation Role

⇒ Reliever Airport Role

⇒ Corporate Aviation Role

10.5.1 One-Airport System - Consolidate at New Site

The one-airport system provides passenger service at a new airport site located somewhere between Petersburg and Suffolk. Passenger service would be discontinued at RIC, PHF, and ORF. A new airport would serve both domestic and international passengers, however, less than a two-airport system. This is due to a portion of the market likely driving to the Washington airports rather than to the new airport.

General Aviation services would also continue at each airport and new GA activity would likely occur at the new airport. However, additional corporate activity would likely occur at the existing airports due to the loss of commercial passenger service.

The future reliever role would be accommodated by PHF due to its location across the river from the new airport site and its large contingent of GA facilities, its expandability, and available capacity.

The HSCT can be accommodated at the existing airports, so it would be capable of utilizing the new airport. Tilt-rotor activity would again likely serve the city centers of Richmond and Norfolk to major eastern markets less than 300 miles distant.

10.5.2 Two-Airport System - Option A, Consolidate at PHF and RIC

The two-airport system considers consolidating passenger service at two of the existing airports: Newport News (PHF) and Richmond (RIC). Approximately 60 percent of the domestic and international passengers would use PHF, and about 40 percent of the passenger traffic would use RIC (see Section 10.9), based on travel time and population centers.

General Aviation services would continue at each airport, however, GA activity would be reduced at PHF, particularly training flights. This would maximize air freight capacity for many large jet aircraft versus small light aircraft. However, additional corporate activity would likely occur at ORF due to the loss of commercial passenger service.

The future reliever role would be accommodated by ORF due to all of the existing General Aviation facilities and available capacity.

As stated previously, the HSCT can be accommodated at the existing airports. Tilt-rotor activity would likely serve the city centers of Richmond and Norfolk to major eastern markets less than 300 miles distant.

10.5.3 Two-Airport System - Option B, Consolidate at RIC and New Site 2

The second option for the two-airport system consists of Richmond International and a new site southwest of Norfolk. Approximately 60 percent of the region's domestic and international passenger traffic would be accommodated at the new airport, and the remaining passengers would be served by RIC.

General Aviation activity would show some shift of activity to the new airport at the three existing airports, however, some new GA activity would occur at the new airport. Additional corporate activity may occur at PHF and ORF due to the loss of passenger service.

The future reliever role would be accommodated by PHF due to its location across the river from the new airport site and its large contingent of GA facilities, its expandability, and available capacity.

The HSCT can be accommodated at RIC, and the new airport would be designed with the HSCT in mind. Tilt-rotor activity would likely serve the city centers of Richmond and Norfolk to major eastern markets less than 300 miles distant.

10.5.4 Three-Airport System - Status Quo

Under this scenario, the three existing airports would continue to develop as outlined in their respective master plans. All three airports would provide domestic passenger service; PHF would be the only airport not served by international passenger service.

General Aviation is sensitive to where pilots live and, considering a majority of them would remain within a 30-minute drive to the airport, it is expected that activity would continue to increase at each of the existing airports.

As stated previously, the HSCT can be accommodated at the existing airports. Tilt-rotor activity would likely serve the city centers of Richmond and Norfolk to major eastern markets less than 300 miles distant if this new aircraft becomes successful in the future.

10.6 DEFINE AIR CARGO ROLE

This section defines the air cargo role(s) for the three alternate airport systems under consideration in Phase II. This assessment includes domestic and international air cargo, a cargo carrier hub, and traffic generated by an integrated industrial park-cargo complex.

While the roles of three existing airports in each of the three airport systems were defined in Phase I of the Eastern Virginia Regional System Plan, the air cargo role has been re-examined and re-evaluated as part of this phase of the study. Thus, the roles summarized here are based on available information, potential for demand and levels of service, and the needs of the eastern Virginia area. As mentioned, the three alternate airport systems examined include the following:

- One-Airport System: A single new regional airport into which commercial air carrier service will be consolidated from all

three of the region's existing commercial airports.

- Two-Airport System: RIC plus a new regional airport in the eastern part of the region to provide commercial air carrier service to the Norfolk and Newport News areas. The eastern airport could be PHF.

- Three-Airport System: A continuation of the development of the region's three existing commercial air carrier airports.

10.6.1 Worldwide Air Cargo Trends

Worldwide air cargo continues to be a growth industry. Measured in revenue ton-miles, Boeing projects world cargo growth to average over 6 percent annually over the next decade.[2] World air freight is expected to grow more than mail, which is expected to grow at only 3 percent per year.

There are a number of trends driving the development and infrastructure of the air cargo industry. The most important are the globalization of logistics and trade, the speed/value relationship of the higher technology products, and the consolidation and alliances of air cargo service providers. As a result, Boeing anticipates that the key outcomes of these emerging trends for air cargo worldwide will include the following:

- Average annual growth in the international express market of 18 percent annually through 2015.

- International market continuing to outpace the domestic market, and U.S. airline share of the world cargo market declining.

- The highest air freight market growth occurring on Asian routes.

- The world air cargo fleet nearly doubling by 2015, with a net addition of more than 1,000 jet freighter aircraft.

In addition to the primary influence of economic activity, many other factors will influence the development of world air cargo. In general, aircraft acquisitions, improved inventory management techniques, deregulation and liberalization, and national development programs have played a significant role in the growth of air cargo. Constraints to growth, primarily originating outside of the airline industry, have frequently been potential and real threats to the air cargo industry.

The expected increase in air cargo traffic will dictate an increased role for cargo at major airports. This is particularly true of airports with significant passenger traffic traveling on widebody and other cargo-capable aircraft, and with direct access to major markets. Passenger traffic allows cargo shippers access to the inexpensive cargo space in passenger aircraft, while access to major markets directly increases the demand for cargo space.

10.6.2 Domestic Air Cargo Role

The U.S. domestic industry continued its healthy growth in air cargo over the last few years. In 1995, the domestic air cargo growth continued to outpace Gross Domestic Product (GDP) growth, indicating that the domestic air cargo industry is still not mature. Boeing projects that the U.S. domestic market will continue to represent over 90 percent of the North American market, and will grow by 5 percent per year over the next decade.

Air cargo has continued to grow as manufacturers developed facilities and selected suppliers in locations that minimize overall production costs, even with

[2] Boeing Commercial Airplane Group, *World Air Cargo Forecast*, 1996/1997.

increased costs from air transportation. Freight forwarders, carriers, and others are using time-dependent air cargo services as an integral part of their overall logistics solutions. Air transportation is also becoming a more important logistical element of direct retail distribution.

The mid-Atlantic region, which over the years has developed into a center for high- and medium-technology manufacturing, should continue to benefit from the growth in air cargo, both GDP-related and from new markets. Moreover, this region will continue to be an ideal shipment point for North Atlantic cargo. This does not mean, however, that building a new cargo facility will automatically attract enough users to support a new facility. The few existing all-cargo airports, such as Alliance and Front Range, are having difficulty luring cargo carriers from passenger airports, and the planned Global Transpark in nearby Kinston, North Carolina, is experiencing fewer-than-anticipated commitments from prospective investors.

Two major factors for a successful air cargo operation are access to inexpensive freight rates associated with belly cargo space on passenger airlines and proximity to large distribution markets. According to Boeing, passenger aircraft carry 50 percent of all cargo, with combination freight and passenger (combi) accounting for another 9 percent. All-freight airlines carry 41 percent of all cargo and, while all-freight airlines have grown rapidly over the past decade, many have recently invested significant sums in developing their existing hub-sorting systems, making them unlikely candidates for major expansion in the near term.

As combination airlines have reduced their use of widebody aircraft on domestic passenger services, cargo capacity has been reduced. As a consequence, they have replaced lost services with scheduled truck "flights." Fueled by (1) growth in road feeder service (RFS) for international air freight, (2) increased truck use by express carriers for deferred shipments, and (3) deregulation of trucking operations of integrators, the trucks are being used as regional hub feeders. In many cases, the entire air express shipment is served by trucks.

Just-in-time (JIT) inventory and logistics networks have also changed the nature of physical distribution in significant ways. Originated in Japan, the JIT concept has spread throughout the world. In manufacturing (as in retailing and other trades), the JIT system is characterized by manufacturing in small lots in direct response to market demands, with inventories of raw materials, work-in-process, and finished goods being held to a minimum.

The JIT inventory system is one of the most widely attempted strategies for reducing inventory carrying costs at all stages of the production, distribution, and/or point-of-sale pipeline. Its primary objective is to procure, transport, and produce the required items in small quantities, "just in time" for their consumption or use. In effect, this leads to increased frequency of shipments, reduced shipment size, decreased lead times on orders, and a greater demand for transportation service reliability. Consequently, air cargo service is used more extensively by companies that employ JIT systems or manufacturing plants. In these cases, the air cargo/express service not only plays a significant role in the regular distribution of goods, but it provides standby capability to solve emergency, or "stock-out" problems which occasionally occur.

The emergence of JIT supply and inventory systems in the U.S. and around the world has placed greater emphasis on the shipping times, service reliability, and overnight capabilities offered by the air cargo/express industry. This, in turn, has prompted the industry to expand its services and products, invest in greater degrees of reliability, and accept the constant challenge for more economic efficiency. No other mode of transportation can satisfy this large and growing demand of the international and domestic business communities.

Implications for Eastern Virginia Airports

- **One-Airport System**: The single new regional airport could handle all the air cargo traffic currently shared by RIC, ORF, and PHF, depending on whether the existing airports continue to serve in a non-passenger role. Consolidation of air cargo traffic and absence of noise constraints could promote development of a cargo hub as well.

- **Two-Airport System**: In a two-airport system, RIC continues to have the largest share of domestic air cargo market from the region. Additional air cargo is consolidated at Newport News/Williamsburg International or a new regional airport in the eastern part of the study area, while the existing airports continue to serve cargo operators.

- **Three-Airport System**: During the forecast period, the domestic air cargo (freight and mail) enplaned tonnage is expected to grow by over 4 percent per year, with air freight growing at almost twice the rate of air mail. In this scenario, RIC continues to realize the largest share, nearly four-fifths of the total market, of air cargo from the catchment area. Similarly, Newport News continues to capture a minimal share of the market.

Revised cargo forecasts are provided in Section 10.9.

10.6.3 International Cargo Role

Boeing projects that international market growth will continue to outpace domestic growth, with the share of U.S. airlines declining over the next decade. Markets in Asia are expected to achieve the highest growth rates in the next decade. As with passenger growth, the fastest-growing segments are expected to be international, particularly the Intra-Asia, U.S.-Asia, Europe-Asia-Australia, U.S.-Europe, and U.S.-Latin America markets. U.S. domestic cargo growth is projected to be slower relative to international cargo growth, and relative to the recent past. However, since the growth will occur on top of a very large base, there will be a need for significant additional capacity based on the U.S. Airport System Capacity studies.

Implications for Eastern Virginia Airports

The eastern Virginia region is well-situated geographically to accommodate transatlantic traffic. Other positive factors include the efficiency that a new, state-of-the-art cargo facility would offer. But the potential for actually attracting international cargo traffic (both existing and new) from airports with well-developed freight forwarding and support services will depend upon the region's success as a domestic and international passenger facility. Another factor would be the potential development of NAS Norfolk as a cargo facility. Since it is a military facility, the extent to which it is developed will be determined more by policy factors than market factors. Without the freight forwarders attracted by passenger carriers, it is unlikely to develop NAS Norfolk as a major facility for cargo carriers. Integrated carriers that are highly sensitive to changes in their flying schedules would

be unlikely to subject themselves to potential disruptions resulting from military exercises.

- **One-Airport System**: A single new regional airport could adequately serve as an international facility for transatlantic traffic. The potential new air cargo traffic captured by the regional airport would depend on the site selected and passenger markets developed.

- **Two-Airport System**: A regional airport in the eastern part of the study area would likely have more international passenger traffic and would, therefore, be more likely to generate growth in international air cargo. The distribution of the international air cargo market between the two airports would be based on the level of international passenger traffic at Richmond and the new airport.

- **Three-Airport System**: Currently, there is no direct international air cargo service in the region. The Phase I study estimated the potential for international air cargo (enplaned tons) in the eastern Virginia region by applying national relationships of international air cargo enplaned to total personal income to forecasts of regional income. Based on this analysis, the international air cargo in the region could grow to exceed the total domestic air cargo from the area airports.

10.6.4 Cargo Hub Role

To assess the likelihood of development of an air cargo hub in the eastern Virginia region, a generalized set of facility requirements for a cargo hub was developed. These characteristics were used to evaluate the successful development of a cargo hub at any one of three alternate airport systems. The air cargo hub facility requirements are summarized as follows:

1. Land requirements - It is estimated that an air cargo hub will require approximately 70 to 110 acres.

2. Airfield requirements - Based on available fleet mix, the facility will need runway lengths in the range of 10,000 to 12,500 feet, with a width of at least 150 feet. A dual parallel runway is preferred but not necessary.

3. Instrument approach capability - A precision instrument approach is essential for cargo hub operations. A Category II ILS/GPS is considered desirable.

4. Surface access - Proximity to an interstate and multimodal facilities are highly desirable to facilitate road feeder service and carrier's truck cargo. Rail access is considered desirable but not necessary.

5. Compatible airport area land use - Many flight operations at air cargo hubs occur during nighttime and early morning hours, peak periods of noise sensitivity. Consequently, the presence of large scale, noise-sensitive land use in the vicinity is a constraint that will ultimately limit hub development.

One-Airport System: An air cargo hub is most likely to develop in the eastern Virginia region in a one-airport system. Consolidation of passenger and cargo traffic and proximity to an interstate and multi-modal facility will fuel development of the hub. Ultimately, the air cargo hub development will depend on the site selected for the new regional airport and cargo facilities available at the airport.

Two-Airport System: Development of a primary cargo hub is more likely under this scenario than under the three-airport system. Segregation of air cargo traffic between RIC

and PHF or a new airport makes it a less-than-optimal scenario for cargo hub development. Ultimately, the air cargo hub development will depend on the sites selected and proximity to residential areas due to potential negative noise effects during peak periods for cargo activity. A new airport site would be less affected by noise considerations.

Three-Airport System: In this scenario, no air cargo hub is expected to be established at any of the three airports. Lack of consolidation of cargo traffic from the region may not generate economies of scale for a new carrier to establish a primary or secondary cargo hub in the region. While the runway lengths are adequate and instrument landing systems are present at these airports, they border residential or downtown areas that may be affected by noise problems from cargo activities.

10.7 ECONOMIC DIVERSIFICATION ROLE OF EACH AIRPORT SYSTEM

While fulfilling the immediate role of providing a base for air transportation services, airports serve a vital economic role. Although the economic impact of an airport is usually described in terms of employment and revenue generated by the airport, its tenants, and suppliers, airports are also a vital part of the regional economic infrastructure and can serve as catalysts for a broad range of economic development. The extent to which an airport can catalyze economic development is dependent on a number of factors, including airport location, existing facilities, and the nature of the existing economy.

The purpose of this subtask is to accomplish the following:

- Identify the types of development activity that are most compatible with and most likely to benefit from proximity to an airport facility.
- Describe economic diversification in general terms.
- Define the potential economic development role for each airport system.

The following economic roles would most likely benefit from proximity to an airport, and were chosen for additional analysis in this section:

- Industrial park role
- Commercial role
- Research park role
- Education/training role
- Residential development role
- Other economic diversification roles

Key Factors Affecting Development

Following are some of the key factors affecting development:

- Availability of developable land
- Direct airfield access
- Flexibility for manufacturer to operate own cargo facility or use common-cargo facilities (freight forwarders) on-airport
- Existing geographical direction of economic development
- Distance to urban core
- Air service
- Supporting transportation infrastructure

- Regulatory environment
- Real estate prices
- Tax rates
- Available labor skills
- Labor rates
- Competition from other facilities

10.7.1 Industrial Park Role

The activities anticipated at an airport industrial park or complex can be grouped into two major categories: those that are aviation-related, and those that are non-aviation-related.

Aviation-related activities include aircraft maintenance, aircraft manufacturing and assembly, and other aerospace activities. These activities require airfield access, and areas reserved for these activities should be located adjacent to the airfield with taxiway connections. These connections could be via a taxiway or a series of branch taxiway stubs from the parallel taxiways to the runways.

Certain non-aviation activities require airfield access, including some manufacturers who rely on JIT delivery systems and shippers using common-use cargo facilities. The ability to operate an industrial plant with direct access to the airfield is one unique benefit that this type of facility offers prospective tenants or owners, beyond the opportunities normally associated with industrial parcels. A mixture of land parcels with and without airfield access should be developed to accommodate the requirements of different potential industrial plants.

Immediate availability of spare parts or components will be demanded by 21st-century industrial plants as JIT delivery becomes more routine. Thus, it is desirable to locate a storage and distribution facility to meet national and international short-term requirements for the plant owners. Similarly, an international trade center would be a logical next step, given the demand it creates for air traffic. To be economically viable, an industrial park should have the following characteristics:

- Located within a 10- to 12-mile radius of the airport.
- Located along arterial roads with direct access to Interstate Highways.
- Located close to rail transport.
- Located close to a skilled labor force.
- Have adequate utilities and supporting infrastructure.[3]

Implications for One-Airport System

With a single-airport system at a new site, there would be sufficient nearby developable land to accommodate an industrial park. The potential site would need adequate utilities and highway access. A new site would probably offer lower land prices but may be less accessible to labor markets. Consolidation of international passenger demand at a single site would increase the chances for the development of an international cargo facility, which would provide an attraction to industries relying on international suppliers or customers.

[3] Economics Research Associates, Third Chicago Regional Airport Site Selection Study: Preliminary Estimate of Potential Economic Benefits, May 1991.

Implications for Two-Airport System

Both two-airport system scenarios (Richmond and Newport News/Williamsburg, and Richmond and a new site) would provide adequate nearby land for industrial development, although the second scenario would provide more land at lower prices. Utilities and highway access are marginal under both scenarios, although the second scenario may result in reduced access to labor markets. More international traffic is likely to be consolidated at PHF or a new airport as stated previously, so internationally oriented industries would be more likely to locate there. These international industries are more likely to find adequate land under the second scenario.

Implications for Three-Airport System

The three existing airports have adequate access to labor markets, utilities, and highways. Developable land is available at Richmond and, to a lesser extent, at Newport News/Williamsburg. Norfolk is the most limited with regard to additional developable land. Because international markets are unlikely to be consolidated, an international cargo facility is less likely to develop within the region, and it is less likely that industries with an international orientation will be attracted.

10.7.2 Commercial Role

Several types of commercial activity can be stimulated by the proximity of an airport and air transportation services. These activities range from commercial office parks, to hotels, convention centers, and retail establishments.

A commercial office location should be:

- Within an 8- to 10-mile radius of the airport.
- Along major arterials or interstate highways.
- Near or at interchanges.
- Near a skilled work force, support services, and amenities such as hotels, restaurants, and retail establishments.[4]

A hotel should be located:

- Within 3 miles of the airport.
- At or near an interstate highway interchange.
- Near demand generators other than the airport (e.g., office space or tourist attractions).[5]

Hotels that can satisfy all three of the above location criteria are the most likely to be successful.

In addition to office complexes and hotels, airports can stimulate activity at convention centers and large retail establishments. Chicago and Atlanta have become major centers of convention activity largely due to easy air access to so many markets resulting from the Delta hub at Atlanta, and the United and American hubs at Chicago. Likewise, the Mall of the Americas in Minneapolis has benefited from out-of-town customers flying in on Northwest Airlines, many flying on special flight packages focused on the Mall.

Implications for One-Airport System

By consolidating passenger originations, a one-airport system would make more non-stop markets viable and would increase the

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[4] Ibid.

[5] Economics Research Associates, Third Chicago Regional Airport Site Selection Study: Preliminary Estimate of Potential Economic Benefits, May 1991.

possibility of attracting an airline hub. A high level of airline service would increase the immediate region's viability as a location for both corporate headquarters and convention centers. Depending on the site, a new airport may have reduced access to the amenities associated with population centers in the short term, but would have more land for the construction of new office, hotel, and other commercial facilities.

Implications for Two-Airport System

As noted in Phase I, an airline hub would still be viable under a two-airport system, although the number of markets with non-stop service would be reduced and the attractiveness for convention centers or corporate headquarters locations slightly diminished. The scenario including Newport News/Williamsburg would have access to major tourism areas but would be slightly less accessible to the labor markets across the river in Norfolk. Under the second scenario, and depending on the site, a new airport may have reduced access to the amenities associated with population centers but more land for the construction of new office, hotel, and other commercial facilities.

Implications for Three-Airport System

As noted in Phase I, a three-airport system is unlikely to consolidate sufficient demand at any one location to attract an airline hub, thereby diminishing the prospect of attracting additional convention centers or corporate headquarters. The existing sites have adequate access to highway facilities, labor markets, and other infrastructure requirements and amenities.

10.7.3 Research Park Role

Many of the most rapidly growing economic areas in the United States—ranging from the Route 128 corridor in Massachusetts, the Research Triangle in North Carolina, Silicon Valley in California, and the Seattle-Tacoma area in Washington State—owe their vitality to their development as the focus of high-technology firms and institutions.

These regions share several characteristics, including (1) their ability to draw upon nearby universities for skilled labor, expertise, and, most importantly, new ideas; (2) their achievement of sufficient 'critical mass' to enable the cross-fertilization of ideas and the free flow of skills and talent among companies to where they can be used most productively; and (3) their adequate support services and amenities. Most of the existing high-tech centers are located near major airports, and have access to air transportation within a 30-minute drive. This will become increasingly important as these industries become more globalized. Joint ventures drawing expertise from different parts of the world will ready transportation access that can only be supplied by an international airport.

Implications for One-Airport System

A single-airport system would increase the number of accessible non-stop markets for a research park located near the airport and thereby increase opportunities for interaction with other research facilities. The ability of a new site to stimulate the development of research centers would depend on its location with respect to universities and other sources of technical expertise.

High-technology industries are time-sensitive and may require immediate access to critical electronic components and other supplies at a moment's notice. Therefore, to

the extent that cargo service is consolidated under a single-airport system, it would enhance the prospects of a research park/high-technology center; however, no proximity to existing universities.

Implications for Two-Airport System

Under a two-airport system serving both Richmond and Hampton Roads, the biotechnology research potential for the Richmond area and the aerospace research potential for the Hampton Roads area would both be promoted. The total number of domestic and international non-stop markets would be less than under the single-airport system, so the opportunities for interaction with other U.S. and international research facilities would be slightly more limited for the area that would have been served by the single-airport system.

Implications for Three-Airport System

The reduced number of non-stop markets that would be served under the three-airport system would reduce the potential for interaction with other high-technology centers. Also, without the focus for development that could be provided by an international airport, technology centers in eastern Virginia would be more likely to be geographically dispersed, and would be less likely to achieve the critical mass necessary to be recognized as a national research center.

10.7.4 Education/Training Role

University research centers may act as catalysts for the development of centers of high-technology industry, such as Silicon Valley in California and the Research Triangle area of North Carolina. Consequently, the educational/training roles for each of the airport systems are similar to the research park roles.

10.7.5 Residential Development Role

To the extent that airports serve as a direct and indirect focus of employment, they play a role in determining residential development patterns. Based on the experience of other new airports, such as Dallas-Ft. Worth, Kansas City International, Houston Intercontinental, and Washington Dulles, the following general location patterns tend to occur for multi-family residential housing:

- Within 8 to 10 miles of the airport (prudent planning should be used to ensure that areas under flight paths remain clear of residential development).
- Along major arterials with high visibility.
- Near shopping/entertainment and services.
- Near employment centers.
- Accessible to interstate highways.[6]

The following development and location patterns occur for single-family residential areas:

- Within 20 miles of the airport.
- Within good school systems.
- Near large tracts of fully serviced land for development.
- Near shopping and services.

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[6] Economics Research Associates, Third Chicago Regional Airport Site Selection Study: Preliminary Estimate of Potential Economic Benefits, May 1991.

- Near interstate highways or major traffic arterials.

- Near recreational areas.

- Noise levels dictate residential development.[7]

Implications for One-Airport System

Residential development would follow employment under the one-airport system. A single airport at a new site would serve as a focus for residential development to the extent that it generates employment and the extent to which it is accessible to existing employment centers and housing stock.

Implications for Two-Airport System

Under a two-airport system, airport-related employment would not be concentrated at a single site and, therefore, the residential development impacts would not be as pronounced. If an airline hub were to move to one of the locations, residential development would increase following direct and indirect employment.

Implications for Three-Airport System

A three-airport system is unlikely to shift residential development patterns from current trends except due to land use planning.

10.7.6 Other Economic Diversification Roles

An airport which serves a combined industrial, commercial, research park, and educational role can, in many respects, be described as a tradeport. A tradeport is a mixed-use facility that combines intermodal transportation services, an employment center, and the tax incentives of a free trade zone. In addition to the passenger orientation of conventional airports, a tradeport focuses on cargo and industry. On-site air, rail, and trucking facilities, plus potential access to deep-sea ports provide seamless point-to-point transportation of goods. Within the tradeport's free trade zone, goods can be manufactured, assembled, and stored tax-free. Taxes are not imposed until goods are removed, creating an ideal situation for the on-site location of manufacturing, warehousing, and distribution.

In addition to serving as a general manufacturing and distribution site for international goods, a tradeport can be used for JIT production and delivery. Tradeports allow essential components to be manufactured and stored adjacent to various means of transportation, thereby ensuring rapid response to changing manufacturing and distribution requirements throughout the logistics pipeline.

To summarize, following are the various features that combine to form a tradeport:

- Strong focus on cargo operations.

- Commercial passenger activity with regularly scheduled flights.

- 24-hour customs service.

- Foreign trade zone, custom officers, facilities, and bonded space.

- Land available for future expansion.

- Air, trucking, shipping, and rail transportation.

- Extensive infrastructure (i.e., utilities and fiber optics networks).

[7] Ibid.

- Minimum of 10,000- to 12,000-foot runway, depending on markets served.

Therefore, a tradeport combines an industrial park with the international market attracted by the free trade zone, and with organized, integrated transportation to provide a smooth, uninterrupted process by which goods are manufactured, stored, and distributed quickly and efficiently.

Tradeports are complex, international, multimodal, economic activity centers. As such, a wide range of variables interact to effect success or failure. A tradeport must have a pro-active local and state government. Likewise, public opinion can assist, delay, or even prevent the creation of a tradeport. Having the facilities, the support, and the financing, a tradeport can be successfully created. However, the principal determining factor as to its success or failure ultimately lies in the ability to create traffic, harness demand, and attract commercial industries, freight forwarders, integrated carriers, and other transportation companies.

Although no existing airports in the United States meet all of the requirements and possess both the facilities and fundamental economic focus of a tradeport, several airports incorporate or plan to incorporate tradeport characteristics, such as Alliance Airport (Fort Worth, Texas); Global Transpark (Kinston, North Carolina), if developed as planned; and Pease International Tradeport (Portsmouth, New Hampshire). Of these facilities, Alliance has been successful in developing the broadest range of tradeport features, however, it more closely resembles an all-cargo airport than a true intermodal tradeport with extensive international traffic, industries, and passenger traffic.

Industries that can benefit from facilities and services provided by a tradeport include retail and commercial activities; conference/recreation centers; high-technology manufacturing, industrial, or research parks; assembly and distribution operations; JIT delivery manufacturing; and air cargo hubs.

Implications for One-Airport System

A single-airport system is likely to create the conditions necessary for the development of a tradeport. It is most likely to consolidate the international passenger traffic that would attract the wide-body service that could transform the airport into an international air cargo facility. Both Richmond and Newport News/Williamsburg are near existing rail and interstate highway systems. Richmond would have more land available for development as a tradeport than Newport News/Williamsburg. A new site, however, is most likely to have the large tracts of land necessary for an expanded tradeport but would need new infrastructure and utilities.

Implications for Two-Airport System

A two-airport system is likely to generate less international air cargo service than a single-airport system, but would retain many of the other tradeport advantages of the single-airport system, depending on the ultimate site of the primary airport. Again, land availability would be an important factor, and a new site would be most likely to have adequate amounts of developable land.

Implications for Three-Airport System

Under a three-airport system, passenger and cargo service would continue to be dispersed, and it is unlikely that there would

be sufficient international cargo service to encourage the development of a tradeport.

10.8 SURFACE TRANSPORTATION

10.8.1 Surface Transportation Technology

The use of existing and new technology requires considerations in the planning of surface transportation for the airport system. Long-range technological assumptions need to be made to evaluate each system alternative capability as a multimodal transportation facility.

Intelligent Transportation Systems

Intelligent transportation systems (ITS) include any number of the following features: traffic surveillance, real-time tracking, electronic toll collection, video image detection, variable message signs, highway advisory radio, in-vehicle route guidance system, and electronic weigh stations. In Virginia, construction of the Smart Road began in mid-1997 as a test facility for ITS. The Smart Road connects Blacksburg, Virginia, with I-81, as shown in **Figure 10-4**. ITS make it easier for people to get to the airport with a minimum of delays due to accidents, construction, and congestion.

The intelligent transportation technology in Hampton Roads and planned for the Richmond region includes vehicle surveillance, lane detection, an incident management system, and variable message signs. Technology to be used for the future in the study area may include real-time tracking, electronic toll collection, electronic weigh stations, video image detection, traveler information services, and a wireless communication system.

High-Speed Rail

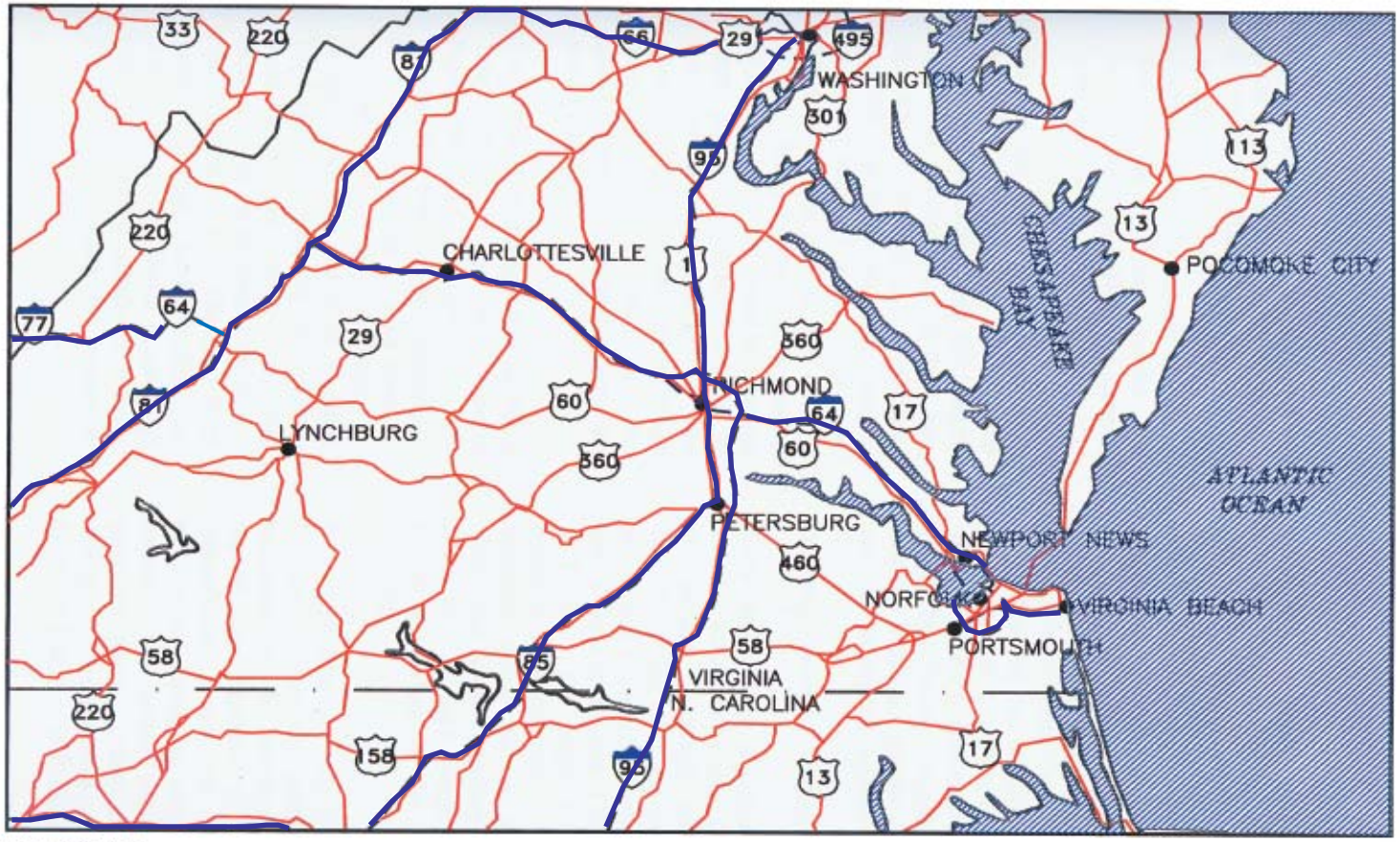
Since the Phase I study, there have been technological developments for high-speed rail and magnetic levitation trains. AMTRAK has developed new train specifications to meet U.S. standards, and a joint venture of the French SNCF and Canadian Bombardier firms was selected as the train supplier. The train selected has a speed of 155 mph with complete electrification. It should be noted, however, that this procurement included the purchase of 12 non-electric locomotives that will be equipped to pull fully operational tilt-train cars at speeds up to 155 mph. These trains will be used for non-electrified rail corridors such as the Virginia to North Carolina CSX line, as shown in **Figure 10-5**. The new electrified AMTRAK tilt-trains began operation in 1999 in the Northeast Corridor from Boston to Washington, D.C., at a maximum speed of 155 mph.

The fact that AMTRAK ordered 18 new 155-mph tilt-trains and 12 non-electrified locomotives, and the fact that Congress continues to fund these trains provides reasonable assurance that fast trains have become an integral part of the U.S. surface transportation system. Strong support is being provided by both the House and Senate to make high-speed ground transportation eligible for innovative financing, provide for state-spending flexibility for development of high-speed ground transportation, and for allowing federal partnership with states and private entities.

The Virginia Department of Rail and Public Transportation and the North Carolina Department of Transportation Rail Division continue to do whatever they can to bring about the increased use of fast passenger rail throughout Virginia and North Carolina.

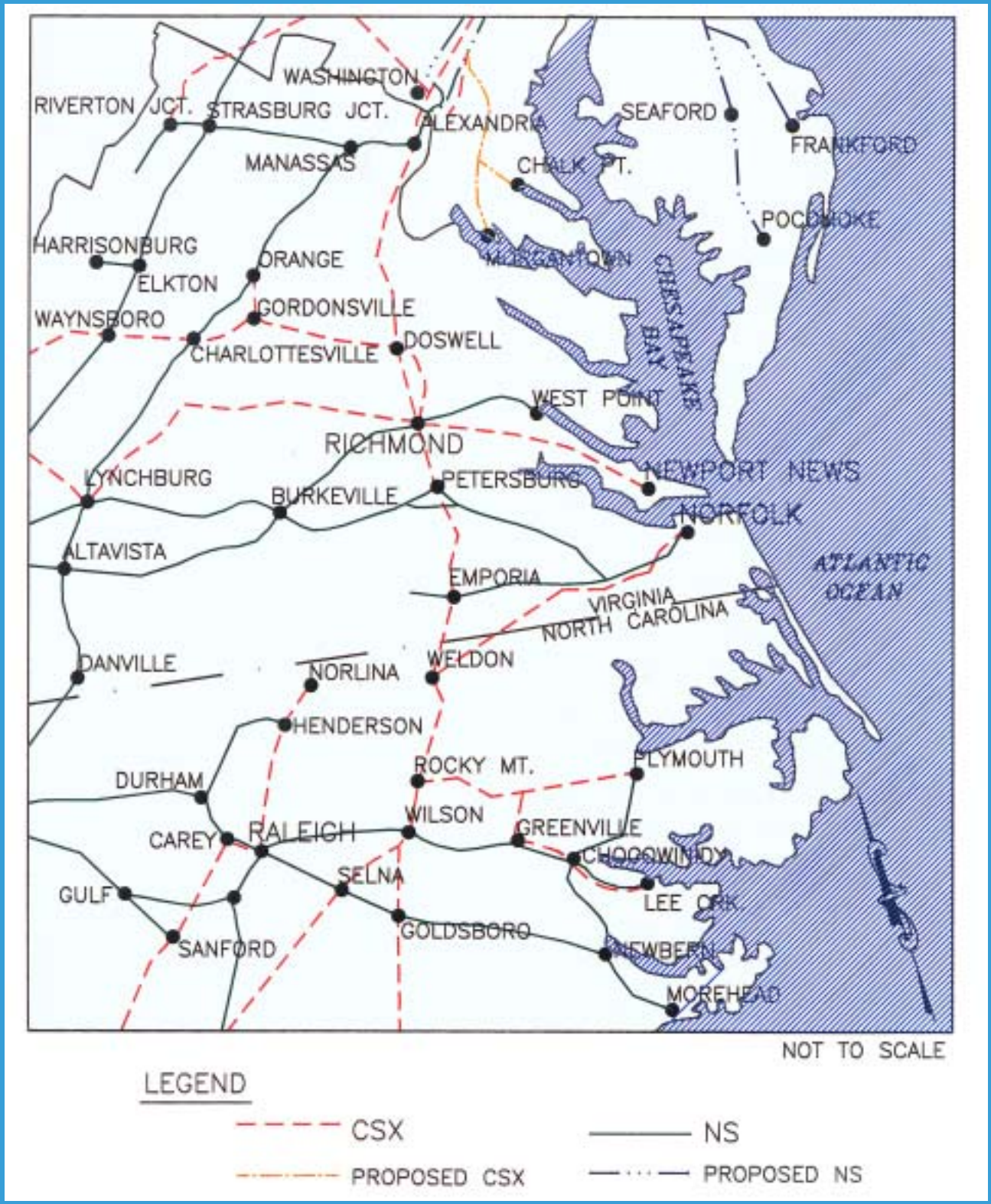
Interstate and Primary Road Map

FIGURE 10-4



Railroad Map

FIGURE 10-5



They are also continuing to encourage South Carolina and Georgia to join their effort to extend the Northeast Corridor 155-mph "fast train" from Charlotte, North Carolina, through South Carolina and Georgia to join the Florida planned high-speed rail system in Jacksonville, Florida. The Florida rail system will include the French TGV system, which travels at speeds over 200 mph.

In 1993, the Federal Rail Administration (FRA) designated the Washington, D.C-Richmond--Raleigh-Charlotte corridor as a high-speed rail corridor, with assurance to both Virginia and North Carolina that they would each be granted $500,000 annually for 6 years to assist with the high-speed rail corridor development program. Early on, Virginia and North Carolina determined that they would work together on an incremental up-grade basis and move ahead as rapidly as possible, based upon the availability of funds. They also determined that they would not provide electrification until resources became available.

The western part of the study area contains the Washington D.C.-to-Richmond-to-Charlotte, North Carolina high-speed rail corridor. The Commonwealth of Virginia recently completed a study of the Washington-to-Richmond corridor. This study recommended a 6-stage incremental approach toward contracting recommended improvements. The total cost for all recommended improvements was $330 million. Purchase of several high-speed train sets (i.e., 110 mph) and construction of a third tract are provided for in various stages, allowing additional capacity and reducing travel time from 120 minutes to 79 minutes.

Magnetic Levitation (Maglev)

There has been no significant magnetic levitation activity in the United States since late 1995, when the German Transrapid maglev team concluded that they were not able to fund a 14-mile maglev system from Orlando to the edge of Disney World in Florida. The single, active maglev project in the world today is the German transrapid system between Hamburg and Berlin. It is a 350-mph system that is a showcase for the world.

It is appropriate to note that Senator Moynihan is assembling draft legislation for the development of "a segment or segments of a maglev transportation system for use in a public/private partnership with at least 33 percent of full project cost paid using nonfederal funds." Three projects are being considered for this effort: Baltimore to Washington, D.C., Albany to New York City, and Las Vegas to the California state line. No public announcement of this venture has been made except in an early draft of a portion of the legislation.

10.8.2 Multimodal Transportation Role

Linking different modes of transportation such as highway, rail, and air travel for future facilities and existing facilities improvements is an important part of the planning process. Multi-modal facilities are on the increase, with legislation such as the Intermodal Surface Transportation Efficiency Act (ISTEA) requiring more efficient use of federal transportation funding. The multimodal assumptions for each airport system alternative will be described. The main transportation modes to be linked to the systems alternatives include highway, light rail, conventional rail, and high-speed rail. Water transport is not likely a direct multi-modal link to the airport alternatives, however, the ease of transport between port facilities and airport facilities must be considered in evaluating the alternatives.

Surface Transportation Studies

The following studies significantly impact the surface transportation corridors for the southeast region. These studies are depicted in **Figure 10-6**.

I-64 Major Investment Study

The 75-mile I-64 corridor from Richmond to Hampton is being studied to address mobility problems. This study identifies, describes, and evaluates alternative modes, intelligent transportation technologies, general alignment, capacity, operating characteristics, and demand management strategies. For a critical section of this corridor, an additional lane in each direction has been recommended from the I-64/I-664 interchange in Hampton to the I-64/Route 143 interchange in Newport News. These lanes are used as HOV lanes during peak travel periods. A range of alternatives, including operational, rail, and highway improvements, are identified and evaluated, and a locally preferred alternative was selected in the spring of 1998.

Six conceptual alternatives range from no build to maximum highway and rail improvements. Highway improvements may include additional single-occupancy vehicle lanes, HOV lanes, and an intelligent transportation system. Rail improvements may include upgrade of existing tracks, addition of train control devices, new equipment, new stations, and an additional track for passenger use with a maximum speed of 125 mph. New rail stations will be multi-modal transit centers, and locations include RIC and PHF.

CSX Corridor Major Investment Study

The 28-mile corridor from Williamsburg to Newport News is nearly 6 miles from Newport News to Hampton. The CSX Corridor MIS identifies transportation needs within the corridor, identifies transportation options, and evaluates these options.

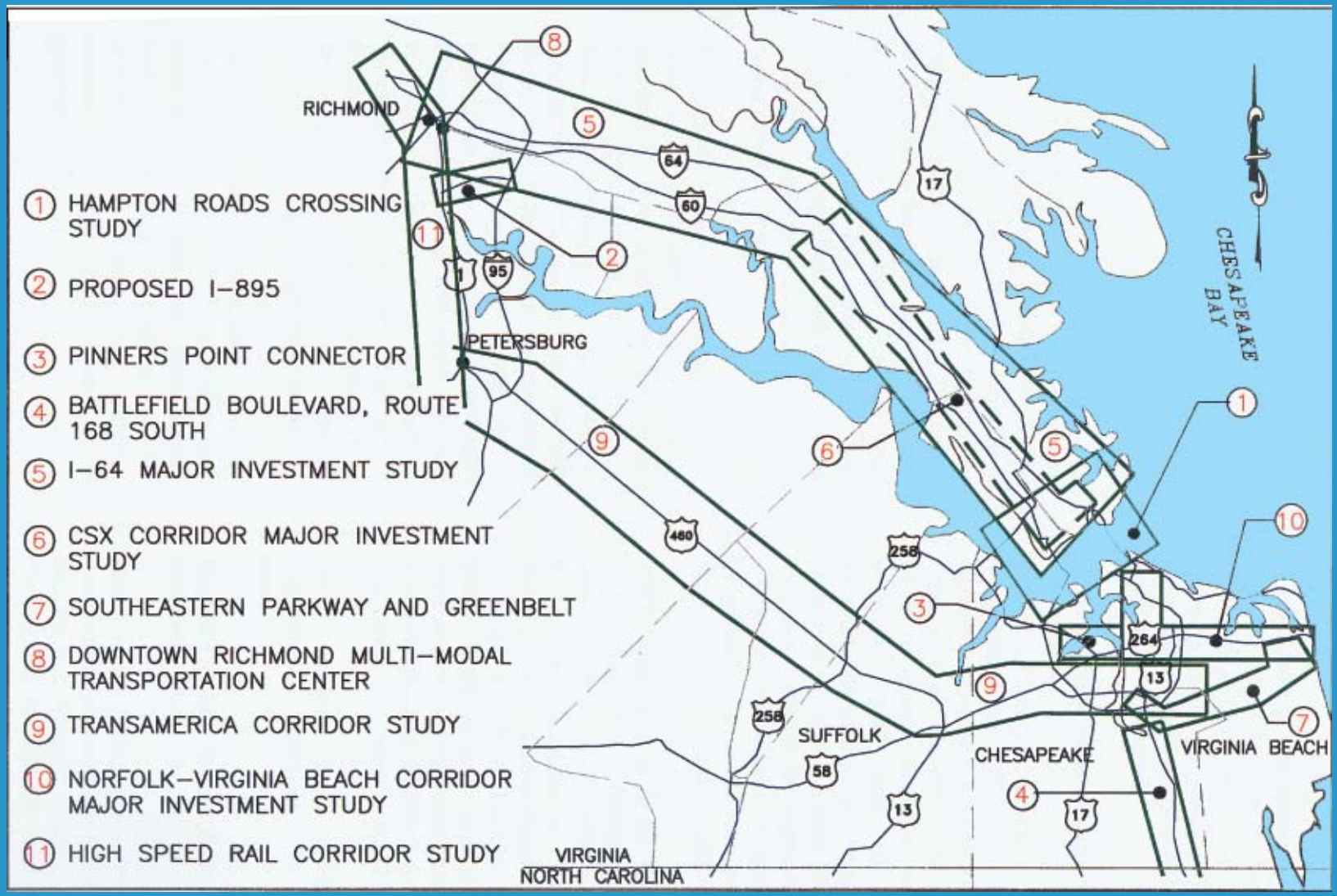
Six transportation options were evaluated, including travel demand management strategies, enhanced bus service, construction of an HOV lane/busway along the CSX right-of-way corridor and Pembroke Avenue, and implementation of a light rail system along the CSX right-of-way. The locally preferred alternative was selected in late 1997.

Hampton Roads Crossing Study

The purpose of this study was to investigate innovative multimodal solutions to the congestion problem at the I-64 crossing of Hampton Roads. Without improvements, traffic could be delayed 15 minutes or more every hour. Initially, 45 possible solutions were identified, including options such as constructing new transportation facilities, upgrading existing roadways, and implementing congestion management strategies.

The alternative chosen for approval by the Hampton Roads MPO as the locally preferred corridor (alternative number 9), parallels I-664, includes a direct connection from the Peninsula to the Norfolk International Terminals and the Norfolk Naval Base, and provides a connection across Craney Island to Route 164 in Portsmouth. The Commonwealth Transportation Board made the final selection of the preferred corridor in September 1997. The actual alignment of the facility in the preferred corridor will be determined with more detailed environmental and engineering analyses.

Each of the transportation corridor alternatives includes a 3-tube tunnel


1 HAMPTON ROADS CROSSING STUDY
2 PROPOSED I–895
3 PINNERS POINT CONNECTOR
4 BATTLEFIELD BOULEVARD, ROUTE 168 SOUTH
5 I–64 MAJOR INVESTMENT STUDY
6 CSX CORRIDOR MAJOR INVESTMENT STUDY
7 SOUTHEASTERN PARKWAY AND GREENBELT
8 DOWNTOWN RICHMOND MULTI–MODAL TRANSPORTATION CENTER
9 TRANSAMERICA CORRIDOR STUDY
10 NORFOLK–VIRGINIA BEACH CORRIDOR MAJOR INVESTMENT STUDY
11 HIGH SPEED RAIL CORRIDOR STUDY
RICHMOND
PETERSBURG
SUFFOLK
CHESAPEAKE
VIRGINIA BEACH
CHESAPEAKE BAY
VIRGINIA
NORTH CAROLINA
64
60
17
95
1
460
258
264
13
58

crossing. Two tubes will carry vehicle traffic and the third tube could be used for reversible HOV lanes, an exclusive busway, exclusive truck lanes, or a passenger rail service.

A new crossing will decrease travel times from the Southside to the Peninsula. It will not have as great an impact on a new airport located near Route 460, but travel times from the Peninsula are expected to be reduced.

Transamerica Corridor Feasibility Study

The Transamerica Corridor Feasibility Study began in 1989 with seven states meeting to discuss a Virginia-to-California corridor located between Interstates 70 and 40. A federal study of the corridor concluded that there is no one transportation system fully viable as a new coast-to-coast service. However, parts of the nation may show promise for segments of a new system. The National Highway System Designation Act calls for the study of a Virginia-West Virginia corridor.

The Virginia Department of Transportation (VDOT) began a study of the Virginia-West Virginia corridor in March 1997. This feasibility study evaluated I-64 from Beckley, West Virginia, to Clifton Forge, Route 220 from Clifton Forge to Roanoke, and Route 460 from Roanoke to Virginia Beach. It focused on upgrading existing roads and not on other modal options, such as rail or intelligent highway systems. The final report was published in July 1998.

Other studies that involve local transportation corridors are described below.

Norfolk-Virginia Beach Corridor Major Investment Study

This study evaluated transit and transportation improvements in the 18-mile corridor from Virginia Beach to downtown Norfolk and the 12-mile corridor to the Norfolk Naval Base. Light rail transit was selected as the locally preferred alternative in January 1997. Preliminary engineering and the final environmental impact statement for light rail transit are proceeding.

The addition of a light rail system between Virginia Beach and Norfolk will improve travel times within the region. A future possible extension of the light rail will be to the Norfolk International Airport. Connections to the Newport News/ Williamsburg International Airport will have to be by bus, another rail system, or automobile. A new airport located near Route 460 will have to be connected to this light rail system by another rail system, bus, or automobile.

Southeastern Parkway and Greenbelt

The Southeastern Parkway and Greenbelt will provide a connection between the intersections of I-64 and I-464 in Chesapeake and State Route 44 in Virginia Beach. The Parkway and Greenbelt will be constructed as four lanes with provision for two HOV lanes to be constructed in the median. A HOV trigger mechanism will be used to determine when implementation of an HOV lane is needed. Multimodal options for the project include a transit corridor, bikeway, and park and ride lots.

The final EIS is in process and the project has been approved by the Commonwealth Transportation Board. Design of the parkway was scheduled to begin in January 1998.

Pinners Point Connector

A new interchange at Pinners Point in Portsmouth will connect the Western Freeway with Route 58 near the Midtown Tunnel. A design public hearing was held in January 1997. Traffic and financing strategies are being evaluated.

Battlefield Boulevard, Route 168 South

A final EIS has been prepared for a new 4-lane divided, limited access facility from the North Carolina state line to the Great Bridge Bypass in Chesapeake, Virginia. The City of Chesapeake completed a traffic and revenue study for this facility in the summer of 1997.

Proposed I-895

The proposed I-895 will connect south Richmond and Chesterfield County with east Henrico Couny and Richmond International Airport. This new road will be a 4-lane limited access facility crossing the James River from I-95/Chippenham Parkway to I-95 south of I-64, with access at Laburnum Avenue. There is also provision for a Direct Airport Access Road Feasibility Study that will connect I-895 and I-64 with the airport terminal.

Construction of I-895 has been proposed under the Public-Private Transportation Act of 1995 (PPTA). The state has conducted all preliminary engineering work for this project and is currently negotiating with the Fluor Daniel and Morrison Knudsen LLC joint venture for project financing, toll rates, and state/federal support.

Port Expansion

Craney Island in Portsmouth is being studied as the site of a new marine terminal in Hampton Roads. This site would require expansion of rail service to Craney Island and road improvements. The report on the future of Craney Island as a port was due to the state legislature in December 1997.

The *Virginia Port Authority 2010 Plan* outlines future expansion at the Norfolk International Terminal. The expansion area will include two new 1,500-foot berths, 120 acres of container storage, and a new intermodal handling facility.

Define Surface Transportation of Each Alternative

The role of surface transportation for each airport system needs to be defined to evaluate the ability to meet the capacity and other needs. The modes of surface transportation to be evaluated include highway, conventional rail, high-speed rail, light rail, and water transportation. To be competitive for the future, highway and rail are the main modes of concern for a multi-modal airport facility.

Two-Airport System Alternative

A two-airport system will require surface transportation corridors that will be adequate to minimize travel time, which will depend on more convenient vehicle and commuter rail. Conventional and high-speed rail may be the optimum mode of travel for passengers farther away.

<u>Richmond International Airport</u>

Future expansion of the local roads serving the airport is possible. The I-64 highway improvements to be proposed in the MIS will help congestion problems for traffic from the southeast. Charles City Road can be used to reach the airport from the southwest direction via I-295 and future I-895.

Proposals for improving bus service include expansion of the existing service area and a cross-town bus connection in the airport area. A proposed transit transfer center near the airport would provide connections between trunkline services, express bus services, cross-town connections, and a proposed nearby park-and-ride facility.

Light rail transit is a long-term possibility in the Richmond metropolitan area. The renovation of the Main Street Station in downtown Richmond will impact the airport by allowing intermodal passenger transfer such as from proposed high-speed rail to light rail, automobile to rail, or conventional rail to bus/taxi to the airport as a destination.

Rail cargo to the airport is currently served by a spur of the CSX track. Future service may be improved with the study of high-speed rail. Transportation of cargo from the Port of Richmond Terminal is primarily accomplished by truck traffic, however, CSX maintains and operates a track to the terminal.

Newport News/Williamsburg International Airport

Interstate highway access is provided by I-64, which is part of a MIS, as described previously. All alternatives would improve vehicle transportation on I-64 to the airport from both north and south directions. From the south, the Hampton Roads new crossing is most critical if this airport is used in the two-airport system. A rail link via the new crossing would improve passenger access from the Southside to the Peninsula, especially if it connects to the proposed Virginia Beach-to-Norfolk light rail transit. Truck cargo transportation from the Norfolk International Terminals to PHF would also be greatly improved by the new crossing. The I-64 MIS and the CSX Corridor Study should favorably impact passenger rail transportation to the airport. The AMTRAK station in Newport News is the closest existing transfer point for passenger rail to PHF. The CSX track is located 6,000 feet from the existing terminal building.

A traffic management system and an additional lane in each direction are planned for I-64 north and south of the airport. A proposed interchange with I-64 and Bland Boulevard was included in the *Hampton Roads 2015 Regional Transportation Plan*.

New Airport Location

A new airport located in the Hampton Roads area would need roadway improvements with adequate capacity to serve a new airport. The Transamerica Study evaluated Route 460 to determine the feasibility of upgrading this route. The addition of a new crossing will help improve travel times to a new airport from the Peninsula. Some of the proposed alternatives for the new crossing may parallel I-664, which could provide easier access to Route 460 and the new airport.

The existing Norfolk Southern track located parallel to Route 460 would provide the main means for passenger and cargo rail transportation to a new airport. In Suffolk, near the junction of Route 460 and Route 58, Norfolk Southern and CSX tracks cross and continue to Norfolk and Portsmouth, respectively. High-speed rail may be a possibility along this corridor. The FRA is planning to standardize railroad signal systems from Baltimore to Richmond to Raleigh to Charlotte for CSX, Norfolk Southern, VRE, and the MARC commuter system. The new signaling system would probably be a wireless signal system. It is expected that the rehabilitation of the CSX rail line from Richmond south to the Virginia/North Carolina boundary will be studied in the future.

One-Airport System

A one-airport system located near Surry County would require major roadway improvements to Route 460 to provide adequate capacity. Travel from the Richmond area would require a rail system, preferably a high-speed rail passenger system, to reduce travel times. The multi-modal conditions for a new airport described in the two-airport system would also apply to the one-airport system.

Three-Airport System

Long-distance surface travel from Richmond to Hampton Roads would not be important in a three-airport system. RIC and PHF would be served by the surface transportation systems described in the two-airport system. The inclusion of a rail line in the new crossing is not as critical for a three-airport system. Local commuter rail to each airport would provide multi-modal capabilities for passenger travel. For the Norfolk International Airport, this would mean an extension of the proposed light rail transit corridor from Virginia Beach to Norfolk. Improvements such as ITS to I-64 would help provide the required highway capacity to the Norfolk International Airport. Conventional rail transport to ORF is possible with Norfolk Southern and ESHR tracks located on the southeastern edge of the airport property.

10.9 REVISED FORECASTS

This section discusses the revised activity forecasts for the eastern Virginia Airport System Study. Four years have passed since the Phase I forecasts were developed. During this time, the following events transpired, which could materially affect the forecasts:

- The economic recovery.
- The continued emphasis on cost and fare reduction by the airlines.
- Air cargo growth continuing to exceed expectations.
- The passage of NAFTA and several "open skies" agreements.
- Revised economic and population forecasts.
- Revised aviation industry forecasts of fares, air cargo activity and international activity.
- A refinement of the definition of the airport system alternatives.

These changes warrant a re-examination of the assumptions underlying the activity forecasts and a revision of the forecasts if the changes in the assumptions are material.

This section begins with a discussion of the factors that have changed since the Phase I forecasts, and continues with a revision of the Base Case passenger forecast. Revised international passenger and air cargo forecasts follow. The section concludes with revised passenger distribution forecasts for 2010, 2020, and 2030 based on the new Base Case forecast and a high range forecast.

10.9.1 Recent Trends Affecting Forecast Activity

As noted in the introduction, there have been several recent economic and aviation industry trends that may affect the forecast.

Since 1992, there has been a steady economic recovery, fueled by low inflation and expanded international trade. The revised BEA and VEC forecasts (see Section 10.4) have incorporated the revised Census projections used in the Phase I study, and

assume expanded immigration, reduced death rates, and a moderate reduction in birth rates. Although employment is expected to continue to increase, wage increases are projected to be low, resulting in only moderate increases in income.

Contrary to projections four years ago, the FAA now expects the air carriers to be able to continue to cut costs despite new aircraft purchase requirements and the transition to quieter Stage 3 aircraft. Eastern Virginia had a preliminary experience with low-cost carriers when Continental introduced low-cost service at Norfolk in 1994. Although the Continental experiment did not succeed, there are now some indications that Southwest Airlines may introduce low-cost service to either Richmond or Norfolk, or possibly both airports.

Trends towards globalization have continued with the passage of the North American Free Trade Agreement (NAFTA), which was followed by the liberalization of air routes between the United States and Canada. In addition, "open skies" agreements have been negotiated between the United States and the Netherlands, Singapore, and several other countries.

Aircraft manufacturers such as Boeing have become more optimistic regarding the air cargo industry as growth in that sector has continued to exceed expectations.

Taken together, these events suggest that there have been enough changes in the economic and aviation industry environments to warrant a change in the forecasts.

10.9.2 Revised Domestic Passenger Forecasts

Table 10.5 presents the revised Base Case forecast of domestic passenger enplanements for the eastern Virginia region. The forecasting equation is the same as the one used in the original forecast (also explained in Table 10.5 notes). The equation incorporated assumptions on population, per capita income, average fares, service factor, the propensity to fly factor, the teleconferencing factor, average seats per aircraft, and enplaning load factor. The assumptions are described below:

Population

The revised population projections presented in Table 10.4 were used. As noted in Section 10.4, the revised VEC population forecasts, as adjusted by the PDCs, were used as the basis for these projections.

Per Capita Income

The revised per capita income projections presented in Table 10.4 were used.

Service Factor

As in the initial analysis, the service factor was defined as the number of daily jet flights to large, medium, and small hub airports plus one-half the number of daily commuter flights to large, medium, and

Table 10.5

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Base Case Regional Forecast of Domestic Originations and Enplanements

	1990	1992	1994	1996	2000	2010	2020	2030
Originations (a)	2148820	2013860	2,590,180	n/a	3,126,000	4,358,000	5,695,000	7,432,000
Hubbing Ratio (b)	1.12	1.18	1.17	n/a	1.15	1.15	1.15	1.15
Enplanements (c)	2409058	2383307	3,019,003	2,641,587	3,595,000	5,012,000	6,549,000	8,547,000
Average Seats Per Aircraft (d)	n/a	83.6	n/a	76.8	79.3	84.0	88.1	92.2
Enplaning Load Factor (e)	n/a	0.454	n/a	53.4%	53.7%	53.7%	53.7%	53.7%
Enplanements/Departure (f)	37.7	38	n/a	41.0	42.6	45.1	47.3	49.5
Aircraft Departures (g)	63873	62719	n/a	64,466	84,400	111,000	138,300	172,500
Service Factor (h)	150.5	145	n/a	146.25	191.5	251.8	313.8	391.3
Population (i)	3339400	n/a	3,532,700	n/a	3,756,194	4,167,943	4,583,186	4,996,807
Per Capita Income (1996$) (j)	20464.65	n/a	20,969	n/a	22,021	24,344	26,231	28,464
Average Fare (1996$) (k)	180.3921	n/a	$ 148.98	$160.91	$ 152.57	$ 145.58	$141.80	$ 138.04
Propensity to Fly Factor (l)	1	1	1.000	1.000	1.025	1.056	1.089	1.122
Teleconferencing Factor (m)	1	1	1.000	1.000	0.989	0.975	0.961	0.947

Notes:
(a) Calculated using following equation:

ORIG = POP x [(2.7182818^-8.631476) x (PCI^1.088983) x (FARE^-.7188044) x (SERVICE ^ .2548855)]

where: ORIG = Originating passengers
POP = Population in catchment area
PCI = Per capita income in catchment area
FARE = Average fare in 1996 dollars.
SERVICE = Total service level (daily jet flights to large, medium and small hub airports plus one-half daily commuter flights to large, medium and small hubs).

Corrected R-squared = .939
Durbin-Watson = 1.344
t-statistics
PCI = 2.821
FARES = -3.380
SERVICE = 1.282

(b) Ratio of 1995 enplanements to originations. Assumed to remain constant through forecast period.
(c) Originations multiplied by hubbing ratio.
(d) Growth rate from Phase I Study (Table 4.4) applied to 1996 seats per aircraft.
(e) Assumed to increase at same rate as FAA projected rate for domestic air carriers.
(f) Average seats per aircraft multiplied by enplaning load factor.
(g) Enplanements divided by enplanements per departure.
(h) Daily jet flights to large, medium, and small hub airports plus one-half daily commuter flights to large, medium and small hub airports. Assumed to increase at same rate as aircraft departures.
(i) Revised projected population for catchment area (see Table 10.3.1).
(i) Revised projected per capita income for catchment area (see Table 10.3.1).
(k) Assumed to increase at FAA projected rate of increase for yield multiplied by FAA projected rate of increase for average trip distance.
(l) Assumes that by 2030 Eastern Virginia generates the same number of originations per capita as average Eastern Seaboard airport, after adjustments for relative differences in per capita income, service levels, and fares. (m) Assumes that 10 percent of business market, which is 53 percent of total market, would be diverted by teleconferencing by 2030.

Sources: FAA Aviation Forecasts: Fiscal Years 1997-2008, FAA Long-Range Aviation Projections: Fiscal Years 2004-2015, and U.S. Department of Commerce BEA Regional Projections to 2045.

small hub airports. The service factor was assumed to grow at the same rate as commercial aircraft departures from a recalculated 1996 base.

Average Fare

The average real fare was projected to continue to decline at the FAA-projected rate of decrease in yield (revenue per passenger mile) multiplied by the FAA-projected increase in average trip length. (Average fare = average revenue per passenger mile multiplied by average trip length).

Propensity to Fly Factor

The propensity to fly, after adjustments for per capita income and fare and service levels is assumed to increase to the East Coast average, as in the Phase I study.

Teleconferencing Factor

The rate of substitution of teleconferencing for business travel was assumed to be the same as the Phase I study.

Hubbing Ratio

The Base Case hubbing ratio, the ratio of enplanements to originations, was assumed to continue at 1995 levels for the forecast period. The year 1995 was the last calendar year for which originations data were available and a hubbing ratio could be calculated.

Average Seats Per Aircraft

Average seats per aircraft were projected to increase at Phase I forecast levels from a revised 1996 base year level. The Phase I assumptions, developed in conjunction with the Steering Committee, assumed a more moderate increase than the FAA. Since the number of seats per aircraft in the region has actually declined slightly over the past 4 years, it would not be prudent to assume the faster FAA growth rates.

Enplaning Load Factor

Since reductions in yield and fares are contingent on continuing high load factors, the FAA load factor growth rates were applied to existing enplaned load factors.

Forecast Results

As shown in Table 10.5, under the revised forecast, total domestic enplanements are projected to increase from 2.6 million in 1996 to 8.6 million in 2030, an average annual increase of 3.5 percent. Aircraft departures are projected to increase from 64,466 to 172,500, an average annual increase of 2.9 percent.

10.9.3 Comparison of Phase I and Phase II Forecast Results

Table 10.6 summarizes the differences between the original Phase I forecast and the revised forecast just described. Also included are differences in the key inputs. As shown, the revised forecast shows lower growth in the early years, but much faster growth thereafter. The per capita income forecasts used in the two forecasts are similar but the revised population forecasts are higher, especially in the out years. Although part of the increase in forecast levels is explained by the higher population projections, the principal difference in the forecasts results from changes in the assumptions on fares. The original forecast assumed a sharp drop in fares resulting from the introduction of a low-cost carrier until 2000, followed by a moderate increase for the remainder of the forecast period. The

Table 10.6

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Comparison of Original and Revised Forecasts of Domestic Originations and Enplanements

	1990	1992	1994	1996	2000	2010	2020	2030
Originations								
Original	2,148,820	2,013,860	n/a	n/a	3,695,000	4,452,000	5,205,000	6,186,000
Revised	n/a	n/a	2,590,180	n/a	3,126,000	4,358,000	5,695,000	7,432,000
Hubbing Ratio								
Original	1.12	1.18	n/a	n/a	1.18	1.18	1.18	1.18
Revised	n/a	n/a	1.17	n/a	1.15	1.15	1.15	1.15
Enplanements								
Original	2,409,508	2,383,307	n/a	n/a	4,373,000	5,269,000	6,160,000	7,321,000
Revised	n/a	n/a	3,019,003	2,641,587	3,595,000	5,012,000	6,549,000	8,547,000
Average Seats Per Aircraft								
Original	n/a	83.6	n/a	n/a	89.1	94.4	99.0	103.6
Revised	n/a	n/a	n/a	76.8	79.3	84.0	88.1	92.2
Enplaning Load Factor								
Original	n/a	45.4%	n/a	n/a	51.2%	51.2%	51.2%	51.2%
Revised	n/a	n/a	n/a	53.4%	53.7%	53.7%	53.7%	53.7%
Enplanements/Departure								
Original	37.7	38.0	n/a	n/a	45.6	48.3	50.7	53.1
Revised	n/a	n/a	n/a	41.0	42.6	45.1	47.3	49.5
Aircraft Departures								
Original	63,873	62,719	n/a	n/a	95,900	109,000	121,500	138,000
Revised	n/a	n/a	n/a	64,466	84,400	111,000	138,300	172,500
Service Factor								
Original	150.5	145.0	n/a	n/a	221.7	252.0	280.9	319.0
Revised	n/a	n/a	n/a	146.3	191.5	251.8	313.8	391.3
Population								
Original	3,339,400	n/a	n/a	n/a	3,748,399	4,129,451	4,467,603	4,766,872
Revised	n/a	n/a	3,532,700	n/a	3,756,194	4,167,943	4,583,186	4,996,807
Per Capita Income (1996$)								
Original	$20,465	n/a	n/a	n/a	$23,394	$25,149	$26,460	$28,505
Revised	n/a	n/a	$20,969	n/a	$22,021	$24,344	$26,231	$28,464
Average Fare (1996$)								
Original	$180.39	n/a	n/a	n/a	$138.99	$146.49	$150.95	$155.53
Revised	n/a	n/a	$148.98	$160.91	$152.57	$145.58	$141.80	$138.04
Propensity to Fly Factor								
Original	1.000	1.000	n/a	n/a	1.025	1.056	1.089	1.122
Revised	n/a	n/a	1.000	1.000	1.025	1.056	1.089	1.122
Teleconferencing Factor								
Original	1.000	1.000	n/a	n/a	0.989	0.975	0.961	0.947
Revised	n/a	n/a	1.000	1.000	0.989	0.975	0.961	0.947

Sources: Table 1.5 and Phase I: Table 4.4.

revised fare assumptions assume a more moderate decline until 2000, but also assume that this decline will continue for the remainder of the forecast period. By 2030, the revised fare projections are 11 percent lower than the original fare projections. These assumptions drive a revised enplanement forecast that trails the Phase I forecast in the early years but exceeds the Phase I passenger levels by about 17 percent by 2030.

Table 10.7 compares the differences in growth rates between the original Phase I and revised domestic passenger forecasts and critical assumptions. The earlier eastern Virginia Air Service Demand Study to the year 2030 (EVASDS) is included for comparison purposes. The EVASDS study, completed in November 1991, was an initial assessment of the need and potential for a new regional airport serving the eastern Virginia area.

10.9.4 International Passenger Forecasts

The methodology used to project international passenger activity was the same as that used in Phase I, except that more recent industry projections of international air passenger growth were incorporated.

Table 10.8 shows the revised forecast of passenger enplanements. These forecasts incorporate revised domestic passenger forecasts for the Canadian and Mexican markets and the international passenger growth rates used in the 1997 Boeing forecasts for the other international markets. When compared to the Phase I forecasts, the revised international forecasts are slightly higher in all markets except Nassau. Overall, the forecast of potential international passengers is approximately 12 percent higher in the revised projections.

10.9.5 Revised Air Cargo Forecasts

Table 10.9 presents the revised regional air cargo forecasts, including air freight and air mail. The revised air cargo forecasts reflect the recent rapid growth in regional air cargo, especially in Richmond, in the revised 1996 base year numbers. Air freight is assumed to increase at the same rate as the Boeing forecast for domestic air freight, adjusted by the difference in economic growth between the catchment area and the United States, as measured by income. The Boeing forecasts only extend to 2015. After 2015, the rate of air freight growth was assumed to continue to taper at the same rate as during the first 20 years. As shown, total enplaned air freight is projected to increase from 33,501 tons in 1996 to 209,900 tons in 2030.

In contrast to air freight, air mail has not grown as rapidly as anticipated in Phase I. A more moderate growth rate has been assumed, based on FAA forecasts of domestic air mail, adjusted for differences in projected income growth between the catchment area and the United States. As shown, total enplaned air mail is projected to increase from 9,715 tons in 1996 to 24,100 tons in 2030.

10.9.6 Distribution of Aviation Activity

This subsection discusses the revised distribution forecasts for the one-airport, two-airport and three-airport scenarios. Six distribution scenarios are included:

Single-Airport System

- Consolidated at search area 1 (see Figure 10-7). (Corresponds to Alternative 3 in Phase I.)

Table 10.7

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Comparison of Growth Rates

	Average Annual Growth Rate (in percent)				
	1980-1990	1990-2000	2000-2010	2010-2020	2020-2030
EVASDS Study (a)	3.7	4.7	4.0	3.7	3.2
Phase I Forecast					
Base Case Originations Forecast (b)	4.8	5.6	1.9	1.6	1.7
Population (b)	1.4	1.2	1.0	0.8	0.7
Income (b)	3.5	2.5	1.7	1.3	1.4
Per Capita Income (b)	2.0	1.3	0.7	0.5	0.7
Fares (b)	(0.7)	(2.6)	0.5	0.3	0.3
Income Spent on Air Travel (b)	3.0	2.9	2.4	1.9	2.0
Revised Phase II Forecast					
Base Case Originations Forecast (c)	4.8	3.8	3.4	2.7	2.7
Population (c)	1.4	1.2	1.0	1.0	0.9
Income (d)	3.5	1.9	2.1	1.7	1.7
Per Capita Income (c)	2.0	0.7	1.0	0.7	0.8
Fares (c)	(0.7)	(1.7)	(0.5)	(0.3)	(0.3)
Income Spent on Air Travel (e)	3.0	2.1	2.9	2.4	2.4

(a) SH&E, Inc., Eastern Virginia Air Service Demand Study to the Year 2030.
(b) Phase I Report.Table 4.5.
(c) Table 1.4.
(d) Table 1.4.
(e) Growth rate in originations multiplied by growth rate in fares.

Sources: As noted and IMG analysis.

(Base Case) (a) 2000-2030

Table 10.8

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Potential Eastern Virginia Scheduled Enplanements and Weekly Flights to Selected International Destinations (Base Case) (a) 2000-2030

Route	2000	2010	2020	2030
NAFTA Markets				
Eastern Va.-Toronto				
Local Market	41,000	58,000	75,000	98,000
Hinterland	2,000	2,000	3,000	4,000
Total	43,000	60,000	78,000	102,000
Weekly Flights:	8	12	15	20
Eastern Va.-Montreal				
Local Market	35,000	49,000	64,000	84,000
Hinterland	2,000	2,000	3,000	4,000
Total	37,000	51,000	67,000	88,000
Weekly Flights:	7	10	13	17
Eastern Va.- Vancouver				
Local Market	18,000	24,000	32,000	42,000
Hinterland	-	-	-	-
Total	18,000	24,000	32,000	42,000
Weekly Flights:	3	5	6	8
Eastern Va.- Mexico City				
Local Market	21,000	35,000	55,000	87,000
Hinterland	-	-	-	-
Total	21,000	35,000	55,000	87,000
Weekly Flights:	4	7	11	18
Non-NAFTA Markets				
Eastern Va.-London				
Local Market	30,000	45,000	64,000	93,000
Hinterland	2,000	3,000	5,000	7,000
Total	32,000	48,000	69,000	100,000
Weekly Flights:	3	4	7	10
Eastern Va.-Frankfurt				
Local Market	23,000	34,000	48,000	69,000
Hinterland	4,000	6,000	9,000	13,000
Total	27,000	40,000	57,000	82,000
Weekly Flights:	2	3	5	7
Eastern Va.-Paris				
Local Market	11,000	16,000	23,000	33,000
Hinterland	4,000	6,000	8,000	12,000
Total	15,000	22,000	31,000	45,000
Weekly Flights:	1	1	2	3

Table 10.8

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Potential Eastern Virginia Scheduled Enplanements and Weekly Flights to Selected International Destinations (Base Case) (a) 2000-2030

Route	2000	2010	2020	2030
Eastern Va.-Tokyo				
Local Market	7,000	14,000	25,000	44,000
Hinterland	-	-	-	-
Total	7,000	14,000	25,000	44,000
Weekly Flights:	0	1	1	3
Eastern Va.-Seoul				
Local Market	8,000	16,000	28,000	49,000
Hinterland	-	-	-	-
Total	8,000	16,000	28,000	49,000
Weekly Flights:	0	1	2	3
Eastern Va.-Hong Kong				
Local Market	3,000	6,000	10,000	17,000
Hinterland	-	-	-	-
Total	3,000	6,000	10,000	17,000
Weekly Flights:	0	0	0	1
Eastern Va.-Nassau				
Local Market	14,000	20,000	27,000	37,000
Hinterland	0	0	0	0
Total	14,000	20,000	27,000	37,000
Weekly Flights:	2	4	5	7
Total Potential Traffic				
Local Market	211,000	317,000	451,000	653,000
Hinterland	14,000	19,000	28,000	40,000
Total	225,000	336,000	479,000	693,000
Weekly Flights:	30	48	67	97
Total Potential Traffic Assuming Flight Threshold and No Hinterland Traffic				
Local Market	106,000	245,000	365,000	636,000
Hinterland	0	0	0	0
Total	106,000	245,000	365,000	636,000
Weekly Flights:	18	41	62	96

Notes:
(a) No time delay penalty used in circuity analysis.
(b) Three flights/week for overseas flights and five flights/week for North American flights.

Source: IMG analysis.

Table 10.9

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Revised Air Cargo Forecast
2000-2030

	1996	2000	2010	2020	2030
Air Freight					
Enplaned Tons (a)	33,501	42,800	77,200	131,200	209,900
Average Annual Growth		6.3%	6.1%	5.4%	4.8%
Air Mail					
Enplaned Tons (b)	9,715	11,000	14,300	18,600	24,100
Average Annual Growth		3.2%	2.6%	2.6%	2.6%
Total Freight and Mail					
Enplaned Tons (c)	43,216	53,800	91,500	149,800	234,000
Average Annual Growth		5.6%	5.5%	5.1%	4.6%

(a) Projected Boeing growth rate for United States adjusted by relative difference in projected growth in income between catchment area and United States.
(b) Projected FAA growth rate for United States adjusted by relative difference in projected growth in income between catchment area and United States.

Sources: Boeing 1996/1997 World Air Cargo Forecast and FAA Aviation Forecasts: Seattle-Tacoma Hub, 1992 and IMG analysis.

Two-Airport System

- Consolidated at Richmond International Airport and Newport News/Williamsburg International Airport. (Corresponds to Alternative 4 in Phase I.)

- Consolidated at Richmond International Airport and search area 2A (see Figure 10-7). (Corresponds to Alternative 5 in Phase I)

- Consolidated at Richmond International Airport and search area 2B (see Figure 10-7).

- Consolidated at Richmond International Airport and search area 2C (see Figure 10-7).

Three-Airport System

- Consolidated at three existing airports. (Corresponds to Status Quo Alternative in Phase I.)

The passenger distribution model is the same as the one used in Phase I. It includes the influence of the following factors on the distribution of passengers:

- Population by county.

- Per capita income by county.

- Fare by airport.

- Ground travel times between each county and airport.

- Potential leakage to nearby airports outside the catchment area.

- Service levels by airport.

The methodology is described in much more detail in Chapter 7 of the Phase I report.

Changes in forecast levels of county population, per capita income, fare levels, and service level/origination ratios were changed to correspond to the revised Base Case forecast equation (Table 10.5). Revised ground travel times (see Section 2.3) were also incorporated into the model. These travel times were adjusted to incorporate the net improvements in access resulting from airport access roads that would be built at the new airport location. The adjustments resulted in a 5-minute improvement for search areas 1 and 2C, and a 2-minute improvement for search area 2A. No net improvement for search area 2B was anticipated. Airport distributions for the Base Case forecast were evaluated for 2010, 2020, and 2030. In addition, a high range forecast distribution was developed for 2030.

Tables 10.10 and 10.11 present the 2010 Base Case distribution forecasts for passengers and aircraft operations. **Tables 10.12 and 10.13** present the 2020 Base Case passenger and aircraft operation distribution forecasts, and **Tables 10.14 and 10.15** present the 2030 Base Case passenger and aircraft operation distribution forecasts.

The revised passenger distributions reflect the higher Base Case forecast levels but are otherwise similar to those in the corresponding Phase I demand management scenarios. In addition, there is little change in each airport's share of the regional total among the three forecast horizon years. The principal difference is in the three-airport system. The Phase I analysis defined the three-airport system as a status quo case, in which there was no change in each airport's share of the regional total, regardless of differences in relative economic growth and service levels. In the Phase II analysis, the three-airport system was not restricted to its current distribution, but was allowed to evolve as the model dictated, just like the single-airport and two-airport alternatives. The revised distribution forecast modeled the increase in passenger levels that Newport News/Williamsburg International Airport would achieve as a result of keeping more of the passengers within its catchment area as service levels grow over time.

As shown in Tables 10.10, 10.12, and 10.14, the two-airport and three-airport systems generate the greatest number of regional passengers. The two-airport system consolidated at Richmond and search area 2B generates the greatest number of passengers, exceeding the three-airport system by approximately 0.5 percent. The other three two-airport alternatives generate slightly fewer passengers than the three-airport alternative.

Tables 10.11, 10.13, and 10.15 present the Base Case distribution of operations for each of the airport system alternatives. The distribution of General Aviation and military operations was assumed to be the same as in Phase I. The distribution of domestic air carrier operations was derived from the distribution of air carrier enplanements using the enplanements-to-aircraft departure relationships derived in the Base Case forecast (see Table 10.5). The same distribution between international aircraft departures and international enplaned passengers used in Phase I was assumed for this analysis. Likewise, the relationship between air freight enplaned tonnage and air cargo operations developed during Phase I was applied during this analysis.

Table 10.10

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Base Case Passenger Forecast by Alternative System
2010: Assumes No Airline Hub

	Richmond	Norfolk	Newport News/ Williamsburg	Search Area 1	Search Area 2	Total
			Single Airport System			
Consolidated at Search Area 1 (d)						
Estimated Total Originations (a)	-	-	-	3,751,000	-	3,751,000
Domestic Enplanements (b)	-	-	-	3,916,000	-	3,916,000
International Enplanements (c)	-	-	-	161,000	-	161,000
Total Enplanements	-	-	-	4,077,000	-	4,077,000
			Two-Airport System			
Consolidated at Richmond and Newport News/Williamsburg (e)						
Estimated Total Originations (a)	1,891,000	-	2,791,000	-	-	4,682,000
Domestic Enplanements (b)	1,974,000	-	2,914,000	-	-	4,888,000
International Enplanements (c)	-	-	62,000	-	-	62,000
Total Enplanements	1,974,000	-	2,976,000	-	-	4,950,000
Consolidated at Richmond and Search Area 2A (f)						
Estimated Total Originations (a)	2,054,000	-	-	-	2,626,000	4,680,000
Domestic Enplanements (b)	2,145,000	-	-	-	2,742,000	4,887,000
International Enplanements (c)	25,000	-	-	-	59,000	84,000
Total Enplanements	2,170,000	-	-	-	2,801,000	4,971,000
Consolidated at Richmond and Search Area 2B						
Estimated Total Originations (a)	2,171,000	-	-	-	2,612,000	4,783,000
Domestic Enplanements (b)	2,267,000	-	-	-	2,727,000	4,994,000
International Enplanements (c)	26,000	-	-	-	58,000	84,000
Total Enplanements	2,293,000	-	-	-	2,785,000	5,078,000
Consolidated at Richmond and Search Area 2C						
Estimated Total Originations (a)	2,325,000	-	-	-	2,063,000	4,388,000
Domestic Enplanements (b)	2,427,000	-	-	-	2,154,000	4,581,000
International Enplanements (c)	28,000	-	-	-	25,000	53,000
Total Enplanements	2,455,000	-	-	-	2,179,000	4,634,000
			Three-Airport System			
Richmond, Norfolk, and Newport News/Williamsburg (g)						
Estimated Total Originations (a)	1,940,000	2,421,000	432,000	-	-	4,793,000
Domestic Enplanements (b)	2,038,000	2,542,000	432,000	-	-	5,012,000
International Enplanements (c)	-	54,000	-	-	-	54,000
Total Enplanements	2,038,000	2,596,000	432,000	-	-	5,066,000

(a) Originations adjusted to include estimate of commuter originations.Adjustment factors obtained from SH&E, Eastern Virginia Air Service Demand Study to the Year 2030.
(b) Ratio between enplanements and originations assumed to equal regional ratio for each demand management alternative.
(c) Estimates based on analysis in Table 10.7 Share of potential international enplanements in each market assumed to be the same as share of domestic originations. North American markets which not sustain five flights per week and overseas markets which cannot sustain three flights per week were dropped from the analysis.
(d) Corresponds to Demand Management Alternative 3 in Phase I.
(e) Corresponds to Demand Management Alternative 4 in Phase I.
(f) Corresponds to Demand Management Alternative 5 in Phase I.
(g) Corresponds to Status Quo Demand Management Alternative in Phase I.

Sources: As noted and IMG analysis.

Table 10.11

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Base Case Operations Forecast by Airport System: 2010
Assumes No Airline Hub

	Richmond	Norfolk	Newport News/ Williamsburg	Search Area 1	Search Area 2	Total
			Single Airport System			
Consolidated at Search Area 1 (f)						
Domestic Passenger Carrier (a)	-	-	-	173,700	-	173,700
International (b)	-	-	-	2,700	-	2,700
Cargo (c)	28,100	5,700	500	11,400	-	45,700
General Aviation (d)	84,200	84,400	153,200	6,200	-	328,000
Military (e)	24,000	-	13,200	-	-	37,200
Total	136,300	90,100	166,900	194,000	-	587,300
			Two-Airport System			
Consolidated at Richmond and Newport News/Williamsburg (g)						
Domestic Passenger Carrier (a)	87,500	-	129,200	-	-	216,700
International (b)	-	-	1,800	-	-	1,800
Cargo (c)	28,100	5,700	500	-	-	34,300
General Aviation (d)	84,200	84,400	153,200	-	-	321,800
Military (e)	24,000	-	13,200	-	-	37,200
Total	223,800	90,100	297,900	-	-	611,800
Consolidated Richmond and Search Area 2A (h)						
Domestic Passenger Carrier (a)	95,100	-	-	-	121,600	216,700
International (b)	500	-	-	-	1,300	1,800
Cargo (c)	28,100	5,700	500	-	11,400	45,700
General Aviation (d)	84,200	84,400	153,200	-	6,200	328,000
Military (e)	24,000	-	13,200	-	-	37,200
Total	231,900	90,100	166,900	-	140,500	629,400
Consolidated at Richmond and Search Area 2B						
Domestic Passenger Carrier (a)	100,500	-	-	-	120,900	221,400
International (b)	600	-	-	-	1,200	1,800
Cargo (c)	28,100	5,700	500	-	11,400	45,700
General Aviation (d)	84,200	84,400	153,200	-	6,200	328,000
Military (e)	24,000	-	13,200	-	-	37,200
Total	237,400	90,100	166,900	-	139,700	634,100
Consolidated at Richmond and Search Area 2C						
Domestic Passenger Carrier (a)	107,600	-	-	-	95,500	203,100
International (b)	600	-	-	-	500	1,100
Cargo (c)	28,100	5,700	500	-	11,400	45,700
General Aviation (d)	84,200	84,400	153,200	-	6,200	328,000
Military (e)	24,000	-	13,200	-	-	37,200
Total	244,500	90,100	166,900	-	113,600	615,100
			Three-Airport System			
Richmond, Norfolk, and Newport News/Williamsburg (l)						
Domestic Passenger Carrier (a)	90,400	112,700	19,200	-	-	222,300
International (b)	-	1,200	-	-	-	1,200
Cargo (c)	28,100	5,700	500	-	-	34,300
General Aviation (d)	84,200	84,400	153,200	-	-	321,800
Military (e)	24,000	-	13,200	-	-	37,200
Total Operations	226,700	204,000	186,100	-	-	616,800

(a) Ratio between aircraft departures and enplanements assumed to equal regional ratio for each demand management alternative.
(b) Estimates based on analysis in Table 1.8R. Share of potential international enplanements in each market assumed to be the same as share of domestic originations. North American markets that do not sustain five flights per week and overseas market that cannot sustain three flights per week were dropped from the analysis.
(c) Phase I distribution applied to Table 1.9R. Cargo operations for new airport sites assumed to equal one-third total regional cargo operations.
(d) Equal to projection in Table 5.1 in Phase I or estimate from Figure 5-1, whichever is smaller.
(e) Table 5.1 in Phase I. Military operations assumed to be 0 at new airport sites.
(f) Corresponds to Demand Management Alternative 3 in Phase I.
(g) Corresponds to Demand Management Alternative 4 in Phase I.
(h) Corresponds to Demand Management Alternative 5 in Phase I.
(i) Corresponds to Status Quo Demand Management Alternative in Phase I.

Sources: As noted and IMG analysis.

Table 10.12

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Base Case Passenger Forecast by Alternative System: 2020
Assumes No Airline Hub

	Richmond	Norfolk	Newport News/ Williamsburg	Search Area 1	Search Area 2	Total
			Single Airport System			
Consolidated at Search Area 1 (d)						
Estimated Total Originations (a)	-	-	-	4,902,000	-	4,902,000
Domestic Enplanements (b)	-	-	-	5,118,000	-	5,118,000
International Enplanements (c)	-	-	-	239,000	-	239,000
Total Enplanements	-	-	-	5,357,000	-	5,357,000
			Two-Airport System			
Consolidated at Richmond and Newport News/Williamsburg (e)						
Estimated Total Originations (a)	2,471,000	-	3,647,000	-	-	6,118,000
Domestic Enplanements (b)	2,580,000	-	3,808,000	-	-	6,388,000
International Enplanements (c)	55,000	-	150,000	-	-	205,000
Total Enplanements	2,635,000	-	3,958,000	-	-	6,593,000
Consolidated at Richmond and Search Area 2A (f)						
Estimated Total Originations (a)	2,684,000	-	-	-	3,432,000	6,116,000
Domestic Enplanements (b)	2,802,000	-	-	-	3,583,000	6,385,000
International Enplanements (c)	87,000	-	-	-	141,000	228,000
Total Enplanements	2,889,000	-	-	-	3,724,000	6,613,000
Consolidated at Richmond and Search Area 2B						
Estimated Total Originations (a)	2,837,000	-	-	-	3,413,000	6,250,000
Domestic Enplanements (b)	2,962,000	-	-	-	3,563,000	6,525,000
International Enplanements (c)	92,000	-	-	-	140,000	232,000
Total Enplanements	3,054,000	-	-	-	3,703,000	6,757,000
Consolidated at Richmond and Search Area 2C						
Estimated Total Originations (a)	3,038,000	-	-	-	2,697,000	5,735,000
Domestic Enplanements (b)	3,172,000	-	-	-	2,816,000	5,988,000
International Enplanements (c)	125,000	-	-	-	87,000	212,000
Total Enplanements	3,297,000	-	-	-	2,903,000	6,200,000
			Three-Airport System			
Richmond, Norfolk, and Newport News/Williamsburg (g)						
Estimated Total Originations (a)	2,525,000	3,078,000	665,000	-	-	6,268,000
Domestic Enplanements (b)	2,652,000	3,232,000	665,000	-	-	6,549,000
International Enplanements (c)	56,000	127,000	-	-	-	183,000
Total Enplanements	2,708,000	3,359,000	665,000	-	-	6,732,000

(a) Originations adjusted to include estimate of commuter originations. Adjustment factors obtained from SH&E, Eastern Virginia Air Service Demand Study to the Year 2030.
(b) Ratio between enplanements and originations assumed to equal regional ratio for each demand management alternative.
(c) Estimates based on analysis in Table 1.9R. Share of potential international enplanements in each market assumed to be the same as share of domestic originations. North American markets that cannot sustain five flights per week and overseas markets that cannot sustain three flights per week were dropped from the analysis.
(d) Corresponds to Demand Management Alternative 3 in Phase I.
(e) Corresponds to Demand Management Alternative 4 in Phase I.
(f) Corresponds to Demand Management Alternative 5 in Phase I.
(g) Corresponds to Status Quo Demand Management Alternative in Phase I.

Sources: As noted and IMG analysis.

Table 10.13

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Base Case Operations Forecast by Airport System: 2020
Assumes No Airline Hub

	Richmond	Norfolk	Newport News/ Williamsburg	Search Area 1	Search Area 2	Total
			Single Airport System			
Consolidated at Search Area 1 (f)						
Domestic Passenger Carrier (a)	-	-	-	216,400	-	216,400
International (b)	-	-	-	4,100	-	4,100
Cargo (c)	40,000	8,100	800	16,300	-	65,200
General Aviation (d)	100,600	100,900	183,100	7,400	-	392,000
Military (e)	24,000	-	13,200	-	-	37,200
Total	164,600	109,000	197,100	244,200	-	714,900
			Two-Airport System			
Consolidated at Richmond and Newport News/Williamsburg (g)						
Domestic Passenger Carrier (a)	109,100	-	161,000	-	-	270,100
International (b)	1,100	-	3,700	-	-	4,800
Cargo (c)	40,000	8,100	800	-	-	48,900
General Aviation (d)	100,600	100,900	148,100	-	-	349,600
Military (e)	24,000	-	13,200	-	-	37,200
Total	274,800	109,000	326,800	-	-	710,600
Consolidated at Richmond and Search Area 2A (h)						
Domestic Passenger Carrier (a)	118,500	-	-	-	151,500	270,000
International (b)	1,600	-	-	-	2,600	4,200
Cargo (c)	40,000	8,100	800	-	16,300	65,200
General Aviation (d)	100,600	100,900	183,100	-	7,400	392,000
Military (e)	24,000	-	13,200	-	-	37,200
Total	284,700	109,000	197,100	-	177,800	768,600
Consolidated at Richmond and Search Area 2B						
Domestic Passenger Carrier (a)	125,200	-	-	-	150,700	275,900
International (b)	1,600	-	-	-	2,600	4,200
Cargo (c)	40,000	8,100	800	-	16,300	65,200
General Aviation (d)	100,600	100,900	183,100	-	7,400	392,000
Military (e)	24,000	-	13,200	-	-	37,200
Total	291,400	109,000	197,100	-	177,000	774,500
Consolidated at Richmond and Search Area 2C						
Domestic Passenger Carrier (a)	134,100	-	-	-	119,100	253,200
International (b)	2,300	-	-	-	1,600	3,900
Cargo (c)	40,000	8,100	800	-	16,300	65,200
General Aviation (d)	100,600	100,900	183,100	-	7,400	392,000
Military (e)	24,000	-	13,200	-	-	37,200
Total	301,000	109,000	197,100	-	144,400	751,500

Table 10.13 (cont'd)

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Base Case Operations Forecast by Airport System: 2020
Assumes No Airline Hub

			Three-Airport System			
Richmond, Norfolk, and Newport News/Williamsburg (I)						
Domestic Passenger Carrier (a)	112,100	136,700	28,100	-	-	276,900
International (b)	1,200	2,300	-	-	-	3,500
Cargo (c)	40,000	8,100	800	-	-	48,900
General Aviation (d)	100,600	100,900	183,100	-	-	384,600
Military (e)	24,000	-	13,200	-	-	37,200
Total Operations	277,900	248,000	225,200	-	-	751,100

(a) Ratio between aircraft departures and enplanements assumed to equal regional ratio for each demand management alternative.
(b) Estimates based on analysis in Table 1.8R. Share of potential international enplanements in each market assumed to be the same as share of domestic originations. North American markets which not sustain five flights per week and overseas markets that cannot sustain three flights per week were dropped from the analysis.
(c) Phase I distribution applied to Table 1.9R. Cargo operations for new airport sites assumed to equal one-third total regional cargo operations.
(d) Equal to projection in Table 5.1 in Phase I or estimate from Figure 5-1, whichever is smaller.
(e) Table 5.1 in Phase I. Military operations assumed to be 0 at new airport sites.
(f) Corresponds to Demand Management Alternative 3 in Phase I.
(g) Corresponds to Demand Management Alternative 4 in Phase I.
(h) Corresponds to Demand Management Alternative 5 in Phase I.
(i) Corresponds to Status Quo Demand Management Alternative in Phase I.

Sources: As noted and IMG analysis.

Table 10.14

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Base Case Passenger Forecast by Alternative System: 2030
Assumes No Airline Hub

	Richmond	Norfolk	Newport News/ Williamsburg	Search Area 1	Search Area 2	Total
			Single Airport System			
Consolidated at Search Area 1 (d)						
Estimated Total Originations (a)	-	-	-	6,397,000	-	6,397,000
Domestic Enplanements (b)	-	-	-	6,679,000	-	6,679,000
International Enplanements (c)	-	-	-	399,000	-	399,000
Total Enplanements	-	-	-	7,078,000	-	7,078,000
			Two-Airport System			
Consolidated at Richmond and Newport News/Williamsburg (e)						
Estimated Total Originations (a)	3,225,000	-	4,759,000	-	-	7,984,000
Domestic Enplanements (b)	3,367,000	-	4,969,000	-	-	8,336,000
International Enplanements (c)	143,000	-	251,000	-	-	394,000
Total Enplanements	3,510,000	-	5,220,000	-	-	8,730,000
Consolidated at Richmond and Search Area 2A (f)						
Estimated Total Originations (a)	3,503,000	-	-	-	4,479,000	7,982,000
Domestic Enplanements (b)	3,657,000	-	-	-	4,676,000	8,333,000
International Enplanements (c)	184,000	-	-	-	236,000	420,000
Total Enplanements	3,841,000	-	-	-	4,912,000	8,753,000
Consolidated at Richmond and Search Area 2B						
Estimated Total Originations (a)	3,702,000	-	-	-	4,454,000	8,156,000
Domestic Enplanements (b)	3,865,000	-	-	-	4,650,000	8,515,000
International Enplanements (c)	195,000	-	-	-	235,000	430,000
Total Enplanements	4,060,000	-	-	-	4,885,000	8,945,000
Consolidated at Richmond and Search Area 2C						
Estimated Total Originations (a)	3,965,000	-	-	-	3,519,000	7,484,000
Domestic Enplanements (b)	4,140,000	-	-	-	3,674,000	7,814,000
International Enplanements (c)	209,000	-	-	-	185,000	394,000
Total Enplanements	4,349,000	-	-	-	3,859,000	8,208,000
			Three-Airport System			
Richmond, Norfolk, and Newport News/Williamsburg (g)						
Estimated Total Originations (a)	3,281,000	3,906,000	999,000	-	-	8,186,000
Domestic Enplanements (b)	3,446,000	4,102,000	999,000	-	-	8,547,000
International Enplanements (c)	145,000	206,000	-	-	-	351,000
Total Enplanements	3,591,000	4,308,000	999,000	-	-	8,898,000

(a) Originations adjusted to include estimate of commuter originations. Adjustment factors obtained from SH&E, Eastern Virginia Air Service Demand Study to the Year 2030.
(b) Ratio between enplanements and originations assumed to equal regional ratio for each demand management alternative.
(c) Estimates based on analysis in Table 1.8R. Share of potential international enplanements in each market assumed to be the same as share of domestic originations. North American markets that not sustain five flights per week and overseas markets that cannot sustain three flights per week were dropped from the analysis.
(d) Corresponds to Demand Management Alternative 3 in Phase I.
(e) Corresponds to Demand Management Alternative 4 in Phase I.
(f) Corresponds to Demand Management Alternative 5 in Phase I.
(g) Corresponds to Status Quo Demand Management Alternative in Phase I.

Sources: As noted and IMG analysis.

Table 10.15

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Base Case Operations Forecast by Airport System: 2030
Assumes No Airline Hub

	Richmond	Norfolk	Newport News/ Williamsburg	Search Area 1	Search Area 2	Total
Single Airport System						
Consolidated at Search Area 1 (f)						
Domestic Passenger Carrier (a)	-	-	-	269,900	-	269,900
International (b)	-	-	-	7,100	-	7,100
Cargo (c)	53,500	10,800	1,000	21,800	-	87,100
General Aviation (d)	120,200	120,600	218,800	8,800	-	468,400
Military (e)	24,000	-	13,200	-	-	37,200
Total	197,700	131,400	233,000	307,600	-	869,700
Two-Airport System						
Consolidated at Richmond and Newport News/Williamsburg (g)						
Domestic Passenger Carrier (a)	136,000	-	200,800	-	-	336,800
International (b)	2,700	-	5,900	-	-	8,600
Cargo (c)	53,500	10,800	1,000	-	-	65,300
General Aviation (d)	120,200	120,600	134,900	-	-	375,700
Military (e)	24,000	-	13,200	-	-	37,200
Total	336,400	131,400	355,800	-	-	823,600
Consolidated at Richmond and Search Area 2A (h)						
Domestic Passenger Carrier (a)	147,800	-	-	-	188,900	336,700
International (b)	3,200	-	-	-	4,100	7,300
Cargo (c)	53,500	10,800	1,000	-	21,800	87,100
General Aviation (d)	120,200	120,600	218,800	-	8,800	468,400
Military (e)	24,000	-	13,200	-	-	37,200
Total	348,700	131,400	233,000	-	223,600	936,700
Consolidated at Richmond and Search Area 2B						
Domestic Passenger Carrier (a)	156,200	-	-	-	187,900	344,100
International (b)	3,400	-	-	-	4,100	7,500
Cargo (c)	53,500	10,800	1,000	-	21,800	87,100
General Aviation (d)	120,200	120,600	218,800	-	8,800	468,400
Military (e)	24,000	-	13,200	-	-	37,200
Total	357,300	131,400	233,000	-	222,600	944,300
Consolidated at Richmond and Search Area 2C						
Domestic Passenger Carrier (a)	167,300	-	-	-	148,400	315,700
International (b)	3,600	-	-	-	3,200	6,800
Cargo (c)	53,500	10,800	1,000	-	21,800	87,100
General Aviation (d)	120,200	120,600	218,800	-	8,800	468,400
Military (e)	24,000	-	13,200	-	-	37,200
Total	368,600	131,400	233,000	-	182,200	915,200

Table 10.15 (cont'd.)

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Base Case Operations Forecast by Airport System: 2030
Assumes No Airline Hub

			Three-Airport System			
Richmond, Norfolk, and Newport News/Williamsburg (I)						
Domestic Passenger Carrier (a)	139,200	165,700	40,400	-	-	345,300
International (b)	2,700	3,600	-	-	-	6,300
Cargo (c)	53,500	10,800	1,000	-	-	65,300
General Aviation (d)	120,200	120,600	218,800	-	-	459,600
Military (e)	24,000	-	13,200	-	-	37,200
Total Operations	339,600	300,700	273,400	-	-	913,700

(a) Ratio between aircraft departures and enplanements assumed to equal regional ratio for each demand management alternative.
(b) Estimates based on analysis in Table 1.8R. Share of potential international enplanements in each market assumed to be the same as share of domestic originations. North American markets which not sustain five flights per week and overseas market that cannot sustain three flights per week were dropped from the analysis.
c) Phase I distribution applied to Table 1.9R. Cargo operations for new airport sites assumed to equal one-third total regional cargo operations.
(d) Equal to projection in Table 5.1 in Phase I or estimate from Figure 5-1, whichever is smaller.
(e) Table 5.1 in Phase I. Military operations assumed to be 0 at new airport sites.
(f) Corresponds to Demand Management Alternative 3 in Phase I.
(g) Corresponds to Demand Management Alternative 4 in Phase I.
(h) Corresponds to Demand Management Alternative 5 in Phase I.
(i) Corresponds to Status Quo Demand Management Alternative in Phase I.

Sources: As noted and IMG analysis.

The total aircraft operations projections shown in the tables are slightly higher than those presented in Phase I. These forecasts assume there will be enough capacity at regional General Aviation airports to accommodate diverted General Aviation activity.

Tables 10.16 and 10.17 present the projected distributions of passengers and aircraft operations under the high forecast. The high forecast incorporates the assumptions used in the airline hubbing scenario in Phase I. Again, the distributions are similar to those generated in Phase I. No hubbing was assumed under the three-airport alternative because of the inability to build a parallel runway system at Norfolk and the insufficient number of originations at Richmond and Newport News/ Williamsburg to sustain a viable airline hub without consolidation.

The single-airport and two-airport systems generate similar numbers of enplanements, ranging from 10.0 million to 11.8 million in 2030. The two-airport systems generate more originations because they provide accessible air service to a greater percentage of the population. The single-airport system generates more connecting passengers because the consolidated originations make more markets viable for non-stop service, which in turn increases the number of connecting opportunities.

10.9.7 Comparison with Individual Airport Master Plans

The EVASS study requires that the entire eastern Virginia region be evaluated as a system, using a common methodology and a common set of assumptions. Consequently, it was not possible to use the three airport master plan forecasts, developed to serve the individual needs of the airports, in this study. Nevertheless, it is useful to compare the master plan forecasts with the EVASS forecasts and discuss the differences where they occur.

The draft Richmond International Airport Master Plan forecasts assumed that RIC would continue its role as an origin-destination airport and that it would gradually reduce the amount of leakage occurring from its service area. Like the EVASS forecast, the Richmond forecast was based on a statistical regression equation. Because the equation was specified differently, the results are also different. The draft forecast projects approximately 3.9 million domestic passenger enplanements by 2030, which is within the Base Case range of activity projected for RIC (3.3 to 4.1 million) under the three-airport system and the four two-airport system alternatives.

The Norfolk International Airport Master Plan adopted the Base Case domestic passenger forecasts from the Phase I EVASS study. Consequently, any differences in the domestic passenger forecasts contained herein and the Master Plan forecasts is attributable to the Phase II revisions.

The Newport News/Williamsburg International Airport Master Plan contained three alternative scenarios:

- The “Low” Scenario assumed that PHF would continue its role as an origin-destination airport, and that future growth would be a function of economic growth in its current catchment area. The 2030 forecast for this scenario is 642,000 passenger enplanements.

Table 10.16

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of High Passenger Forecast by Alternative System

	Richmond	Norfolk	Newport News/ Williamsburg	Search Area 1	Search Area 2	Total
Single Airport System						
Consolidated at Search Area 1 (d)						
Estimated Total Originations (a)	-	-	-	7,172,000	-	7,172,000
Domestic Enplanements (b)	-	-	-	11,133,000	-	11,133,000
International Enplanements (c)	-	-	-	630,000	-	630,000
Total Enplanements	-	-	-	11,763,000	-	11,763,000
Two-Airport System						
Consolidated at Richmond and Newport News/Williamsburg (e)						
Estimated Total Originations (a)	3,172,000	-	5,022,000	-	-	8,194,000
Domestic Enplanements (b)	3,313,000	-	7,399,000	-	-	10,712,000
International Enplanements (c)	140,000	-	386,000	-	-	526,000
Total Enplanements	3,453,000	-	7,785,000	-	-	11,238,000
Consolidated at Richmond and Search Area 2A (f)						
Estimated Total Originations (a)	3,440,000	-	-	-	4,723,000	8,163,000
Domestic Enplanements (b)	3,591,000	-	-	-	6,954,000	10,545,000
International Enplanements (c)	181,000	-	-	-	363,000	544,000
Total Enplanements	3,772,000	-	-	-	7,317,000	11,089,000
Consolidated at Richmond and Search Area 2B						
Estimated Total Originations (a)	3,635,000	-	-	-	4,696,000	8,331,000
Domestic Enplanements (b)	3,795,000	-	-	-	6,916,000	10,711,000
International Enplanements (c)	192,000	-	-	-	362,000	554,000
Total Enplanements	3,987,000	-	-	-	7,278,000	11,265,000
Consolidated at Richmond and Search Area 2C						
Estimated Total Originations (a)	3,893,000	-	-	-	3,710,000	7,603,000
Domestic Enplanements (b)	4,065,000	-	-	-	5,464,000	9,529,000
International Enplanements (c)	205,000	-	-	-	285,000	490,000
Total Enplanements	4,270,000	-	-	-	5,749,000	10,019,000
Three-Airport System						
Richmond, Norfolk, and Newport News/Williamsburg (g)						
Estimated Total Originations (a)	3,281,000	3,906,000	999,000	-	-	8,186,000
Domestic Enplanements (b)	3,446,000	4,102,000	999,000	-	-	8,547,000
International Enplanements (c)	145,000	206,000	0	-	-	351,000
Total Enplanements	3,591,000	4,308,000	999,000	-	-	8,898,000

(a) Ratio of hub to non-hub originations from Tables 7.6 and 7.8 Phase I report applied to revised originations in Table 10-9-5.
(b) Ratio of hub to non-hub domestic enplanements from Tables 7.6 and 7.8 Phase I report applied to revised domestic enplanements in Table 1.10R.
(c) Ratio of hub to non-hub international enplanements from Tables 7.6 and 7.8 Phase I report applied to revised international enplanements in Table 1.10R.
(d) Corresponds to Demand Management Alternative 3 in Phase I.
(e) Corresponds to Demand Management Alternative 4 in Phase I.
(f) Corresponds to Demand Management Alternative 5 in Phase I.
(g) Corresponds to Status Quo Demand Management Alternative in Phase I.
Sources: As noted and IMG analysis.

Table 10.17

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of High Operations Forecast by Airport System

	Richmond	Norfolk	Newport News/ Williamsburg	Search Area 1	Search Area 2	Total
			Single Airport System			
Consolidated at Search Area 1 (f)						
Domestic Passenger Carrier (a)	-	-	-	341,000	-	341,000
International (b)	-	-	-	11,200	-	11,200
Cargo (c)	53,500	10,800	1,000	21,800	-	87,100
General Aviation (d)	120,200	120,600	218,800	8,800	-	468,400
Military (e)	24,000	-	13,200	-	-	37,200
Total	197,700	131,400	233,000	382,800	-	944,900
			Two-Airport System			
Consolidated at Richmond and Newport News/Williamsburg (g)						
Domestic Passenger Carrier (a)	133,900	-	226,600	-	-	360,500
International (b)	2,700	-	9,100	-	-	11,800
Cargo (c)	53,500	10,800	1,000	-	-	65,300
General Aviation (d)	120,200	120,600	42,800	-	-	283,600
Military (e)	24,000	-	13,200	-	-	37,200
Total	334,300	131,400	292,700	-	-	758,400
Consolidated at Richmond and Search Area 2A (h)						
Domestic Passenger Carrier (a)	145,100	-	-	-	213,000	358,100
International (b)	3,100	-	-	-	6,300	9,400
Cargo (c)	53,500	10,800	1,000	-	21,800	87,100
General Aviation (d)	120,200	120,600	218,800	-	8,800	468,400
Military (e)	24,000	-	13,200	-	-	37,200
Total	345,900	131,400	233,000	-	249,900	960,200
Consolidated at Richmond and Search Area 2B						
Domestic Passenger Carrier (a)	153,300	-	-	-	211,800	365,100
International (b)	3,300	-	-	-	6,300	9,600
Cargo (c)	53,500	10,800	1,000	-	21,800	87,100
General Aviation (d)	120,200	120,600	218,800	-	8,800	468,400
Military (e)	24,000	-	13,200	-	-	37,200
Total	354,300	131,400	233,000	-	248,700	967,400
Consolidated at Richmond and Search Area 2C						
Domestic Passenger Carrier (a)	164,200	-	-	-	167,400	331,600
International (b)	3,500	-	-	-	4,900	8,400
Cargo (c)	53,500	10,800	1,000	-	21,800	87,100
General Aviation (d)	120,200	120,600	218,800	-	8,800	468,400
Military (e)	24,000	-	13,200	-	-	37,200
Total	365,400	131,400	233,000	-	202,900	932,700
			Three-Airport System			
Richmond, Norfolk, and Newport News/Williamsburg (i)						
Domestic Passenger Carrier (a)	139,200	165,700	40,400	-	-	345,300
International (b)	2,700	3,600	-	-	-	6,300
Cargo (c)	53,500	10,800	1,000	-	-	65,300
General Aviation (d)	120,200	120,600	218,800	-	-	459,600
Military (e)	24,000	-	13,200	-	-	37,200
Total Operations	339,600	300,700	273,400	-	-	913,700

(a) Passenger aircraft operations estimated from enplanements using passenger to operation ratios from Table 7.10 in Phase 1 report.
(b) International aircraft operations estimated from international enplanements using passenger to operation ratios from Table 7.10. in Phase I report.
(c) Assumed to be the same as in Table 1.11R
(d) Equal to projection in Table 5.1 in Phase I or estimate from Figure 5-1, whichever is smaller.
(e) Assumed to be the same as in Table 1.11R.
(f) Corresponds to Demand Management Alternative 3 in Phase I.
(g) Corresponds to Demand Management Alternative 4 in Phase I.
(h) Corresponds to Demand Management Alternative 5 in Phase I.
(i) Corresponds to Status Quo Demand Management Alternative in Phase I.

Sources: As noted and IMG analysis.

- The "Linear Hub" scenario assumed a low-cost carrier such as Southwest Airlines would add a significant number of short-haul, point-to-point routes to markets not currently being served, and thereby significantly stimulate origin-destination traffic. The 2030 forecast is 2,831,000 enplanements under this scenario.

- The "Connecting Hub" Scenario assumed a regional connecting hub by a major carrier wherein 60 to 70 percent of enplanements would be connections. The 2030 forecast is 8,462,000 enplanements under this scenario.

The Master Plan "Low" Scenario most closely corresponds with the Base Case forecast of the three-airport system, although the three-airport system forecast anticipates a slight expansion of the service area as service levels increase, and therefore has a higher forecast.

There is no system alternative in the EVASS study that corresponds with the Linear Hub scenario. There is some similarity between the Connecting Hub scenario and the high forecast for the two-airport system with RIC and PHF, but the EVASS forecast projects significantly fewer connecting enplanements.

10.10 DEFINE PHASE II NEW AIRPORT STUDY AREAS

Since a potential new airport would serve some or all of the market areas served by the three regional airports, it should be centrally located with respect to the composite catchment area, as described in the Phase I study. This locational requirement leads to the consideration of a search area midway between the Norfolk/Newport News/ Williamsburg/Hampton Roads metropolitan area and the Richmond metropolitan area for the one-airport system. The one-airport search area is delineated by Surry and Sussex Counties between Route 460 to the south and Route 10 to the north, as shown in **Figure 10-7**.

The search area for the two-airport system consists of three sub-areas within the catchment area for the Norfolk/Newport News/Williamsburg/Hampton Roads metropolitan area, as depicted in Figure 10-7. This is due to the necessity to avoid the Great Dismal Swamp, other obvious wetland areas, and existing developed areas. The westernmost sub-area (C) is bounded by Route 460, Route 258, Route 10, and Route 32. The center sub-area (A) is bordered by Route 460, Nansemond River, and Route 191 extended north. The easternmost sub-area (B) is described by Interstate 64, Route 407, then following the Chesapeake and Virginia Beach City line to the Intracoastal Waterway over to Route 168, then down to the Town of Good Hope, and over to the Town of West Landing and Route 17.

The factors that are evaluated in subsequent tasks in this study regarding the search areas and the construction of a potential new airport include the following:

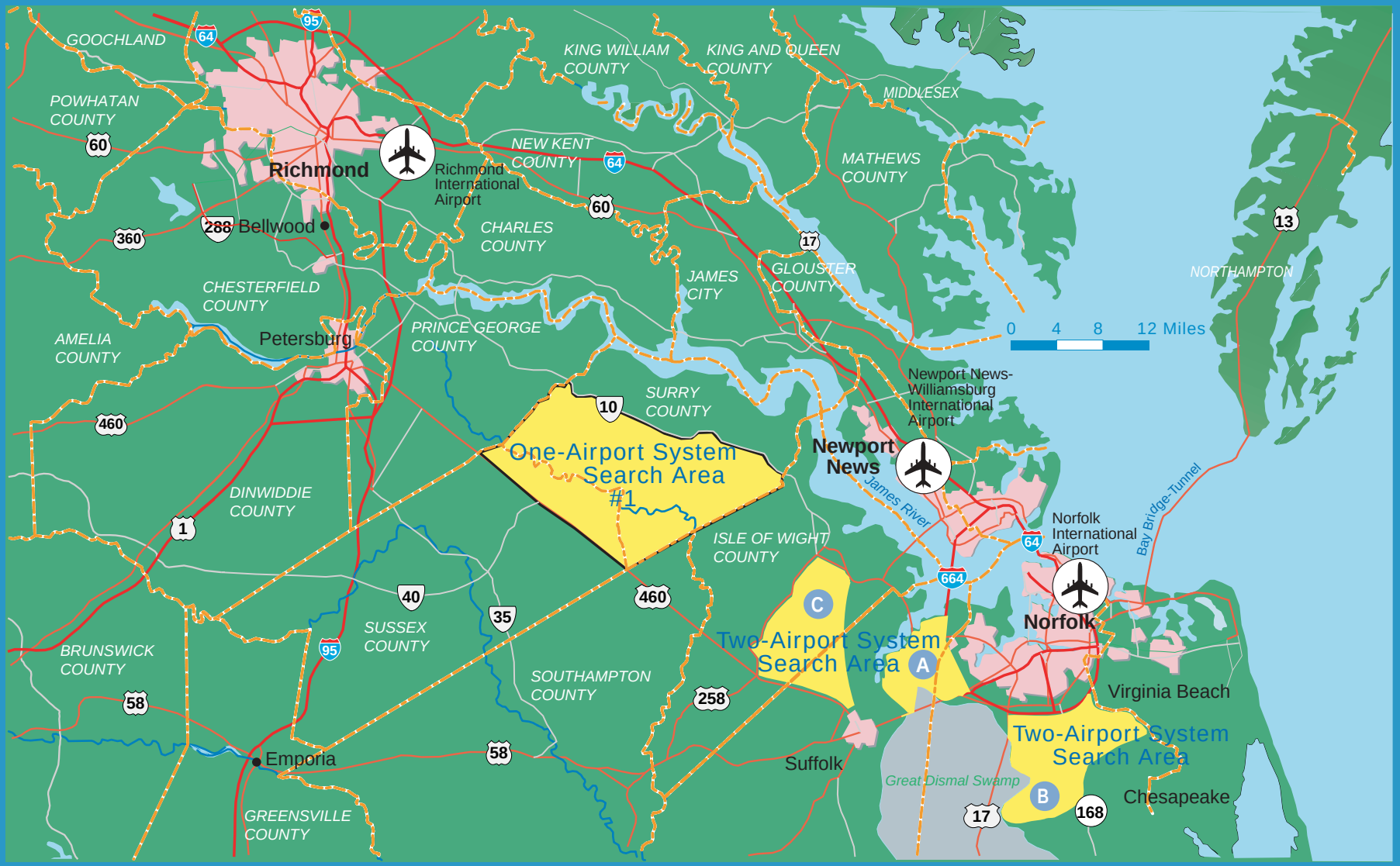
- Travel Times
- Airspace Impacts
- Level of Service
- Transportation/Utility Infrastructure
- Construction Costs
- Economic Impacts
- Financial Feasibility
- Community Development Potential

Search Areas for a New Airport

New Airport Search Areas
Urbanized Area
County Boundary

FIGURE 10-7

EASTERN VIRGINIA AIRPORT SYSTEM STUDY



- Environmental Impacts

The FAA Airport Environmental Handbook is used as a general guide for this work. Some of the major environmental factors to be evaluated include the following:

- Noise - Evaluation of existing and planned residential land use is compared with future anticipated noise levels.

- Air Quality - Evaluation of existing and proposed amendments to the Clean Air Act as well as the status of air quality within the study areas.

- Water Quality - Evaluation of existing and proposed requirements to manage stormwater runoff and wastewater discharge/treatment.

- Water Availability - Evaluation of available potable water supplies within the study areas.

- Chesapeake Bay Act - Evaluation of Resource Protection Areas/Resource Management Areas within the study areas. Tidal and non-tidal wetlands will also play an important role in the evaluation of the study areas.

- Other Natural Factors - Evaluation of the known presence of endangered species, habitat, DOT 4F properties, and known historical and archeological sites within the study areas. Tidal and non-tidal wetlands will also play an important role in the evaluation of the study areas.

Chapter Eleven
SELECTION OF PREFERRED AIRPORT SYSTEM

In the Phase I study, Chapters 5 through 7 analyzed airport capacities, facility requirements, capital costs, financial needs, and economic impacts for several alternative airport systems. The alternative systems considered in this study include the following, which are depicted in Figure 10-7.

The one-airport system that involves a new airport located between Richmond and Norfolk, identified as search area 1, which would serve all of eastern Virginia's commercial airline passenger traffic.

The two-airport system, which includes Richmond International Airport (RIC) and Newport News/Williamsburg International Airport (PHF), would serve all of eastern Virginia's commercial airline passenger needs.

The two-airport system that includes Richmond International Airport and a new airport located south of the James River, and is identified as search area 2, would serve all of eastern Virginia's commercial service needs. Search area 2 is divided into sub-areas A, B, and C, as depicted in Figure 10-7.

The three-airport system involves the continued expansion of the region's existing three commercial airports, RIC, PHF, and Norfolk International Airport (ORF).

Tasks involved in evaluating and comparing the three alternatives include the following, which are updated from the Phase I study:

- Operational factors
- Facility requirements and costs
- Travel times
- Level of service factors
- Environmental factors
- Transportation/utility improvements
- Preliminary financial feasibility
- Economic impacts
- Community development potential

11.1 OPERATIONAL FACTORS

11.1.1 Existing Airspace

Based on the findings of the FAA Capacity Task Force for eastern Virginia (see Chapters 5 and 6 in the Phase I report), airspace requirements are not expected to constrain regional airport system development and would not play a major role in the evaluation of alternative demand management scenarios. The Phase II portion of the study examines more closely the potential impacts on airspace which could occur from development of a new airport within each of the search areas.

The Airspace Subgroup of the FAA Capacity Task Force for eastern Virginia assessed the overall impact of potential physical and operational changes associated with the three existing regional airports and

a potential new airport. The Subgroup investigated the following specific issues:

- Potential conflicts of physical and operational changes with traffic to or from nearby civilian or military airports.

- Potential for independent arrival and departure routes serving new runways.

- Ability to accommodate potential improvements in the close-in airspace.

- Ability of aircraft from eastern Virginia to enter into the en route traffic stream without undue effect on the air traffic system between Washington, D.C., and Raleigh-Durham.

- Ability to accommodate international traffic.

The Subgroup concluded that given the long time frame of development, potential physical and operational changes could be assimilated into the air traffic system with minimum impacts. Since the Subgroup concluded that all potential changes could be accommodated, airspace factors are not expected to vary substantially among alternatives for the existing airports. For potential new airports, the sites were evaluated based on the same criteria used by the Subgroup.

11.1.2 Impact in the Airspace of New Airport Alternatives

The runway alignment would determine the airspace that should be protected and reserved for airport operations. The ideal airspace structure for an airport is one that provides unobstructed corridors, permitting at least eight nautical miles of straight approaches to the runways and the flexibility to disperse departures. Airspace design and advances in technology have allowed the implementation of unusual airspace structures that allow airports to meet capacity levels whenever the airspace around the airport is constrained. However, this should not be a major factor for eastern Virginia airports.

The most desirable runway orientation based on wind is the one that has the largest wind coverage and minimum crosswind components. Wind coverage is the percentage of time crosswind components are below an acceptable velocity. The desirable wind coverage for an airport is 95 percent or greater, based on the total number of weather observations.

For potential new airports within the search areas, the airspace will be evaluated to consider the following:

- Runway orientation.

- Existing airspace.

- Conflicts of physical and operational changes with traffic to or from nearby civilian or military airports.

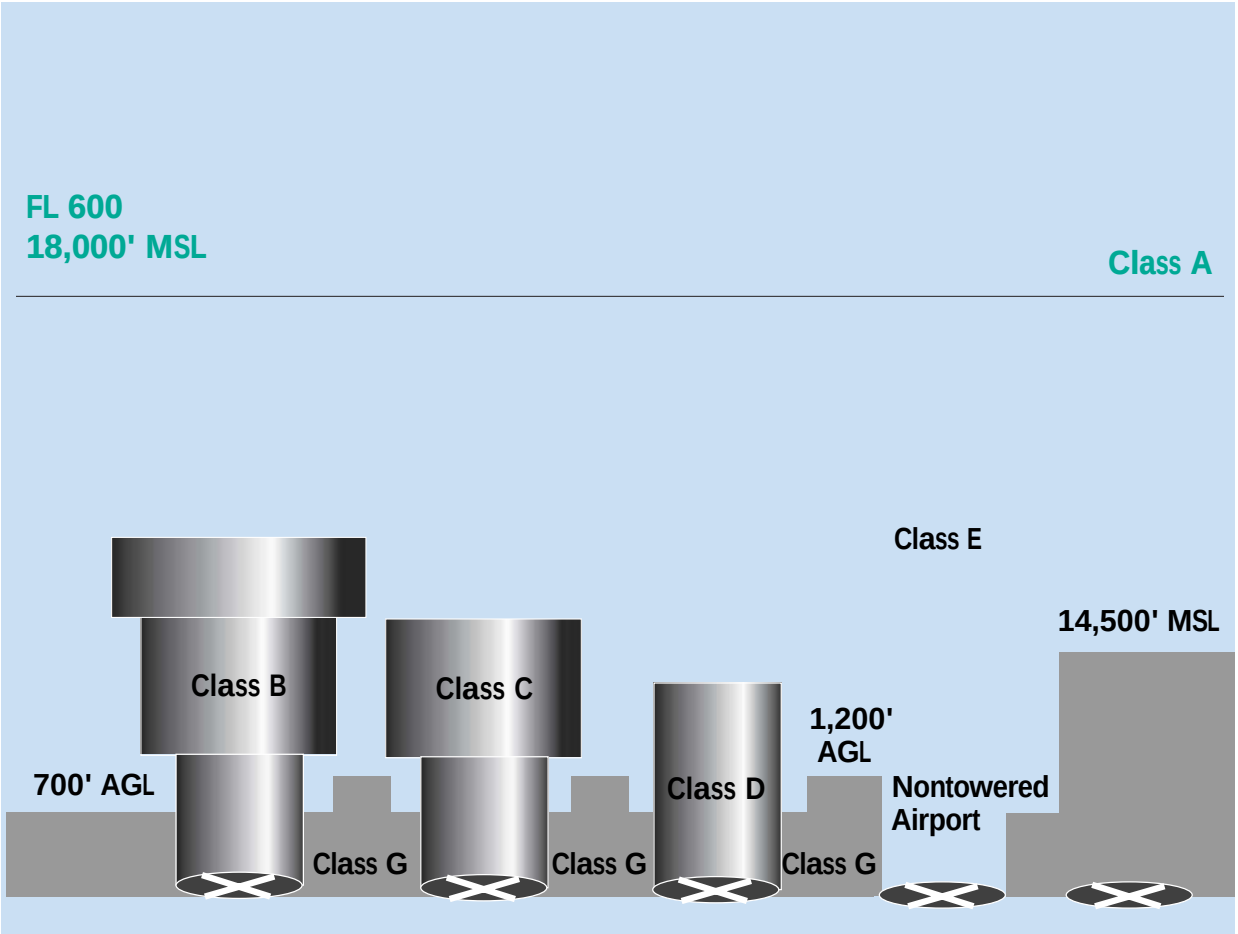
- Potential for independent arrival and departure routes serving new runways.

- Ability to accommodate potential improvements in the close-in airspace.

Airspace is currently classified as either controlled or uncontrolled. Controlled airspace is supported by ground-to-air communications, navigation aids, and air traffic services. In September 1993, the FAA completed an 11-month major airspace reclassification effort. The new classifications and terminology, and their relationship to the old system, are depicted in **Figure 11-1**. This classification is used in the description of each airport system's airspace.

Airspace Classification

FIGURE 11-1



New Classification	Old Classification
Class A	Positive Control Area
Class B	Terminal Control Area (TCA)
Class C	Airport Radar Service Area (ARSA)
Class D	Control Zone with Tower, Airport Traffic Area
Class E	General Controlled Airspace
Class G	Uncontrolled Airspace

AGL Above Ground Level FL Flight Level MSL Mean Sea Level

One-Airport System - Search Area 1

The search area for a new central airport site in eastern Virginia is equidistant from the Norfolk and Richmond areas, as shown in **Figure 11-2**. The airspace in this region is outside of the Norfolk Approach Class E airspace but includes a large section of the Class E airspace of Wakefield Municipal Airport as well as the airport itself. Any new large airport development in this region would require a reconfiguration of Wakefield Municipal's airspace.

Preliminary wind analysis of the Norfolk, Richmond, and Wakefield areas suggest that a new airport within search area 1 would have runways oriented in a northeast-to-southwest alignment. This configuration would project the extended centerlines of the runways into the existing Class E airspace over the Newport News-Williamsburg International and Williamsburg-Jamestown Airports to the northeast. To the southwest, the centerlines do not infringe on existing airspace.

Bordering the search area to the north and to the south are high-power electrical transmission lines that may require relocation if a new facility is developed.

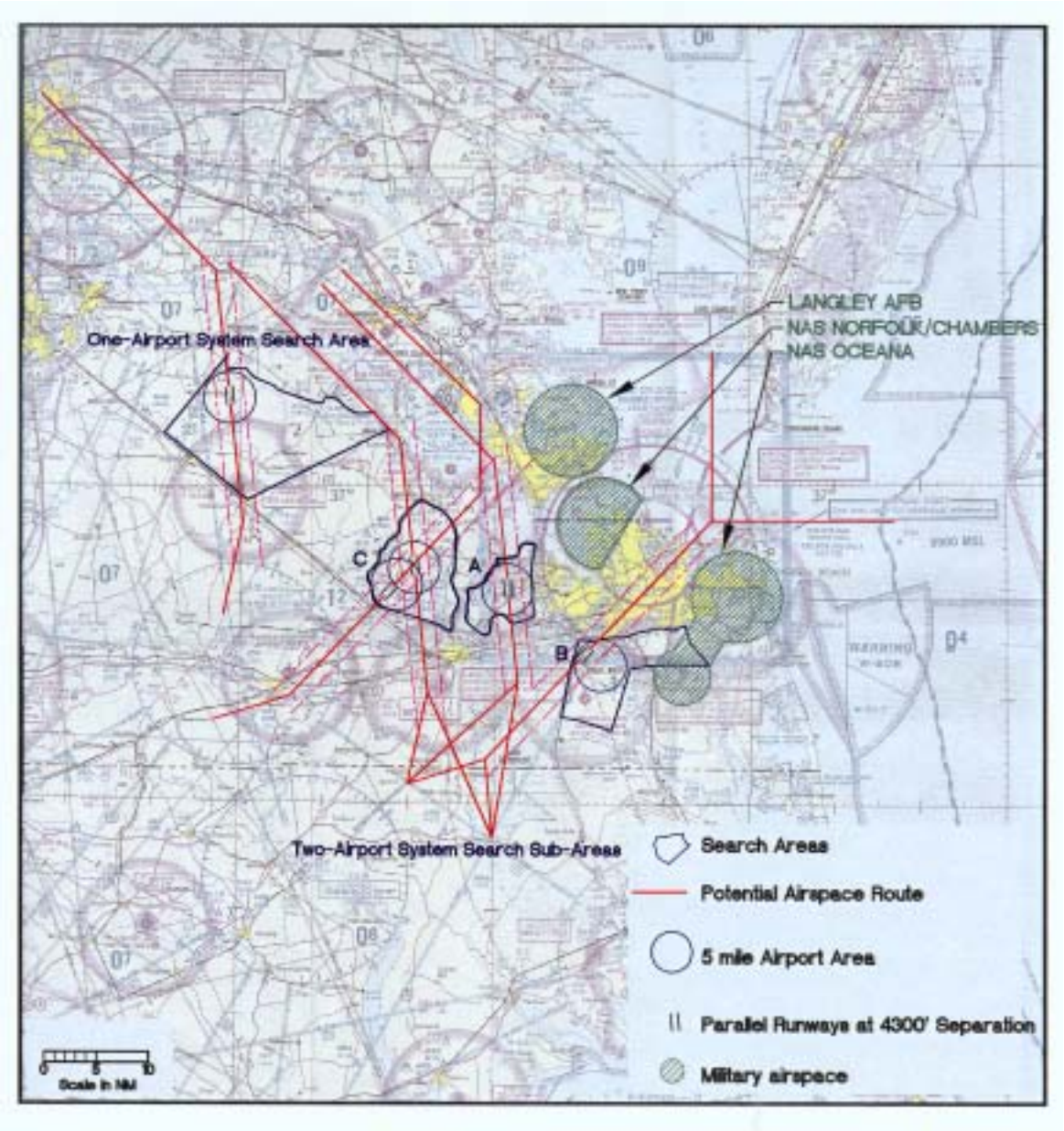
Two-Airport System - RIC and Search Area 2

Search area 2 is divided into three sub-areas: A, B, and C, as depicted in Figures 10-7 and 11-2.

Based on historical data, within the vicinity of Norfolk and Virginia Beach, wind patterns are aligned along a northeast-to-southwest direction, with predominant winds occurring from the northeast. This pattern dictates the orientation of the runways at several of the airports in the area as well as their runway use. Further analysis of wind data from Norfolk International Airport (coverage 98.98 percent) illustrates the possibility of aligning runways in a north-south orientation while maintaining wind coverage above 95 percent. If crosswind runways are determined to be required, then airspace constraints would have a negative impact on search areas A and B.

Any runways located within search areas A and C should be aligned with magnetic heading 0-180. This would provide wind coverage of 99.78 percent in all weather conditions. This alignment would also allow unrestricted approach and departure corridors to the runways without infringing on existing military airspace. At these locations, there could be corridors as long as 12 nautical miles for straight-in independent approaches from either direction. Although the extended centerlines of new runways intersect with the extended centerline of Runway 09-27 at NAS Norfolk, the potential interaction would have a minimal impact on capacity or operations at either airport.

For a facility located within search area B, the runway orientation should follow an alignment with magnetic orientation 050-230. Any new airport development in this area would infringe on the Class E airspace of Chesapeake Airport, which is in the southern section of the search area. While it is assumed that any new airport development in this area would result in restructuring the Norfolk Class C airspace, it is possible to locate runways of adequate separation within this search area and remain outside of the NAS Oceana and NAS Norfolk/Chambers airspace. Although the centerlines to the new runways would remain outside of the military airspace, the extended centerlines intersect the extended centerline of Runway 09-27 at NAS Norfolk.


LANGLEY AFB
NAS NORFOLK/CHAMBERS
NAS OCEANA
One-Airport System Search Area
Two-Airport System Search Sub-Areas
A
B
C
Search Areas
Potential Airspace Route
5 mile Airport Area
Parallel Runways at 4300' Separation
Military airspace
Scale in NM

According to the FAA Capacity Task Force for eastern Virginia, the interaction between these corridors is not likely to have a major effect on capacity and operations at either airport. Based on the forecasted operations at a new airport and the capacity of the proposed parallel runway configurations, it is unlikely that the construction of a crosswind runway would meet cost-benefit standards.

11.1.3 Capacity and Delay

For non-hubbing scenarios, the findings of the FAA Capacity Task Force for eastern Virginia indicate that delay should not be sufficient to constrain growth in aircraft operations. According to the Task Force, airspace requirements are not expected to constrain regional airport system development and would not play a major role in the evaluation of the airport systems. Because the implementation and development timeframe for a new airport is not expected until the year 2020, and given the evolutionary nature of air traffic control technologies and procedures, specific requirements are difficult to gauge at this time. It is anticipated that advances in air traffic management may alleviate existing airspace constraints, and that the development of a new airport in eastern Virginia would not be hindered by current airspace definitions.

The level of delay at each of the existing airports was calculated by applying the forecasted demand in each of the system alternatives to the delay curves prepared by the FAA in the *Eastern Virginia Airport Capacity Enhancement Plan*, published in May 1994.

For the new airport concepts, the level of delay is assumed to be on average less than half a minute per aircraft operation since it would be a new facility designed to accommodate its projected demand. **Table 11.1** summarizes the level of delay for the airports in each of the configurations.

11.2 FACILITY REQUIREMENTS AND CAPITAL COSTS

This section describes the revised facility requirements and capital costs associated with each alternative airport system. The analysis and assumptions involved in developing the facility requirements and unit costs are the same as in Phase I, with the exception of some minor changes, which are discussed below. Total capital costs under the base forecast scenario are then discussed, followed by the high forecast scenario.

Facility requirements for the three existing airports and the two search areas were developed using the planning factors described in Section 6.1.1 and the revised forecasts. No changes were made to the planning factors in order to maintain consistency between the two studies.

The actual requirements have changed somewhat as a result of revised activity levels generated under each airport system scenario. In addition, several assumptions were made regarding the timing of the opening of a new airport and the construction of new runways. Actual demand will dictate what facilities would be constructed based on cost/benefit analysis (for discretionary-funded projects) and environmental approvals.

It is assumed that in the alternatives involving a new airport, the opening would occur in 2020. Beyond 2020, only cargo and General Aviation facilities would continue to be developed at the existing airport(s) not included in the airport system,

Table 11.1

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Average Minutes of Delay/Operation
Assumes No Airline Hub
Year 2030

	Richmond Intl.		Norfolk Intl.		Newport News Intl.		Search Area 1		Search Area 2	
	Annual Operations	**Delay (minutes)**	**Annual Operations**	**Delay (minutes)**	**Annual Operations**	**Delay (minutes)**	**Annual Operations**	**Delay (minutes)**	**Annual Operations**	**Delay (minutes)**
SINGLE-AIRPORT SYSTEM										
Search Area 1	197,700	0.50	131,400	<.5	233,000	2.00	307,100	<.5	-	-
TWO-AIRPORT SYSTEM										
Richmond and Newport News/Williamsburg	334,600	1.50	131,400	<.5	358,700	1.50	-	-	-	-
Richmond and Search Area 2A	348,000	1.75	131,400	<.5	233,000	2.00	-	-	225,600	<.5
Richmond and Search Area 2B	359,700	1.80	131,400	<.5	233,000	2.00	-	-	215,600	<.5
Richmond and Search Area 2C	367,500	2.00	131,400	<.5	233,000	2.00	-	-	185,800	<.5
THREE-AIRPORT SYSTEM										
Richmond, Norfolk, and Newport News/Williamsburg	337,900	1.75	300,800	2.00	275,100	1.70	-	-	-	-

Note: Airport System assumes Task Force improvements to meet demand.
Delay is described as average delay per aircraft operation.

Source: Eastern Virginia Airport Capacity Enhancement Plan and HNTB analysis.

and these facilities would be re-evaluated in the future based on market demand. If cargo cannot be sustained at all the airports, it would likely consolidate similarly to the passenger service. It is also assumed that under the new airport scenarios, airfield construction would consist initially of two runways, and a third runway would be constructed in 2030, if demand warranted. The FAA Capacity Study determined airfield capacity at the existing airports to be sufficient through 2030.

The unit costs used to estimate capital costs of facility improvements, which were modified from Phase I, are included as **Table 11.2.** The costs represent 1996 dollars, which correspond to the forecast and financial base data. The changes from Phase I include the terminal building unit cost. This was increased from $148 to $160 for existing terminal expansion, which represents a more current industry average for this type of construction. The construction costs for a new terminal at a new airport site are estimated at $200 per square foot. Runway costs were revised based on new runway costs estimated in the existing airport master plans. The average cost for a 10,000-foot runway with parallel taxiway system is $83 million. Apron costs were increased to $150 per square yard, and land acquisition was increased for search area 2 from $1,700 to $8,000 per acre. This is based on unzoned land values located in search area B according to the Chesapeake City Assessors' Office.

The cost of a new Aircraft Rescue and Fire Fighting (ARFF) facility was updated based on the new facility constructed at ORF. The unit cost was increased to $150 per square foot and $500,000 per vehicle required by the Federal Aviation Regulation (FAR) Part 139 ARFF Index.

Several assumptions were made for the timing of facility at the existing airports in each airport system. In the year 2020, under the three-airport system, the facility costs shown in **Table 11.3** are directly from each of the existing airport's Master Plans through the year 2015. Under the one- and two-airport systems, it is assumed that the existing airports would develop their facilities as prescribed in their Master Plans through the year 2005 or based on the EVASS activity projections, whichever is greater. It is also assumed that some runway and taxiway improvements would take place at the existing airports in the one- and two-airport systems.

In 2030, as shown in **Tables 11.4**, under the three-airport system, each existing airport would develop its facility according to its 2030 Master Plan capital program. The one- and two-airport systems are expanded as described above in 2020, up to the 2005 Master Plan projects or EVASS projections, whichever is greater. In both situations, actual demand will dictate when facilities are constructed.

Based on the facility requirements and unit costs, projected facility costs at each airport were calculated for the status quo (three-airport system) and the three other airport system alternatives. Projected facility costs at each airport under the different alternatives for planning levels 2020 and 2030 and a high forecast scenario are detailed in **Appendix A,** and summarized by alternative system in Tables 11.3 through 11.5. It should be noted that under the two-airport system alternative which considers a new airport in three search sub-areas, search area C is used for the evaluation of facility cost estimates. A new airport in any of the three search sub-areas (A, B, or C) would have similar facility costs. Therefore, for the purpose of the cost analysis, search area

Table 11.2

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Unit Capital Costs ($1996)

Category	Unit	Recommended Cost Per Unit ($1996) (a)
Terminal Building (b)	sq. ft.	$160
Terminal Auto Parking	sq. yd.	$30
Apron Area	sq. yd.	$150
Air Cargo Building (b)	sq. ft.	$70
Air Cargo Apron	sq. yd.	$150
Land Acquisition (f)	acres	$1,700
Runway (g)	lump sum	$83,000,000
ARFF (h)	sq. ft.	$150
Fuel Facilities (b)	gallon of capacity	$3
Airport Maintenance Facilities (b)	sq. ft.	$79
Air Traffic Control Tower (b)	lump sum	$21,000,000
Utilities (c)		
Sanitary Sewer		
Pipes (8" diameter)	ft	40
Pipes (10" diameter)	ft	45
Pipes (12" diameter)	ft	50
Pipes (24" diameter)	ft	$65
Treatment Plant (5 MGD)	Station	$16,000,000
Water System		
Wells (1 MGD)	well	$150,000
Pipes (6" diameter)	ft	$28
Pipes (8" diameter)	ft	$30
Pipes (12" diameter)	ft	$36
Pipes (16" diameter)	ft	$54
Storage Tank (.5 MGD)	tank	$675,000
Access Roads (d)		
New Road (2-lane)	lane mile	$1,765,000
Road Widening	lane mile	$1,242,000

a) Virginia Air Transportation System Plan, 1989 adjusted for 1996 dollars.
b) HNTB estimate based on similar airports and escalated to 1996 dollars. $200/sq. ft. is assumed for new terminal construction.
c) Analysis by Hankins-Anderson.
d) Analysis by URS.
e) Includes contingency and engineering and administrative costs.
f) $1,700 per acre for Search Area 1 and $8,000 per acre for Search Area 2.
g) Average of E.VA Airport Master Plan Cost Estimates for proposed runways.
h) $150 per square foot plus $500,000 per required vehicle.

Sources: As noted.

Table 11.3

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Facility Costs through 2020 and Master Plan Projects for Each System

Planning Factor	Units	Unit Costs	Three Airport System Status Quo**		One Airport System New Airport - Area One***		Two Airport System RIC/PHF***		Two Airport System RIC/New Airport-Area 2C***	
			Net Req.	Cost Est.*	Net Req.	Cost Est.*	Net Req.	Cost Est.*	Net Req.	Cost Est.*
Land Acquisition	acre	$1,700	0	$5,935,000	16,000	$30,450,000	0	$5,935,000	16,000	$133,935,000
Site Preparation	cu. yd.	$2	0	$0	16,000	$110,000,000	0	$0	16,000	$110,000,000
Utilities	various	n/a	0	$0	0	$21,670,000	0	$0	0	$21,670,000
Wetland Mitigation	acre	$70,000	10	$700,000	4,910	$343,700,000	10	$700,000	4,910	$343,700,000
Runway/Taxiway	lump sum	$83,000,000	ls	$399,969,000	0	$318,392,000	0	$291,642,000	2	$425,692,000
Airport Roadways	lane mile	$1,307,750	0	$46,092,000	24	$79,092,000	0	$46,092,000	20	$73,592,000
Off-Airport Road & Railways	lump sum	n/a	0	$158,654,000	0	$191,887,000	0	$158,654,000	0	$187,885,000
NAVAIDS	per ILS	$2,500,000	2	$20,000,000	6	$15,000,000	2	$20,000,000	6	$15,000,000
Air Traffic Control Tower	lump sum	$21,000,000	0	$21,000,000	1	$21,000,000	0	$21,000,000	1	$21,000,000
ARFF	sq. ft.	$150	ls	$2,500,000	10,000	$3,000,000	10,000	$1,500,000	10,000	$3,000,000
Fuel Storage Facilities	gal. of cap.	$3.10	0	$5,490,000	242,690	$4,162,000	0	$3,410,000	132,850	$3,822,000
Terminal Building	sq. ft.	$160	0	$194,235,000	631,722	$286,829,000	351,885	$205,872,000	342,335	$228,952,000
Terminal Parking - at grade	spaces	$1,000	0	$7,184,000	15,098	$20,632,000	17,261	$17,261,000	14,507	$15,441,000
Terminal Parking - structure	spaces	$8,500	0	$104,636,000	6,471	$120,756,000	4,741	$106,051,000	3,560	$96,016,000
Air Carrier Gates	gates	$250,000	0	$0	49	$12,134,000	45	$8,814,000	42	$6,642,000
Regional Carrier Positions	positions	$0	0	$0	24	$0	13	$0	16	$0
Apron Area	sq. yd.	$150	0	$30,600,000	332,830	$78,250,000	254,604	$54,791,000	247,189	$56,403,000
Air Cargo Building	sq. ft.	$70	3,381	$15,737,000	73,738	$17,662,000	3,381	$12,737,000	73,738	$17,662,000
Air Cargo Apron	sq. yd.	$150	939	$16,761,000	20,483	$15,913,000	939	$12,981,000	20,483	$15,913,000
A/E and Contingency	n/a	n/a	n/a	$208,799,000	n/a	$423,026,000	n/a	$191,121,000	n/a	$442,037,000
TOTAL				**$1,238,292,000**		**$2,113,555,000**		**$1,158,561,000**		**$2,218,362,000**

* Rounded to nearest thousand.

** Costs from latest Airport Master Plan through 2015

*** Costs from latest Airport Master Plan through 2005 or EVASS projections, which ever is greater.

Source: HNTB analysis, 1998.

Table 11.4

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Facility Costs through 2030 and Master Plan Projects for Each System

			Three Airport System Status Quo**		One Airport System New Airport - Area One***		Two Airport System RIC/PHF***		Two Airport System RIC/New Airport-Area 2C***	
Planning Factor	**Units**	**Unit Costs**	**Net Req.**	**Cost Est.***	**Net Req.**	**Cost Est.***	**Net Req.**	**Cost Est.***	**Net Req.**	**Cost Est.***
Land Acquisition	acre	various	0	$5,935,000	16,000	$30,450,000	0	$5,935,000	16,000	$133,935,000
Site Preparation	acre	various	0	$0	16,000	$110,000,000	0	$0	16,000	$110,000,000
Utilities	various	n/a	0	$0	0	$21,670,000	0	$0	0	$21,670,000
Wetland Mitigation	acre	$70,000	0	$6,000,000	4,910	$343,700,000	0	$3,000,000	4,900	$346,000,000
Runway/Taxiway	lump sum	$83,000,000	ls	$471,124,000	ls	$478,092,000	ls	$368,342,000	ls	$502,392,000
Airport Roadways	lane mile	$1,307,750	0	$89,092,000	24	$79,325,000	0	$46,092,000	20	$77,168,000
Off-Airport Roadways	lump sum	n/a	0	$173,707,000	0	$158,707,000	0	$158,707,000	0	$187,938,000
NAVAIDS	per ILS	$2,500,000	2	$5,000,000	8	$20,000,000	2	$20,000,000	6	$15,000,000
Air Traffic Control Tower	lump sum	$21,000,000	0	$21,000,000	1	$21,000,000	0	$21,000,000	1	$21,000,000
ARFF	sq. ft.	$150	ls	$5,500,000	12,000	$3,800,000	10,000	$1,500,000	12,000	$3,800,000
Fuel Storage Facilities	gal. of cap.	$3.10	0	$13,150,000	304,320	$4,353,000	0	$3,410,000	170,820	$3,940,000
Terminal Building	sq. ft.	$160	0	$222,235,000	834,670	$327,419,000	351,885	$205,872,000	455,071	$251,499,000
Terminal Parking - at grade	spaces	$1,000	0	$7,184,000	19,703	$25,237,000	20,146	$20,146,000	18,039	$18,973,000
Terminal Parking - structure	spaces	$8,500	0	$217,796,000	8,444	$137,530,000	7,081	$125,945,000	4,645	$105,239,000
Air Carrier Gates	gates	$250,000	0	$0	61	$15,244,000	51	$8,814,000	51	$8,343,000
Regional Carrier Positions	positions	$0	0	$0	29	$0	15	$0	22	$0
Apron Area	sq. yd.	$150	0	$30,600,000	418,113	$91,042,000	254,604	$54,791,000	293,830	$63,400,000
Air Cargo Building	sq. ft.	$70	3,381	$21,737,000	116,081	$20,626,000	147,026	$15,792,000	259,726	$23,681,000
Air Cargo Apron	sq. yd.	$150	939	$23,351,000	32,245	$17,677,000	939	$12,981,000	32,245	$17,677,000
A/E and Contingency	n/a	n/a	n/a	$272,681,000	n/a	$470,805,000	n/a	$221,046,000	n/a	$457,996,000
TOTAL				**$1,586,092,000**		**$2,376,677,000**		**$1,293,373,000**		**$2,369,651,000**

* Rounded to nearest thousand.

** Costs from latest Airport Master Plan through 2030

*** Costs from latest Airport Master Plan through 2005 or EVASS projections, which ever is greater.

Source: HNTB analysis, 1998.

C would represent the area for a new airport in the two-airport system alternative. Total facility costs for each airport under each alternative are further summarized by year in **Table 11.5**.

11.2.1 One-Airport System (Consolidated at Search Area 1)

Under the one-airport system, a new airport in search area 1 would initially cost $1.3 billion in 2020. The largest line item under this alternative would be wetland mitigation.

Approximately 4,900 acres of land could contain some wetland areas that would need to be mitigated. This is a conservative estimate since a new airport would be sited to avoid wetlands impacts. Therefore, the $343 million in wetland mitigation is likely the high end of what the actual cost would be.

It is assumed that a new airport would be located within a 16,000-acre area. This is a conservative estimate since the future airport owner could lease or sell the surrounding property to private interest for development. However, the airport owner would have control over the type of development to ensure the land uses are compatible. Once the airport system is chosen, a more definitive land requirement for airport development would be analyzed.

The terminal building would cost $287 million, and runway/taxiway construction would cost $318 million. Total system costs would amount to $2.2 billion, as shown in Table 11.3. By the year 2030, the cumulative system facility costs would increase to $2.5 billion, based on passenger and aircraft operations projects, as shown in Table 11.4. Under the high forecast scenario, the cumulative system cost would be $2.6 billion, as shown in Table 11.5.

11.2.2 Two-Airport System (RIC and PHF)

Concentrating service at RIC and PHF under this alternative would result in a total system facilities cost of $1.2 billion in 2020: $611 million for improvements to RIC, $323 million for improvements to PHF, and the remainder for improvements to ORF. Terminal building and runway improvements would be the largest expense at each of these airports.

In 2030, the preliminary cumulative facility costs for the system would be $1.3 billion. Under the high forecast scenario, the cumulative system cost would increase to $1.4 billion, as shown in Table 11.5.

11.2.3 Two-Airport System (RIC and Search Area 2)

Concentrating service at RIC and a new airport in 2020 at search area 2 under this alternative would have an initial total facilities cost of $2.3 billion: $612 million for improvements to RIC, $1.3 billion for construction of a search area 2 airport, and the remainder for PHF and ORF.

In 2030, the cumulative facility costs for RIC would be $620 million, the new airport would be $1.3 billion, and the total system cost would be $2.4 billion. Under the high forecast scenario, the cumulative system cost would increase to $2.8 billion, as shown in Table 11.5.

11.2.4 Three-Airport System (Status Quo)

Projected facility costs through the year 2020 at RIC, ORF, and PHF under the status quo would total $1.2 billion (Table 11.3). Under this scenario, each of the three airports would continue to grow within the region as described in their master plan if

Table 11.5

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Accumulative Facility Costs by Year
(millions)

	Base Forecast		High Forecast
	1998-2020	**2021-2030**	**2021-2030**
	Single-Airport System		
Richmond	$474	$474	$474
Norfolk	$279	$356	$356
Newport News/Williamsburg	$122	$122	$122
Search Area 1	$1,600	$1,819	$2,001
Search Area 2	$0	$0	$0
Total	$2,475	$2,771	$2,953
Two-Airport System – Consolidated at Richmond and Newport News/Williamsburg			
Richmond	$612	$619	$619
Norfolk	$279	$356	$356
Newport News/Williamsburg	$343	$394	$479
Search Area 1	$0	$0	$0
Search Area 2	$0	$0	$0
Total	$1,234	$1,369	$1,454
Two-Airport System - Consolidated at Richmond and Search Area 2C			
Richmond	$612	$620	$620
Norfolk	$279	$356	$356
Newport News/Williamsburg	$122	$122	$122
Search Area 1	$0	$0	$0
Search Area 2	$1,281	$1,348	$1,734
Total	$2,294	$2,446	$2,832
Three-Airport System - Richmond, Norfolk, and Newport News/Williamsburg			
Richmond	$644	$806	$806
Norfolk	$429	$483	$483
Newport News/Williamsburg	$240	$373	$373
Search Area 1	$0	$0	$0
Search Area 2	$0	$0	$0
Total	$1,313	$1,662	$1,662

Source: HNTB

demand justifies expansion. RIC would have the highest facility costs, totaling approximately $644 million, followed by ORF at $429 million and PHF at $218 million. Runways, terminals, and structure parking costs would be the largest line items at the three airports. **Appendix A** identifies projects by individual airport for each system. In 2030, the system costs, base and high forecast, increase to $1.6 billion.

11.2.5 Preliminary Facility Cost Summary

Comparing the costs for facilities at each of the airport systems through the year 2030, the two-airport system (RIC and PHF) is the least expensive at $1.37 billion, as shown in Table 11.6. The three-airport system alternative is the next least expensive at $1.66 million, followed by the one-airport system at $2.77 billion and the two-airport (RIC and new airport) system at $2.4 billion. These are preliminary cost estimates and are refined in more detail in Chapter 16.

11.3 TRAVEL TIMES

Automobile travel times were calculated from each of the cities and counties located in the catchment areas to each of the three existing airports and four search areas. The quickest route was determined from the geographic center of the city or county to the airport system alternative destination. The population center was used instead of the geographic center for calculation of travel times from Virginia Beach, Chesapeake, and York County. The travel times and selected route distances from the three existing airports and the four search areas to each city and county are shown in **Appendix B**.

A detailed travel time computation was performed for cities and counties with large populations, including Chesapeake, Hampton, Newport News, Norfolk, Portsmouth, Virginia Beach, Chesterfield County, Henrico County, and Richmond. The travel times from these localities to each of the system alternative locations were computed on a road segment-by-segment basis in the Hampton Roads area using the measured 1995 speeds in the *Hampton Roads Regional Travel Time Volume II: Data Report*. All roads outside the Hampton Roads area were assigned the following speeds:

- Interstates
  - ⇒ I-64 and I-95 through Richmond — 57 mph
  - ⇒ All other Interstates (I-95, I-64, etc.) — 62 mph
- Divided Highway — 45 mph
- Non-Divided Highway — 40 mph
- Urban Highway — 30 mph
- Urban Access Roads — 20 mph
- Local Roads — 20 mph

A trip-planning computer program using the above speeds was used to calculate the travel times for the less-populated cities and counties in the catchment area. The speed used for interstate highway travel through Hampton Roads was 52 mph.

The existing road network was used in calculating travel times except for proposed I-895 and the proposed extension of Route 288 in the Richmond area. No new airport access roads were used in travel time calculations. The Jamestown Ferry was included in the calculation of travel times when it provided the quickest route.

The location of each search area destination was selected to be as close to a major roadway as possible. Travel times to the one-airport search area and to search area C could increase by as much as five minutes with new access roads. Travel times to search area A could increase by as much as

two minutes with an improved access road. Search area B was located near Route 168, so a new access road would have no effect on the computed travel times to this area.

11.4 LEVEL OF SERVICE FACTORS

People usually fly because they need to get somewhere as quickly as possible, faster than by any alternative mode of transportation. Therefore, the time spent by the passenger, both on the ground and in the air, is a critical measure of the level of service of the alternative airport systems to the user. This section builds upon and revises the analysis of travel time first conducted in Section 7.5 of the Phase I study. It first discusses the average and minimum ground travel times to airport service for each alternative airport system, followed by a discussion of the number of potential non-stop markets with each alternative and the average air travel time. The section concludes with a combined assessment of ground and air travel time as a measure of overall level of service.

The ground transportation assumptions used for the level of service analysis of the alternative airport systems are the same as those used for the travel time analysis in Section 11.3. The following discussion concerns the relative accessibility of the alternative airport systems. **Table 11.6** presents the ground travel time for each alternative under both the Base Case and high forecasts for 2030.

Ground travel times are presented from the standpoint of all passengers originating within the eastern Virginia catchment area (see Figure 1 in the Executive Summary), and also from the standpoint of the segment of those passengers who actually use an eastern Virginia airport. In this way, the level of service of the alternatives can be measured for residents of the eastern Virginia area as well as for total users of the eastern Virginia airports. Both minimum travel times and average travel times are presented. The minimum time represents the ground travel time to the nearest airport, whereas the average time reflects the fact that passengers sometimes drive to more distant airports because of better service. The minimum and average times are weighted both by the number of originations in each jurisdiction and the population in each jurisdiction. Weighting by originations presents a better measure of the ground travel times experienced by those persons who actually fly. However, this measure neglects to take into account that people who live farther away are less likely to fly because of the reduced level of service; therefore, those people are not included in the calculation. Weighting by population presents a better measure of the level of service of alternative airport systems to the overall region.

As expected, the greater the number of airports in the system, the lower the minimum ground travel times. Under the Base Case, the three-airport system has the lowest minimum and average ground travel times, while the single-airport alternative has the highest average and minimum ground travel times. The two-airport system alternatives, including RIC and search areas 2A and 2B, have slightly lower ground travel times than the other two two-airport system alternatives. Average ground travel times are reduced slightly for all catchment area originations under the high forecasts because the greater air service levels attract more passengers to the eastern Virginia airports and reduce the number of passengers driving to more distant airports such as Washington National Airport

Table 11.6

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Average and Minimum 2030 Ground Travel Times by Alternative
(Minutes)

	All Airports (a)		East Virginia Airports (b)	
	Weighted by Originations	**Weighted by Population**	**Weighted by Originations**	**Weighted by Population**
	Average Travel Time			
Base Case				
1-Airport System	94.9	103.9	69.3	94.5
2-Airport System - RIC & PHF	57.6	75.1	38.3	63.5
2-Airport System - RIC & 2A	54.7	70.7	37.0	58.9
2-Airport System - RIC & 2B	56.6	72.6	37.7	60.4
2-Airport System - RIC & 2C	68.0	82.2	46.1	59.9
3-Airport System	47.5	67.2	29.4	56.9
High Forecast				
1-Airport System	92.7	101.1	69.7	94.5
2-Airport System - RIC & PHF	56.9	74.6	38.5	63.8
2-Airport System - RIC & 2A	54.2	70.3	37.1	59.1
2-Airport System - RIC & 2B	56.1	72.2	37.8	60.6
2-Airport System - RIC & 2C	67.2	81.4	46.2	66.9
3-Airport System	47.5	67.2	29.4	56.9
	Minimum Travel Time			
Base Case				
1-Airport System	74.1	83.1	69.3	94.5
2-Airport System - RIC & PHF	42.0	56.2	35.6	58.8
2-Airport System - RIC & 2A	40.2	52.9	34.7	55.0
2-Airport System - RIC & 2B	41.5	54.1	35.4	56.3
2-Airport System - RIC & 2C	48.0	59.9	42.6	62.4
3-Airport System	33.4	48.7	26.0	51.3
High Forecast				
1-Airport System	74.0	83.1	69.7	94.5
2-Airport System - RIC & PHF	42.0	56.2	35.7	58.8
2-Airport System - RIC & 2A	40.2	52.9	34.8	55.0
2-Airport System - RIC & 2B	41.5	54.1	35.5	56.3
2-Airport System - RIC & 2C	48.0	59.9	42.8	62.4
3-Airport System	33.4	48.7	26.0	51.3

(a) Weighted travel times to all airports, including Eastern Virginia airports, DCA, IAD, BWI, and RDU.
(b) Weighted travel times to Eastern Virginia airports only.

Source: HNTB analysis, 1997.

(DCA), Washington Dulles International Airport (IAD), Baltimore-Washington International Airport (BWI), and Raleigh-Durham International Airport (RDU). Conversely, average ground travel times for catchment area passengers using eastern Virginia airports increase under the high forecast because the increased service levels attract passengers from farther away.

Ground travel time is not the only measure of the level of service to the passenger. Air travel time and the number of connections required are also relevant factors. **Table 11.7** presents the number of non-stop markets; the percentage of originations experiencing non-stop service under each were largely obtained from the airline hub analysis conducted in Sections 4.3 and 7.4.5 in the Phase I report. Markets were considered viable for non-stop service if they could generate sufficient enplanements, either originating or connecting, to justify twice-a-day service by 100-seat aircraft at 60 percent load factors. Originations to each market were assumed to grow at the same rate as total originations.

Because of the growth in originations, even under the three-airport system case (which would have the least amount of consolidation), the percentage of non-stop originations is expected to grow from 30 percent (see Tables 3.16, 3.17, and 3.18 in Phase I) to over 50 percent by 2030. The percentage of non-stop originations with non-stop service is higher under each of the consolidated alternative airport systems than it is under the three-airport system, ranging from 54.4 percent to 69.4 percent under the Base Case forecasts. The single-airport alternatives generate higher non-stop percentages than the multiple-airport alternatives since they can concentrate more traffic. Since an airline hub generates additional connecting spokes, the number and percentage of non-stop markets increases significantly under the high forecast. Under the high forecast, the percentage of non-stop originations ranges from 51 percent to 81 percent, depending on the alternative.

Table 11.8 presents the average air travel time by alternative. These were calculated only for eastern Virginia airport passengers since there was not enough information to calculate average air travel times for the other airports. Average air travel time is a function of the percentage of non-stop originating passengers since a trip requiring a connection requires more time than a non-stop flight. Under the Base Case, the single-airport alternatives, with their higher non-stop percentages, offer more of a time savings than the multiple-airport alternatives. With the high forecast, the percentage of non-stop markets and non-stop originations is greater, therefore, the travel time advantages are also greater.

Table 11.9 combines the average ground travel time with the average air travel time to generate a total trip time for each alternative. To be consistent with the air travel times, ground travel times are for eastern Virginia airport passengers. Under the Base Case forecast, the combined travel time for the three-airport alternative and three of the two-airport alternatives (RIC and PHF, RIC and 2A, and RIC and 2B) are roughly comparable, ranging from 242 to 245 minutes. The combined travel times of all the consolidation alternatives are reduced under the high forecast. The one-airport alternative still has the highest combined travel time, but three of the two-airport alternatives (RIC and PHF, RIC and 2A, and RIC and 2B) have combined travel times ranging from 3 minutes to 5 minutes less than the three-airport case.

In general, the multiple-airport alternatives offer greater ground travel time

Table 11.7

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Estimated Non-Stop Air Service in 2030 by Alternative

Alternative	Airport	Number of Non-Stop Jet Markets (a)	Total Originations (b)	Non-Stop Originations (c)	Percent Non-Stop (d)
Base Case					
1-Airport System	Search Area 1	40	6,387,000	4,433,000	69.4%
2-Airport System	Richmond	21	3,184,000	1,579,000	49.6%
	Newport News	31	4,887,000	3,020,000	61.8%
	Total	31	8,071,000	4,599,000	57.0%
2-Airport System	Richmond	24	3,493,000	1,883,000	53.9%
	Search Area 2A	30	4,527,000	2,757,000	60.9%
	Total	30	8,020,000	4,640,000	57.9%
2-Airport System	Richmond	24	3,760,000	2,023,000	53.8%
	Search Area 2B	29	4,293,000	2,563,000	59.7%
	Total	29	8,053,000	4,586,000	56.9%
2-Airport System	Richmond	27	3,940,000	2,262,000	57.4%
	Search Area 2C	24	3,608,000	1,941,000	53.8%
	Total	25	7,548,000	4,203,000	55.7%
3-Airport System	Richmond	21	3,238,000	1,603,000	49.5%
	Norfolk	27	3,907,000	2,247,000	57.5%
	Newport News	6	1,041,000	289,000	27.8%
	Total	27	8,186,000	4,139,000	50.6%
High Forecast					
1-Airport System	Search Area 1	66	7,160,000	5,843,000	81.6%
2-Airport System	Richmond	21	3,132,000	1,550,000	49.5%
	Newport News	50	5,157,000	3,765,000	73.0%
	Total	50	8,289,000	5,315,000	64.1%
2-Airport System	Richmond	24	3,430,000	1,845,000	53.8%
	Search Area 2A	46	4,773,000	3,365,000	70.5%
	Total	46	8,203,000	5,210,000	63.5%
2-Airport System	Richmond	24	3,692,000	1,990,000	53.9%
	Search Area 2B	45	4,527,000	3,182,000	70.3%
	Total	45	8,219,000	5,172,000	62.9%
2-Airport System	Richmond	24	3,869,000	2,082,000	53.8%
	Search Area 2C	39	3,804,000	2,454,000	64.5%
	Total	39	7,673,000	4,536,000	59.1%
3-Airport System	Richmond	21	3,238,000	1,603,000	49.5%
	Norfolk	27	3,907,000	2,247,000	57.5%
	Newport News	6	1,041,000	289,000	27.8%
	Total	27	8,186,000	4,139,000	50.6%

(a) Number of non-stop markets with jet service. See Section 4.3 for details.
(b) Tables 7.6 and 7.9.
(c) Hubbing analysis. See Section 4.3 for details.
(d) Non-stop originations divided by total originations.

Sources: As noted and HNTB analysis, 1997.

Table 11.8

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Estimated Average Air Travel Time in 2030 by Alternative

Alternative	Airport	Average Non-Stop Travel Time (a)	Percent Non-Stop Originations (b)	Average Connecting Travel Time (c)	Percent Connecting Originations (d)	Average Air Travel Time (e)
Base Case						
1-Airport System	Search Area 1	165	69.4%	262	30.6%	195
2-Airport System	Richmond	165	49.6%	262	50.4%	214
	Newport News	165	61.8%	262	38.2%	202
	Total	165	57.0%	262	43.0%	207
2-Airport System	Richmond	165	53.9%	262	46.1%	210
	Search Area 2A	165	60.9%	262	39.1%	203
	Total	165	57.9%	262	42.1%	206
2-Airport System	Richmond	165	53.8%	262	46.2%	210
	Search Area 2B	165	59.7%	262	40.3%	204
	Total	165	56.9%	262	43.1%	207
2-Airport System	Richmond	165	57.4%	262	42.6%	206
	Search Area 2C	165	53.8%	262	46.2%	210
	Total	165	55.7%	262	44.3%	208
3-Airport System	Richmond	165	49.5%	262	50.5%	214
	Norfolk	165	57.5%	262	42.5%	206
	Newport News	165	27.8%	262	72.2%	235
	Total	165	50.6%	262	49.4%	213
High Forecast						
1-Airport System	Search Area 1	165	81.6%	262	18.4%	183
2-Airport System	Richmond	165	49.5%	262	50.5%	214
	Newport News	165	73.0%	262	27.0%	191
	Total	165	64.1%	262	35.9%	200
2-Airport System	Richmond	165	53.8%	262	46.2%	210
	Search Area 2A	165	70.5%	262	29.5%	194
	Total	165	63.5%	262	36.5%	200
2-Airport System	Richmond	165	53.9%	262	46.1%	210
	Search Area 2B	165	70.3%	262	29.7%	194
	Total	165	62.9%	262	37.1%	201
2-Airport System	Richmond	165	53.8%	262	46.2%	210
	Search Area 2C	165	64.5%	262	35.5%	199
	Total	165	59.1%	262	40.9%	205
3-Airport System	Richmond	165	49.5%	262	50.5%	214
	Norfolk	165	57.5%	262	42.5%	206
	Newport News	165	27.8%	262	72.2%	235
	Total	165	50.6%	262	49.4%	213

(a) Average flight distance (Section 4.2) multiplied by average minutes per mile for non-stop flights (.172) from Official Airline Guide.
(b) Table 11.9.
(c) Average non-stop flight time plus additional flight time for circuity, take-offs, and landings (41 minutes) and connections (56 minutes) from Official Airline Guide.
(d) 100 percent less percent non-stop.
(e) Average non-stop and connecting flight times weighted by percentage of non-stop and connecting originations.

Sources: As noted and HNTB analysis, 1997.

Table 11.9

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Estimated Average Combined Ground and Air Travel Time in 2030 by Alternative (Minutes)

		Average Ground Travel Time (a)	Average Air Travel Time (b)	Average Combined Travel Time (c)
Base Case				
1-Airport System	1A	69	195	264
2-Airport System	RIC & PHF	38	207	245
2-Airport System	RIC & 2A	37	206	243
2-Airport System	RIC & 2B	38	207	244
2-Airport System	RIC & 2C	46	208	254
3-Airport System	RIC, ORF, & PHF	29	213	242
High Forecast				
1-Airport System	1A	70	183	253
2-Airport System	RIC & PHF	39	200	238
2-Airport System	RIC & 2A	37	200	237
2-Airport System	RIC & 2B	38	201	239
2-Airport System	RIC & 2C	46	205	251
3-Airport System	RIC, ORF, & PHF	29	213	242

(a) Table 11.8. Average ground travel time for Eastern Virginia airport passengers weighted by originations.
(b) Table 11.10.
(c) Average ground travel time plus average air travel time.

Sources: As noted and HNTB analysis, 1997.

convenience, whereas the single-airport alternative offers greater air travel time convenience. Measured in terms of total travel time, the two-airport and three-airport systems have comparable levels of service under the Base Case. Under the high forecast, the two-airport systems have a slightly better level of service than the three-airport system. Under both the Base Case and high forecast, the single-airport system provides the least convenience.

11.5 ENVIRONMENTAL FACTORS

The purpose of this section is to identify, in a preliminary manner, the potential environmental impacts that need to be avoided within an airport search area of approximately 25 square miles. A more detailed analysis and assessment of environmental impacts is provided in Chapter 13. Environmental issues, although important, are but one aspect of the overall study to define the best airport system for eastern Virginia. Other factors, including financing, relative proximity to established and likely future population centers, as well as planned changes to the transportation and infrastructure network of eastern Virginia, are the primary focus of the study in its early stages. Once an airport system for eastern Virginia is selected, more detailed environmental studies will be conducted. Given the nature of this project, it is expected that an EIS would be conducted and that appropriate permits for a new airport system would be obtained well in advance of construction. The environmental overviews from each of the existing airport's master plans are included as **Appendix C**.

11.5.1 Wetlands

Methodology

A preliminary wetland analysis was performed to provide an overview of potential wetland impacts as a consequence of the development of each airport system search area. This overview was prepared based on existing data only. No field research was included in the project. The following published resources were used:

- Atlas of National Wetlands Inventory Maps of the Chesapeake Bay, Volume I of IV, Coastal Plain Virginia–Western Shore, September 1986.

- Soil Survey of Isle of Wight County, Virginia, Issued September 1986.

- Soil Survey of Norfolk County, Virginia, Issued May 1959.

- Soil Survey of City of Suffolk, Virginia, Issued June 1981.

- United States Geological Survey (USGS) topographic maps, 1:24,000, 1:100,000, and 1:250,000 series.

The four search areas were identified on USGS topographic maps. These maps are included as **Figures 11-3 through 11-6**.

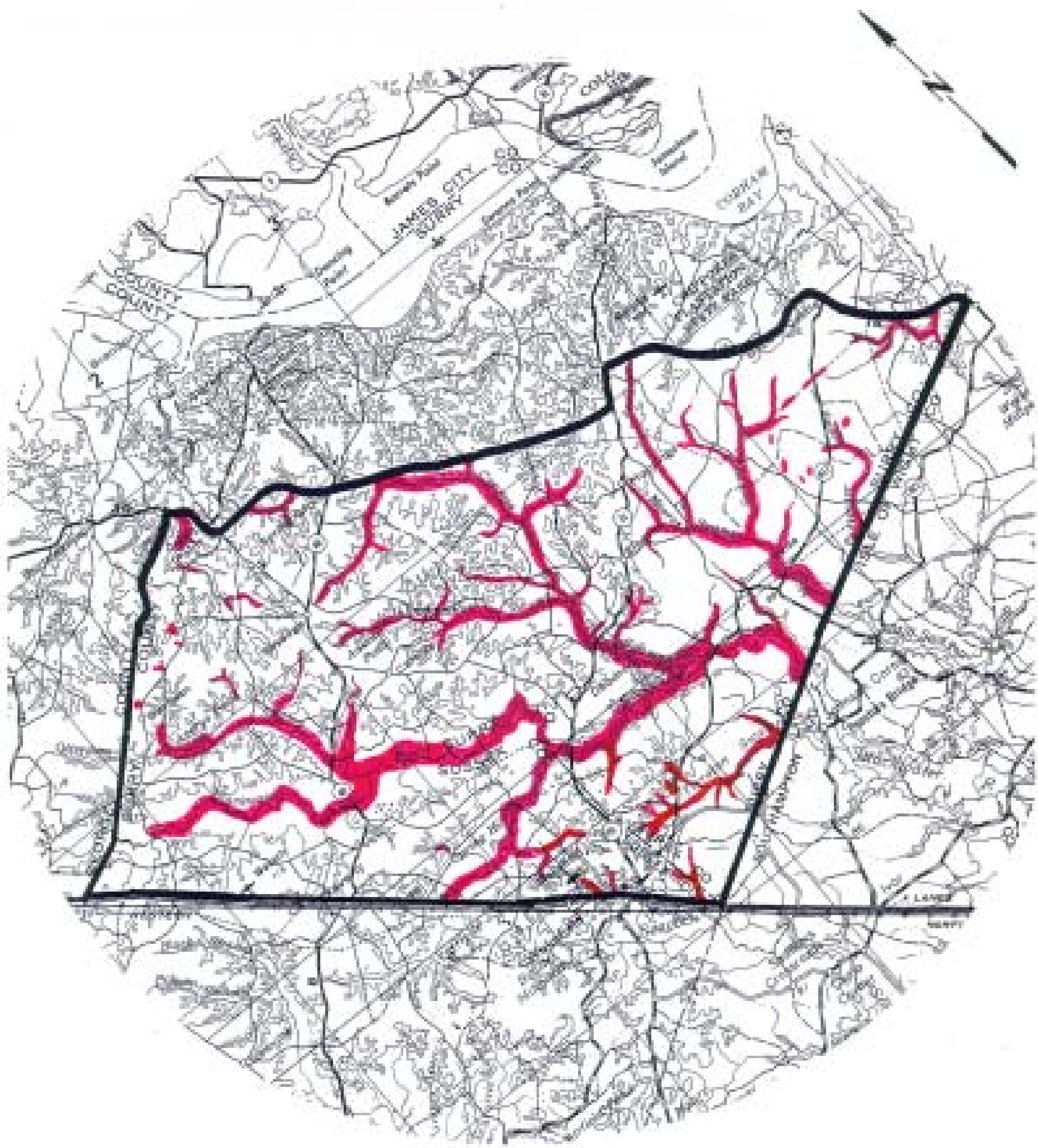
Areas designated as wetlands on the *Atlas of National Wetlands Inventory Maps of the Chesapeake Bay* U.S. Fish and Wildlife Service Region 5 (Atlas) were identified on the USGS maps. The Atlas "presents a broad picture of the distribution of wetlands within large geographic areas." The Atlas states that the minimum mapping unit is 1 to 3 acres, but that wetlands less than 1 acre are commonly mapped. According to the Atlas: "Wetlands include a variety of wet habitats commonly called marshes, bogs, and swamps. They are lands where permanent

Wetlands and Hydric Soils One-Airport Search Area

FIGURE 11-3

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Search Area Boundary
Mapped or Inferred Wetlands Areas
Mapped Hydric Soils



Map Source:
U.S.G.S. 1:250,000 Topographic Quadrangles

0 5 10 Miles

Wetlands and Hydric Soils
Search Area A

FIGURE 11-4

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Search Area Boundary
Mapped or Inferred Wetlands Areas
Mapped Hydric Soils

Map Source:
U.S.G.S. 1:250,000 Topographic Quadrangles

0 5 10 Miles

Wetlands and Hydric Soils
Search Area B

FIGURE 11-5

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Search Area Boundary
Mapped or Inferred Wetlands Areas
Mapped Hydric Soils

Map Source:
U.S.G.S. 1:250,000 Topographic Quadrangles

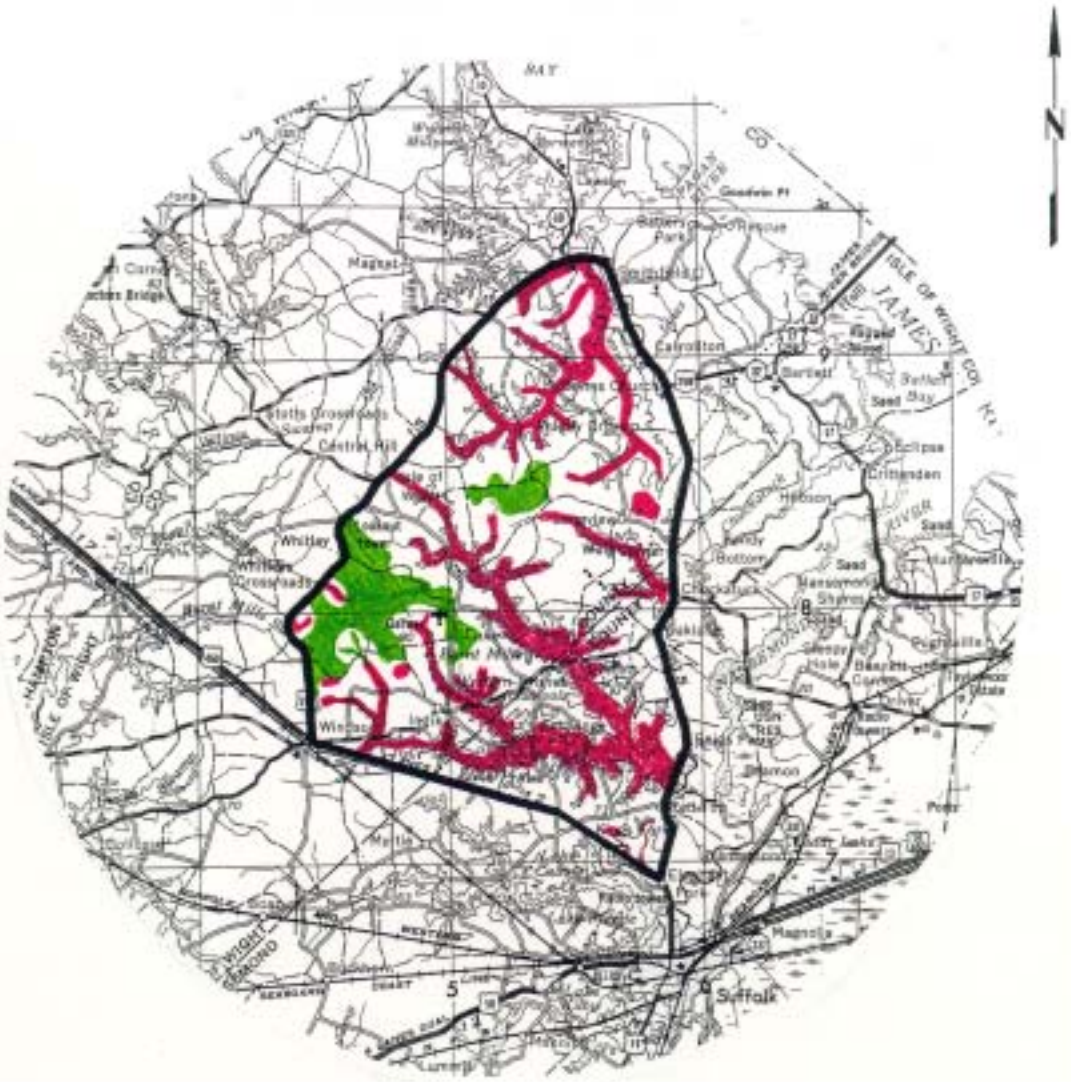
0 5 10 Miles

Wetlands and Hydric Soils
Search Area C

FIGURE 11-6

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Search Area Boundary
Mapped or Inferred Wetlands Areas
Mapped Hydric Soils



Map Source:
U.S.G.S. 1:250,000 Topographic Quadrangles

0 5 10 Miles

or seasonal saturation with water determines the nature of soil development and types of plants and animals living there." The U.S. Fish and Wildlife Service specifically defines *wetland* as ."..lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water." For the purposes of this classification, wetlands must have one or more of the following attributes: (1) at least periodically, the land supports predominantly hydrophytes, (2) the substrate is predominantly undrained hydric soil, and (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year. (Hydric soils are either saturated at or near the soil surface with water that is virtually lacking free oxygen for significant periods during the growing season, or flooded frequently for long periods during the growing season.)

Generalized areas of wetlands were identified on the USGS maps to provide a preliminary overview of wetlands locations within each of the four airport system search areas. Some designated wetlands areas were too small to be shown on the USGS maps. Many areas in each of the search areas were peppered with small areas of wetlands that were not included on the USGS maps. These areas are generally discussed in the following sections, addressing each of the study areas individually.

A review of soil survey data was performed where available and applicable to the four airport system search areas. Large contiguous areas of soil types included in the Atlas' preliminary list of hydric soils for Virginia were interpreted as probable wetland areas for the purposes of this study. Wetland areas are shown on Figures 11-3 through 11-6 in red, and hydric soils areas are shown in green.

One-Airport System

The one-airport system search area is located in Surry County, Virginia. Areas designated as wetlands in the Atlas are shown on Figure 11-3 in red. Many small wetland areas are located throughout this search area. Wetland Inventory Maps from the Atlas used for this search area are Bacon's Castle, Claremont, Dendron, Ivor, Runnymede, Savedge, and Waverly.

Although a U.S. Department of Agriculture Soil Conservation Service Soil Survey was not available for this search area, hydric soils do exist, according to the Soil Conservation Service. However, these areas are "peppered" with hydric soils throughout the search area.

Two-Airport System (RIC and Search Area 2)

Each sub-area for search area 2, A, B and C, is evaluated below and depicted in Figure 10-7.

Search Area A

Search area A is located north of U.S. Route 460, south of the James River, east of the Nansemond River, and west of the Elizabeth River. Areas designated as wetlands in the Atlas are shown on Figure 11-4 in red. Many small wetland areas are located throughout this search area. Wetland Inventory Maps from the Atlas used for this search area are Newport News South, Chuckatuck, and Bowers Hill.

A review of the U.S. Department of Agriculture Soil Conservation Service's Soil Surveys was performed for Norfolk County, Virginia, and the City of Suffolk, Virginia.

Based on the information in these soil surveys, search area A includes a number of hydric soils areas. The largest areas of the predominant hydric soils are shown on Figure 11-4 in green. The three predominant hydric soils from the City of Suffolk Soil Survey are soils in the Weston, Torhunta, and Tomotley series. The three predominant hydric soils from the Norfolk County Soil Survey are in the Portsmouth, Othello-Fallsington, and the Fallsington series.

Search Area B

Search area B is located south of the cities of Portsmouth and Chesapeake, and east of the Dismal Swamp Canal and U.S. Route 17. Areas designated as wetlands in the Atlas are shown on Figure 11-5 in red. Many small wetlands areas are located throughout this area. Wetland Inventory Maps from the Atlas used for this search area are Norfolk South, Kempsville, Fentress, and Deep Creek.

An initial review of the U.S. Department of Agriculture Soil Conservation Service's Soil Survey was done for Norfolk County, Virginia. Based on the information in this soil survey, search area B includes a number of hydric soils areas. This soil survey also contained two areas of soils not included in the Atlas' hydric soils list: "Mucky Peat" and "Wet Soils." Mucky Peat is described in the Norfolk County Soil Survey as "the most extensive organic soil in the Dismal Swamp." According to the Norfolk County Soil Survey, Wet Soils is "considered to be an isolated part of the Dismal Swamp and is known locally as the 'Green Sea.'" The principal soils included in the Wet Soils designation are hydric soils in the Portsmouth, Othello, Elkton, Bayboro, and Bladen series. Large areas of hydric soils and Mucky Peat and Wet Soils are shown on Figure 11-5 in green.

Search Area C

Search area C is located northeast of Windsor, Virginia, north of U.S. Route 460, east of U.S. Route 258, and west of SR10. Areas designated as wetlands in the Atlas are shown on Figure 11-6 in red. Many small wetlands areas are located throughout this search area. Wetland Inventory Maps from the Atlas used for this search area are Benns Church, Chuckatuck, Windsor, Smithfield, and Zuni. It should be noted that most of the mapped or inferred wetland areas are surface water.

A review of the U.S. Department of Agriculture Soil Conservation Service's Soil Surveys was done for the Isle of Wight County, Virginia, and the City of Suffolk, Virginia. Based on the information in these soil surveys, search area C includes a number of hydric soils, including two large areas. Both areas are labeled as pocosins and are characterized by the presence of Myatt series hydric soils. These pocosins are shown on Drawing 7 in green. Pocosins are defined in the City of Suffolk soil survey as "level upland 'wetland' or swamp." The pocosin located in the central portion of the search area is the Ross Pocosin, and the pocosin located in the western portion of the search area is the String of Logs Pocosin.

Preliminary wetland analysis of the search areas examined the presence of wetlands and hydric soils. Within the one-airport system search area, which covers approximately 150,000 acres, 13 percent of the area is considered wetland, while there are no data available on the size or location of hydric soils. Within the search areas for the two-airport system, search area A (32,800 acres) is 30 percent wetland and 20 percent hydric soil, and search area B (47,800 acres) is 30

percent wetland and 60 percent hydric soil. Search area C (64,500 acres) is 20 percent wetland and 6 percent hydric soil.

11.5.2 Other Environmental Considerations

A preliminary evaluation of environmental factors has been performed to provide an overview of potential environmental impacts associated with the development of a regional airport system for eastern Virginia. The preliminary evaluation included an examination of search areas A, B, and C and the one-airport system search area with respect to several environmental issues. The environmental issues evaluated for each search area included compliance with existing regulations governing air quality, water quality, water availability, and impacts upon noise, the Chesapeake Bay Act Preservation Areas, and other natural factors. For the purpose of this preliminary evaluation, other natural factors have been defined as the known presence of endangered species and habitat and known historical and archeological sites located within the search areas. The following sources were used as part of this preliminary evaluation:

- Virginia Administrative Code, *Title 9-Environment-Part I*, Volume 6, 1996.

- Telephone discussions with the Virginia Department of Environmental Quality-Tidewater Regional Office regarding existing air quality regulations in southeastern Virginia, October 1997.

- Telephone discussions with Planning Department staff from the City of Chesapeake, City of Portsmouth, City of Suffolk, Isle of Wight County, Surry County, and Sussex County regarding existing stormwater quality management regulations, October 1997.

- USGS Water Resources Investigations Report 87-4240, Hydrogeology and Analysis of the Ground Water Flow System in the Coastal Plain of Southeastern Virginia, 1987.

- Commonwealth of Virginia Department of Environmental Quality, *Ground Water Management Area Withdrawal Permit Package*.

- Telephone discussions with Planning Department staff from the City of Chesapeake, City of Portsmouth, City of Suffolk, Isle of Wight County, Surry County, and Sussex County regarding existing noise management regulations, October 1997.

- Telephone discussions with Planning Department staff and review of City of Chesapeake, City of Portsmouth, City of Suffolk, Isle of Wight County, Surry County, and Sussex County maps showing areas designated as Resource Protection Areas and Resource Management Areas, October 1997.

- Virginia Department of Conservation and Recreation, *General Location Area Maps for Natural Heritage Resources*, City of Chesapeake, City of Portsmouth, City of Suffolk, Isle of Wight County, Surry County, and Sussex County, September 1997.

- Virginia Department of Historic Resources, *Topographic Quadrangle Inventory of Historic Places*, October 1997.

Preliminary Evaluation

The following sections discuss the findings of the preliminary evaluation with respect to environmental factors. Each environmental factor evaluated is presented separately. It should be noted that all issues will be

evaluated in greater detail if and when a new airport system is chosen.

Air Quality

Search areas A, B, and C and the one-airport system search area are each located within existing air quality attainment zones, as defined by the Clean Air Act Amendments. Attainment areas are areas in which the measured levels of criteria pollutant(s), typically ozone, are below levels defined by the National Ambient Air Quality Standards (NAAQS). It should be noted that the Environmental Protection Agency (EPA) and the Commonwealth of Virginia are currently evaluating whether certain pollutant levels defined by NAAQS should be lowered. It is unclear at this time whether the four search areas would remain within an air quality attainment zone if NAAQS pollutant levels are lowered as part of the evaluation by the EPA and Virginia.

Currently, the Commonwealth of Virginia does not require permits for emissions from indirect or secondary (mobile) sources such as airplanes operating in association with an airport facility. Direct sources associated with airport operations, such as emissions from fuel-burning equipment used to heat buildings or supply power for buildings, petroleum storage and transfer operations, solvent cleaning, and painting, are regulated by the Commonwealth of Virginia. Depending on the expected volume of emissions from these specific operations, permitting under the Clean Air Act Amendments could be required. Additionally, if the project is federally funded, a demonstration of conformity to the Virginia State Implementation Plan (SIP) may be required to meet air quality standards.

Water Quality

Water quality is an important issue confronting development of a new airport system. Planning department personnel in each city and/or county in which the four search areas are located indicate that each locality follows Virginia Stormwater Management Regulations (VSMR). The VSMR require that post-development stormwater quality be equal to or better than pre-development stormwater quality. Stormwater runoff in each search area is also regulated under the Chesapeake Bay Act. Land use within at least a portion of each city and/or county in which the four search areas are located, with the exception of Sussex County, is regulated by the Chesapeake Bay Act. The southernmost corner of the one-airport system search area is located within Sussex County.

Wastewater management for a new facility sited within search areas A and B would be handled by the Hampton Roads Sanitation District (HRSD). HRSD does not normally accept stormwater from most facilities because the sheer volume of stormwater generated can overwhelm even large sanitary sewage treatment plants. Generally, stormwater is managed on site. HRSD has extended a service line to the Smithfield, Virginia area in the northern portion of search area C, and it is possible that HRSD service could be extended to include appropriate portions of the remainder of search area C. HRSD service does not extend to the one-airport system search area. A new airport system would likely need certain CPDES permits to comply with state regulations. A stormwater construction general permit would be required during the construction phase of the airport. Once operational, an individual stormwater permit would be required for stormwater discharges from the airport and for any wastewater that is not routed to a central sanitary system.

Individual stormwater and wastewater permit discharge applications include notification of adjacent landowners and anti-degradation review.

Water Availability

Water supply in the Hampton Roads area is not managed regionally. Individual cities supply potable water to areas within their boundaries, although several cities have agreements with neighboring cities to purchase and supply water. Water supply within search area A is handled by the Cities of Portsmouth and Suffolk. Water supply within search area B is handled by the City of Chesapeake. Within each city, water supply needs are met through the use of surface waters or ground water supply wells. Development of a new airport within these search areas has not been included in existing water supply plans.

Water supply needs within search area C and within the one-airport system search area are met largely through the use of ground water supply wells. Each of the four search areas is located within the eastern Virginia Ground Water Management Area. The use of ground water as a water resource is closely managed within this management area to ensure future ground water quality and quantity. The Virginia Department of Environmental Quality requires that all ground water withdrawal systems in excess of 300,000 gallons per month obtain permits. Proposed new withdrawals must be evaluated during the permitting process to predict the impact on ground water quality and/or quantity. If the proposed withdrawal is anticipated to impact other permitted or unpermitted ground water users, a Ground Water Mitigation Plan must be prepared and approved by VDEQ as part of the permitting process.

Noise

Search areas A and B are located in the Hampton Roads metropolitan area. Both search areas include large, densely developed residential neighborhoods. The boundaries for a new airport within either search area A or B would likely be located outside densely developed residential neighborhoods. However, the close proximity of densely developed residential areas to potential airport locations suggests that development of a new airport in these search areas would likely result in increased aircraft noise levels to nearby residential neighborhoods.

Search area C and the one-airport system search area are located in much less densely developed areas. Therefore, the impact of increased aircraft noise on residential neighborhoods adjacent to search area C and the one-airport system search area would be minor.

Chesapeake Bay Act

Land use within each of the four search areas is regulated by the Chesapeake Bay Act. Only land use in the southernmost corner of the one-airport system search area, located within Sussex County, is not regulated by the Chesapeake Bay Act. The Chesapeake Bay Act requires that cities and counties located within the Chesapeake Bay Preservation Area (CBPA) establish Resource Protection Areas (RPAs) and Resource Management Areas (RMAs) within their given localities. Development within RPAs is limited to water-dependent uses only, such as piers, docks, shoreline stabilization, etc. Development within RMAs is permitted, providing appropriate stormwater management controls are incorporated into the development.

RPAs have been defined as land located at or near the shoreline that is of important value to water quality. RPAs include tidal wetlands, certain non-tidal wetlands, tidal shores and other lands that are deemed especially important to water quality. RPAs include a 100-foot buffer measured from the landward side of these features.

RMAs have been defined as land that protects the values of the RPA, and include floodplains, highly erodible soils, steep slopes, highly permeable soils, non-tidal wetlands, and other lands that are deemed necessary to protect water quality. RMAs are located landward of RPAs and may extend as far as the boundary of the Chesapeake Bay watershed in that area. **Figures 11-7 through 11-10** show the areas within each search area that have been designated as part of the CBPA. Based on a review of watershed boundaries, it appears that search areas A and C fall entirely within the CBPA. The northern portion of search area B (approximately 50 percent of search area B) is located within the CBPA. Of the four search areas, the one-airport system search area contains the least land area located within the CBPA. Approximately 15 percent of the area within the one-airport system search area is located within the CBPA.

Natural Factors

Natural factors evaluated as part of this preliminary evaluation included the known presence of endangered species and habitat and known historical and archeological sites located within the search areas. Numerous natural heritage resources and historical and archeological sites are located within the four search areas. Generally, the historical and archeological sites are located in developed areas with long-time residential or urban land uses. The natural heritage resources are generally located in less developed or undeveloped areas. **Figures 11-11 through 11-14** show the general distribution of known historical and archeological sites within the four study areas.

The one-airport system search area contains significantly fewer known natural heritage sites than the other search areas. These natural heritage sites are scattered throughout the search area. No federally-protected and only two state-protected natural heritage areas are known to be present in the one-airport system search area.

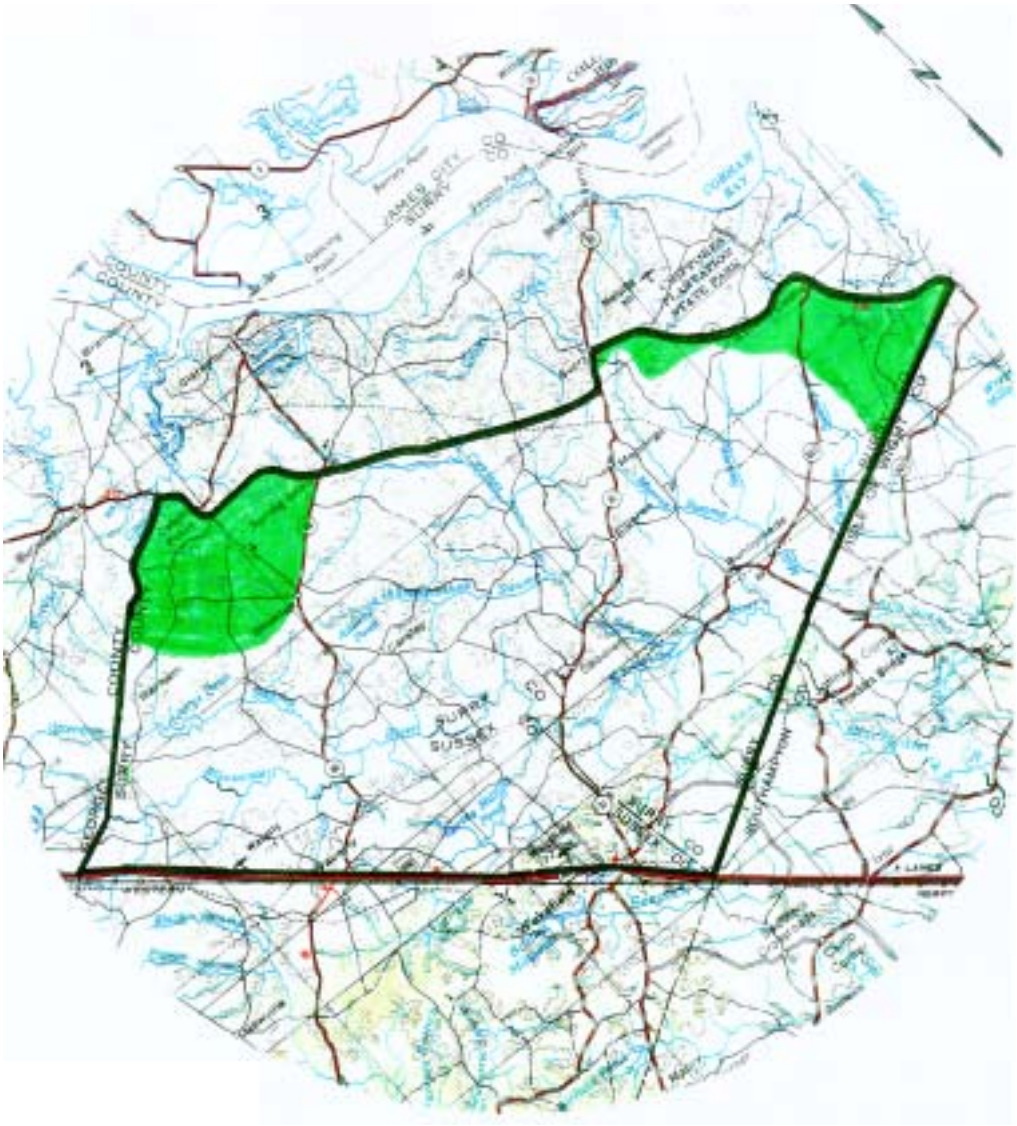
Search areas A, B, and C each contain numerous federally-protected natural heritage areas. Approximately 20 to 25 percent of the land area within search areas A and B has been designated as federally-protected natural heritage areas. A percentage estimate of federally protected land in search area C cannot be made at this time because of the lack of completed mapping in this area. Several state-protected sites are also located within these three search areas. Search areas A, B, and C each appear to contain significantly more land that has been designated as federally or state-protected natural heritage areas than the one-airport system search area.

The environmental issues evaluated for each search area included compliance with existing regulations governing air quality, water quality, water availability, and impacts upon noise, the CBPAs, and other natural factors. For the purpose of this preliminary evaluation, other natural factors have been defined as the known presence of endangered species and habitat, and known historical and archeological sites located within the search areas. If a new airport system is chosen, these issues will need to be defined in greater detail as part of an EIS

Chesapeake Bay Preservation Areas
One-Airport System Search Area

FIGURE 11-7

Search Area Boundary
Chesapeake Bay Preservation Area



Map Source:
U.S.G.S. 1:250,000 Topographic Quadrangles

Chesapeake Bay Preservation Areas
Search Area A

FIGURE 11-8

Search Area Boundary
Chesapeake Bay Preservation Area

Map Source:
U.S.G.S. 1:250,000 Topographic Quadrangles

0 5 Miles

Chesapeake Bay Preservation Areas
Search Area B

FIGURE 11-9

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Search Area Boundary
Chesapeake Bay Preservation Area

Map Source:
U.S.G.S. 1:250,000 Topographic Quadrangles

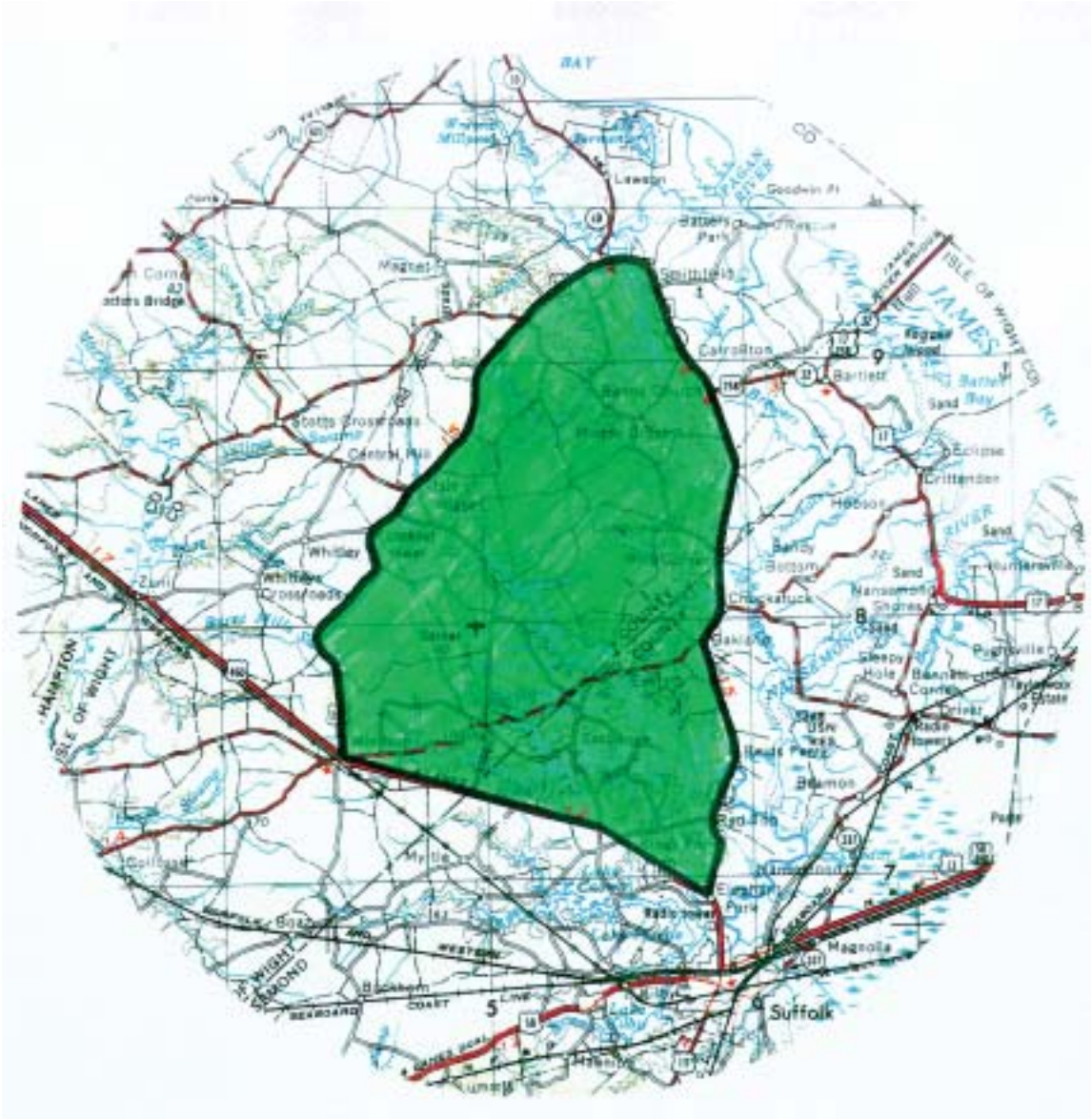
0 5 Miles

Chesapeake Bay Preservation Areas
Search Area C

FIGURE 11-10

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Search Area Boundary
Chesapeake Bay Preservation Area



Map Source:
U.S.G.S. 1:250,000 Topographic Quadrangles

0 5 Miles

Historical and Archeological Sites
One-Airport System Search Area

FIGURE 11-11

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Search Area Boundary
Known Historical or Archeological Site

Map Source:
U.S.G.S. 1:250,000 Topographic Quadrangles

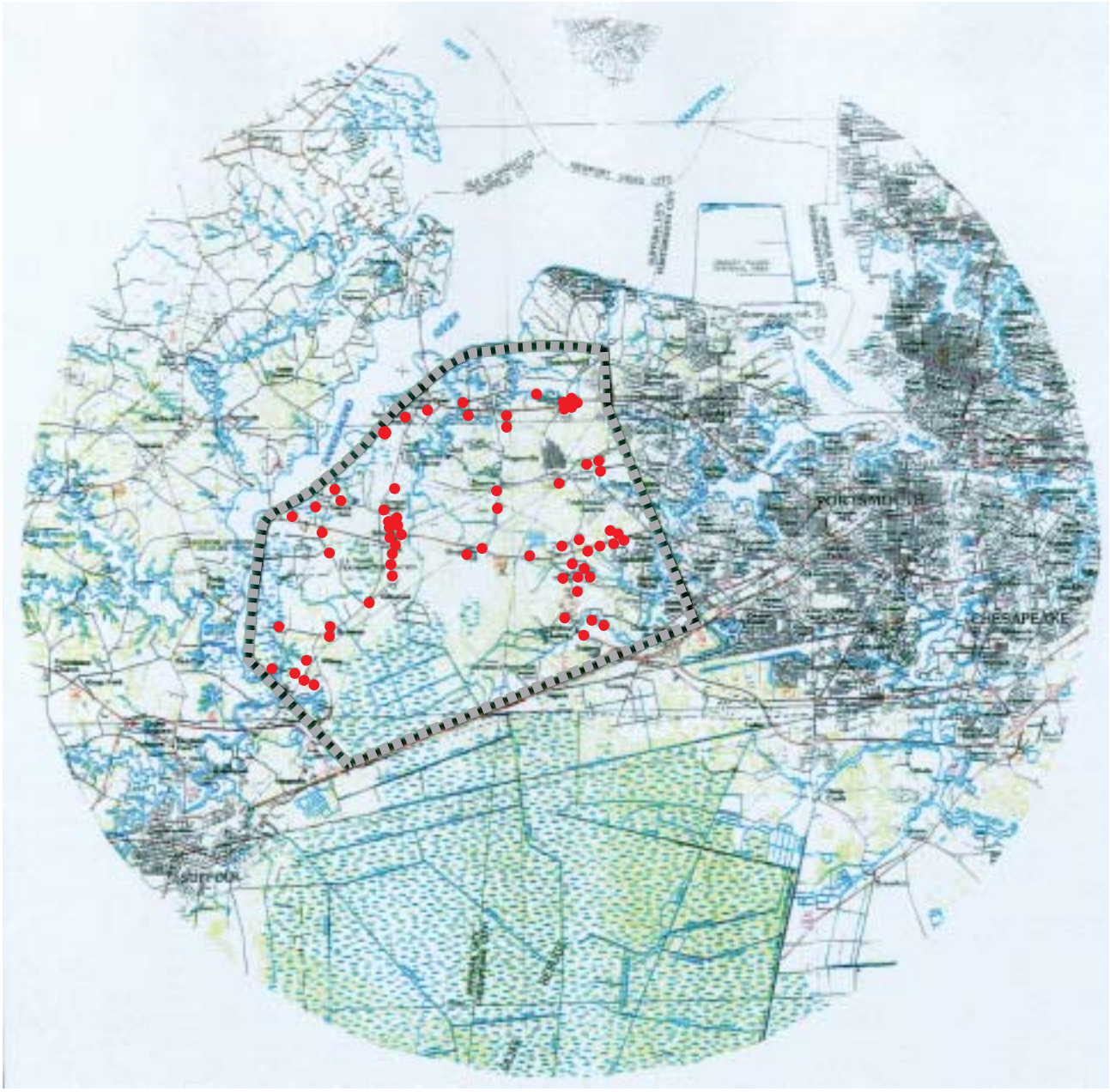
0 5 Miles

Historical and Archeological Sites
Search Area A

FIGURE 11-12

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Search Area Boundary
Known Historical or Archeological Site



Map Source:
U.S.G.S. 1:250,000 Topographic Quadrangles

0 5 Miles

Historical and Archeological Sites
Search Area B

FIGURE 11-13

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Search Area Boundary
Known Historical or Archeological Site

Map Source:
U.S.G.S. 1:250,000 Topographic Quadrangles

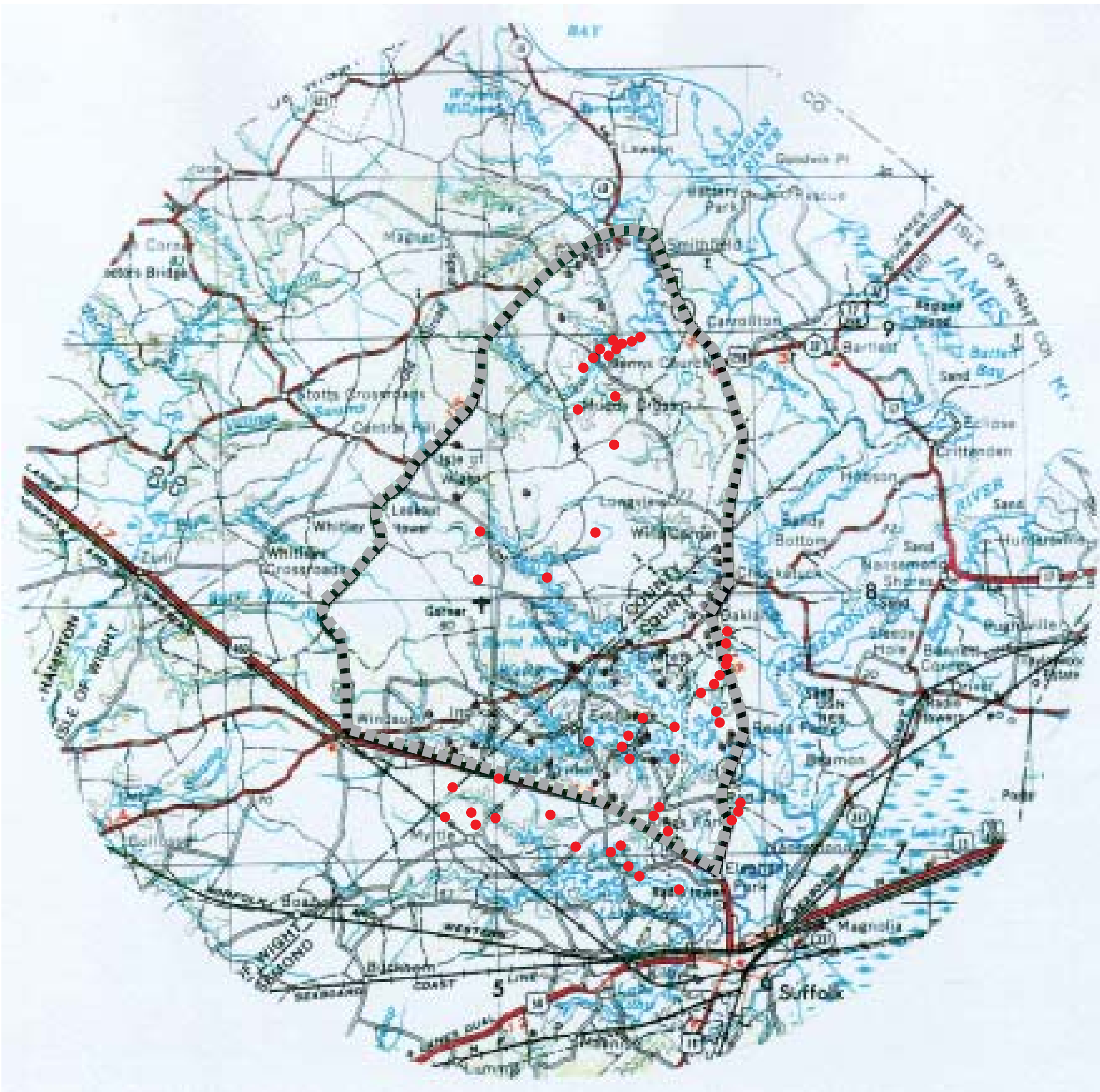
0 5 Miles

Historical and Archeological Sites
Search Area C

FIGURE 11-14

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Search Area Boundary
● Known Historical or Archeological Site



Map Source:
U.S.G.S. 1:250,000 Topographic Quadrangles

0 5 Miles

or other supporting environmental documentation.

Because of ongoing re-evaluation of air quality standards by the EPA and the Commonwealth of Virginia, it is unclear whether the search areas, which are all located within air quality attainment zones, would remain within these zones. Emissions from secondary sources such as airplanes, do not require permits within the Commonwealth of Virginia; however, depending on the measured levels from primary sources of emissions, these airport-related operations might require permits.

Each of the search areas must comply with Virginia Stormwater Management Regulations (VSMR), which require that post-development stormwater quality be equal to or better than pre-development water quality. The stormwater runoff in each of the two-airport system search areas and a portion of the runoff in the one-airport system search area falls under regulation by the Chesapeake Bay Act. It is likely that operations for water supply will have to be permitted.

Noise will likely have a higher impact on sub-areas A and B within the Hampton Roads area because of the proximity to existing urban development. Sub-area C and the one-airport system search area are likely to have lower noise impacts on existing residential communities.

Sub-areas A, B, and C and most of the one-airport system search area fall within the Chesapeake Bay Act regulations. The Act requires that localities within the preservation area establish two areas: the RPA, which limits the development to water-dependent uses only, and the RMA, which permits other types of development as long as appropriate stormwater management controls are established.

11.6 TRANSPORTATION/ UTILITY IMPROVEMENTS

11.6.1 Transportation Improvements

The transportation improvements needed to provide access to the alternative airport sites are described and the estimated capital costs are shown in **Table 11.10**. The off-airport road improvements that are expected to be constructed by the year 2030 are not included in this table. Planned road improvements in the area of each airport alternative are shown and future impacts to ground access at the airports are discussed. The future road improvements were obtained from the Commonwealth Transportation Board *Six Year Improvement Program Fiscal Year 1996-97*, the Richmond Regional Planning District Commission *2015 Long Range Transportation Plan*, and the Hampton Roads Planning District Commission *2015 Regional Transportation Plan*.

One-Airport System

Ground access to the one-airport system search area is from Route 460, with a new access road to the east. State Routes 10 or 40 may be improved to provide access to the new airport site. A 6-mile access road from Route 460 with a grade-separated interchange is assumed for this alternative. For the year 2030, the projected traffic volume for Route 460 will require an additional lane in each direction. The improvement to Route 460 will likely occur prior to 2030 and is, therefore, not included in the cost estimates under the one-airport system.

- Six-mile access road from Route 460 will require four lanes and a grade-separated interchange with Route 460. Estimated cost = $33.23 million

Table 11.10

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Projected Off-Airport Roadway Costs

	Total Cost
Option 1 – One-Airport System	
Access road from Route 460 to new airport	$33,233,000
Additional lane for Route 460 from I-295 to Route 58	$286,000,000
Total Off-Airport Roadway Costs	$319,233,000
Option 2 – Two-Airport System	
Richmond	
Modify interchange at Airport Drive and I-64	$15,000,000
Construct a grade separated intersection at Airport Drive and Williamsburg Road	$35,000,000
Newport News/Williamsburg	
Modify proposed I-64/Bland Blvd. interchange	$11,500,000
Raised 4-lane road for flyover at Jefferson Ave. and 6-lane road from flyover to airport	$10,700,000
Bland Boulevard Bridge	$7,000,000
Rail connection to CSX corridor	$17,000,000
Total Off-Airport Roadway Costs (both airports)	$96,200,000
Option 3A – Two-Airport System	
Richmond	
Modify interchange at Airport Drive and I-64	$15,000,000
Construct a grade-separated intersection at Airport Drive and Williamsburg Road	$35,000,000
Search Area A	
Access road from I-664	$12,640,000
Total Off-Airport Roadway Costs (both airports)	$62,640,000
Option 3B – Two-Airport System	
Richmond	
Modify interchange at Airport Drive and I-64	$15,000,000
Construct a grade-separated intersection at Airport Drive and Williamsburg Road	$35,000,000
Search Area B	
Access road from Route 168	$5,600,000
Total Off-Airport Roadway Costs (both airports)	$55,600,000
Option 3C – Two-Airport System	
Richmond	
Modify interchange at Airport Drive and I-64	$15,000,000
Construct a grade-separated intersection at Airport Drive and Williamsburg Road	$35,000,000
Search Area C	
Access road from Route 460	$29,230,000
Total Off-Airport Roadway Costs (both airports)	$79,230,000
Option 4 – Three-Airport System	
Richmond	
Modify interchange at Airport Drive and I-64	$15,000,000
Construct a grade-separated intersection at Airport Drive and Williamsburg Road	$35,000,000
Newport News/Williamsburg	
Modify proposed I-64/Bland Blvd. interchange	$11,500,000
Raised 4-lane road for flyover at Jefferson Ave. and 6-lane road from flyover to airport	$10,700,000
Bland Boulevard Bridge	$7,000,000
Rail connection to CSX	$17,000,000
Norfolk	
Rail connection to Virginia Beach LRT	$90,000,000
Total Off-Airport Roadway Costs (all airports)	$186,200,000

SOURCE: URS - Greiner

Road improvements in this area include a new alignment of Route 40 at the town of Waverly, as shown in **Figure 11-15**. VDOT will study improvement alternatives for Route 10. The Transamerica Corridor Study is exploring the options for improving auto travel on Route 460. Rail connection to this airport alternative can be provided with a new spur from the Norfolk Southern track located parallel to Route 460.

Two-Airport System (RIC and PHF)

Transportation Improvements at RIC

Improvements to Airport Drive are required due to existing traffic problems. Increased originations at RIC will require better access to the airport from the south. A grade-separated interchange at Airport Drive and Terminal Road is recommended in the *Richmond International Airport Master Plan Update*. Dedicated turn lanes and acceleration lanes are recommended at the intersection of Airport Drive and the relocated northern portion of Terminal Drive. Right turns only should be allowed from Eubank Road to Airport Drive. Airport Drive should be extended to the south to connect with I-895 so that more direct access is provided from the south. The South Airport Drive project is included in the airport capital improvement plan for the years 2001 to 2005, and should be constructed by the year 2030. Other off-airport road improvements recommended in the *Richmond International Airport Master Plan Update* include modifying the I-64 and Airport Drive interchange to improve traffic flow and provide a grade separation at Williamsburg Road and Airport Drive. Costs for off-airport road improvements due to increased traffic include the following:

- Modify interchange at Airport Drive and I-64. Estimated cost = $15 million
- Construct a grade-separated intersection at Airport Drive and Williamsburg Road. Estimated cost = $35 million

Future road improvements included in the *Virginia Department of Transportation Six Year Plan* that will improve ground access to RIC, including widening Charles City Road to four lanes, adding an interchange at I-295 and Charles City Road, and constructing I-295 and I-895. **Figure 11-16** shows the planned transportation improvements.

Transportation Improvements at PHF

A new interchange is proposed in the *Hampton Roads 2015 Regional Transportation Plan* for I-64 and Bland Boulevard, which is the main access road to the airport. Additional modifications to this proposed interchange may be required so it can handle the increased airport traffic and intermodal connections. A Bland Boulevard flyover over Jefferson Avenue is assumed, with four lanes from the new I-64 interchange and Jefferson Avenue and six lanes from Jefferson Avenue to the airport. Ramps from Jefferson Avenue will connect with the Bland Boulevard flyover. Costs for these improvements include the following:

- Modify the proposed I-64/Bland Boulevard interchange due to the flyover. Estimated cost = $11.5 million

- Construct Bland Boulevard flyover with four lanes from I-64 to Jefferson Avenue, and widen Bland Boulevard from Jefferson Avenue to the airport. Estimated cost = $10.7 million

- Construct Bland Boulevard bridge over Jefferson Avenue and provide ramps from Jefferson Avenue to Bland Boulevard. Estimated cost = $7.0 million

Planned Transportation Improvements
One-Airport System Search Area

FIGURE 11-15

IMPROVEMENT SUMMARY
Route 40 – Relocate road at Waverly

Transportation Improvements
Richmond International Airport

FIGURE 11-16

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

2015 PLAN

- Proposed New Interchange
- Improvement Recommended
- Proposed New Facilities
- I-64 Major Investment Study

IMPROVEMENT SUMMARY:

9-Mile Road - Rte 33	- Widen to 4 & 6 Lanes	I-295	- New Interchange Charles City Rd.
Charles City Rd.	- Widen to 4 Lanes	I-64	- Widen to 6 Lanes
Interstate 895	- New 4 Lanes	Laburnum Ave.	- Widen to 6 Lanes
Williamsburg Rd. U.S. 60	- Widen to 4 Lanes	Airport Drive	- Extend south to I-895 (Not in VDOT 6-Year Plan)

SOURCE: VDOT 6-Year Improvement Program and Richmond International Airport Master Plan Update.

- Total road improvement costs, including ROW costs, are $29.2 million.

As shown in **Figure 11-17**, planned area road improvements include widening of I-64 to six lanes and eight lanes. The I-64 Major Investment Study and the CSX Corridor Study explore different options for improving intermodal travel along the I-64 corridor, including a rail station at Bland Boulevard for airport passenger travel. An intermodal rail connection to this airport is recommended because of the highway capacity problems on I-64. The estimated costs for the rail connection include a rail spur parallel to Bland Boulevard from the CSX corridor to the airport with an overpass at Jefferson Avenue.

- Rail connection parallel to Bland Boulevard from CSX tracks to the airport. Estimated cost = $17 million

For the two-airport systems using search areas A, B and C, the off-airport transportation improvements for RIC are the same as discussed in the two-airport system using RIC and PHF.

Two-Airport System (RIC and New Airport in Search Area A)

The search area A airport will have a new access road from I-664 or from Route 13/58/460. For cost-estimating purposes, a 2-mile access road with four lanes and a partial interchange at I-664 was assumed.

- Two-mile access road with four lanes and partial interchange at I-664. Estimated cost = $30.0 million

The new Hampton Roads Crossing, which will parallel I-664 for a portion of the project, will provide a major intermodal link with the Peninsula and with shipping terminals in Norfolk. In this search area, the Transamerica Corridor Study will provide increased automobile transportation. Intermodal connections to rail can easily be made due to the number of tracks in this search area.

Figure 11-18 shows planned transportation improvements for search area A.

Two-Airport System (RIC and New Airport in Search Area B)

An access road to the search area B airport will need to be constructed from Route 168 or the proposed Southeastern Parkway. A one-mile access road with four lanes was assumed with an intersection at Route 168.

- One-mile access road with four lanes and an intersection at Route 168. Estimated cost = $15.0 million

This developing area has planned road widenings for most major urban roads. The proposed Southeastern Parkway will improve transportation from Virginia Beach to this airport site. HOV and regular lanes will be constructed at I-64, as shown on **Figure 11-19**.

Two-Airport System (RIC and New Airport in Search Area C)

An airport located at search area C would have an access road connected to Route 460, Route 258, or Route 10/32. The James River Bridge would provide access from the Peninsula, and Route 460 would provide access from Richmond, Petersburg, and the south side of Hampton Roads. A 4-mile access road with four lanes and an intersection at Route 258 was assumed. Route 258 will need to have four lanes from Route 460 to the airport access road. No improvements to Route 460 are required for the projected traffic volume from a new airport at this location.

Transportation Improvements Newport News-Williamsburg International Airport

FIGURE 11-17

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

2015 PLAN

Proposed New Interchange

Improvement Recommended

(4) Number of Proposed Lanes

CSX Corridor Major Investment Study

I-64 Major Investment Study

IMPROVEMENT SUMMARY:

George Washington Hwy U.S. 17	- Widen to 6 Lanes	Jefferson Ave.	- Widen to 6 Lanes
I-64 Bland Blvd.	- New Interchange		
I-64	- Widen to 6 & 8 Lanes		

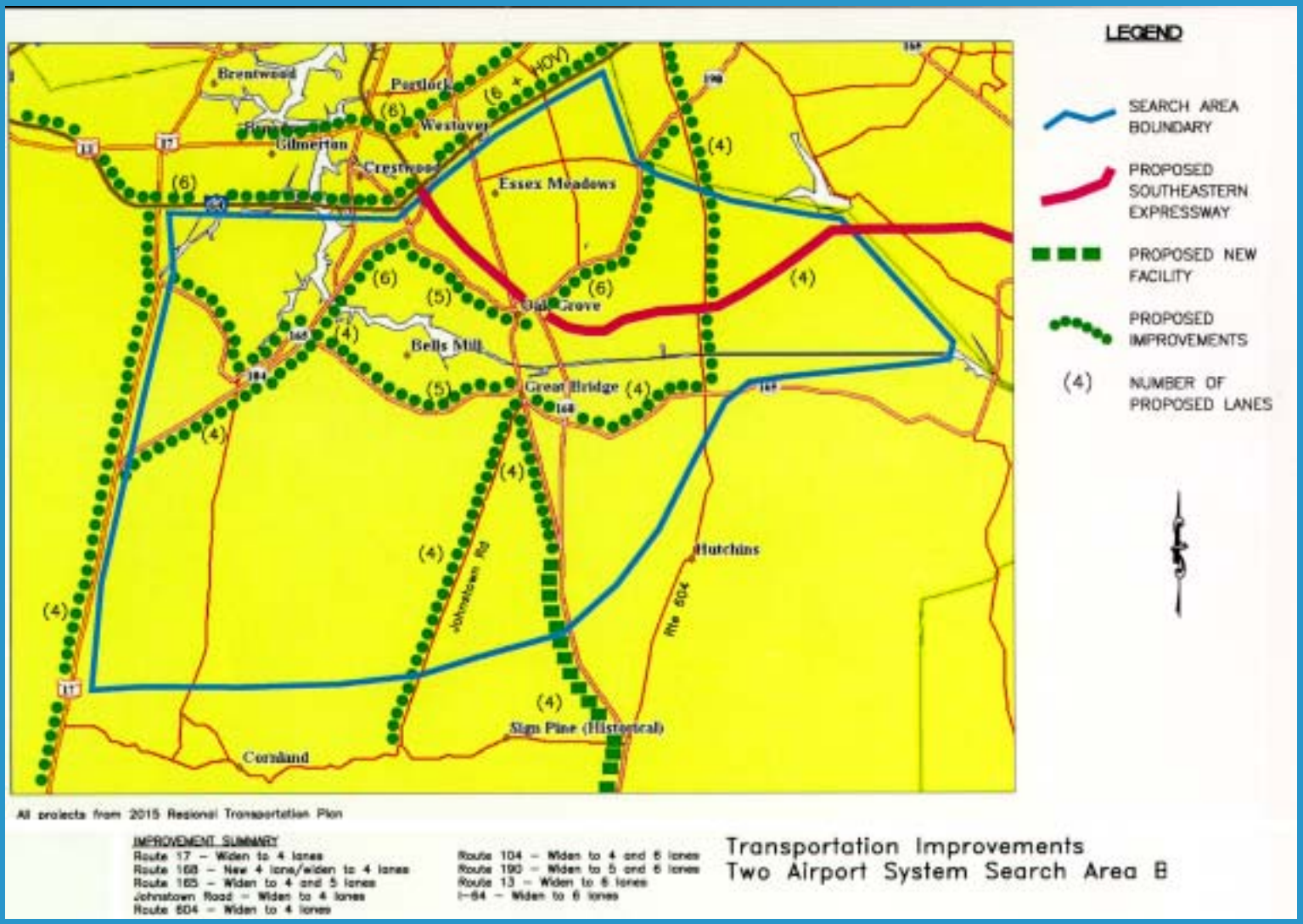
SOURCE: VDOT 6-Year Improvement Program

Transportation Improvements
Search Area A

FIGURE 11-18

Transportation Improvements
Search Area B

FIGURE 11-19



- Four-mile access road from Route 258, and widen Route 258 from Route 460. Estimated cost = $29.23 million

Part of Route 10/32 will be widened in the future to four lanes, and the Transamerica Corridor Study will provide recommendations for improving Route 460. Future road improvements for this search area are shown on **Figure 11-20.**

Three-Airport System

The road improvement costs for the Richmond International Airport and the Newport News/Williamsburg International Airport are as discussed in the two-airport system alternative. An intermodal rail connection is recommended to connect the airport to the future Norfolk to Virginia Beach light rail system. **Figure 11-21** shows the road transportation improvements planned for the area around Norfolk International Airport.

- Rail spur from the Norfolk/Virginia Beach light rail transit to the airport. Estimated cost = $28.6 million

11.6.2 Utility Improvements

This section analyzes utility improvements needed for the new airport. The existing airports have adequate water distribution and wastewater collection systems in place. Infrastructure improvements would consist of on-site extensions. The new airport facility would require complete new water and wastewater systems.

Water and Wastewater Systems

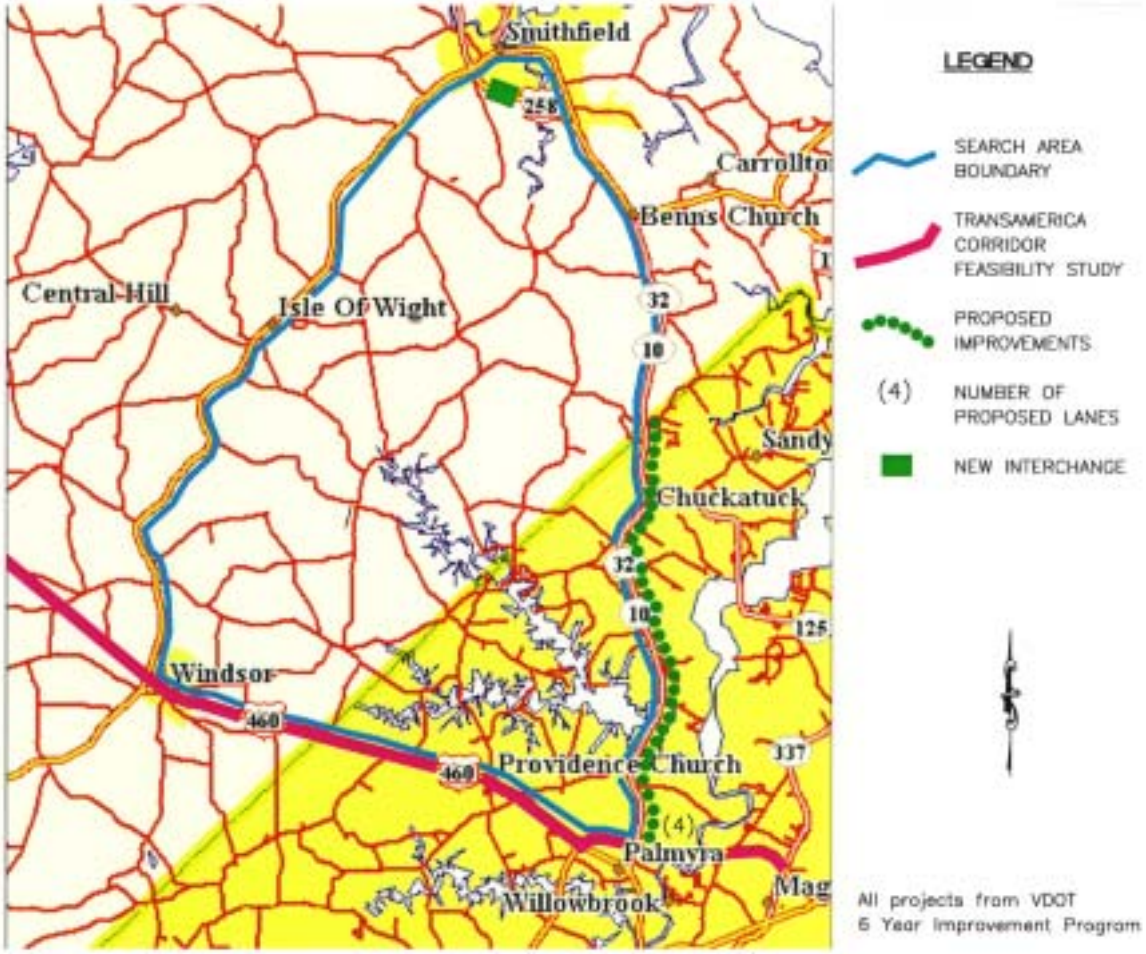
Water and wastewater flow data have been collected from existing airports and used to estimate the demands for the new facility. State agencies were also contacted to determine the feasible water and wastewater alternatives.

Water Supply System

Water in the one-airport system search area would most likely be supplied by wells. Surface water withdrawals and reservoirs would not be allowed according to the Virginia Department of Health. Groundwater is plentiful and should provide the required amount of water. The quality of the groundwater throughout the area is good; however, some areas contain fluoride that must be removed. The one-airport system search area is within a groundwater management area that requires a special permit for groundwater withdrawal.

The water usage for the existing airports varies from 16 to 20 gallons per day per passenger. Twenty gallons per day per passenger was used in calculating the total demand for the new airport. The maximum number of passengers forecasted, with airline hubbing, is approximately 50,000 passengers per day. Water demand would be 20 gallons per passenger per day x 50,000 passengers per day, which equals 1,000,000 gallons per day. This demand can be provided by two wells supplying 500,000 gallons per day (350 gpm) each.

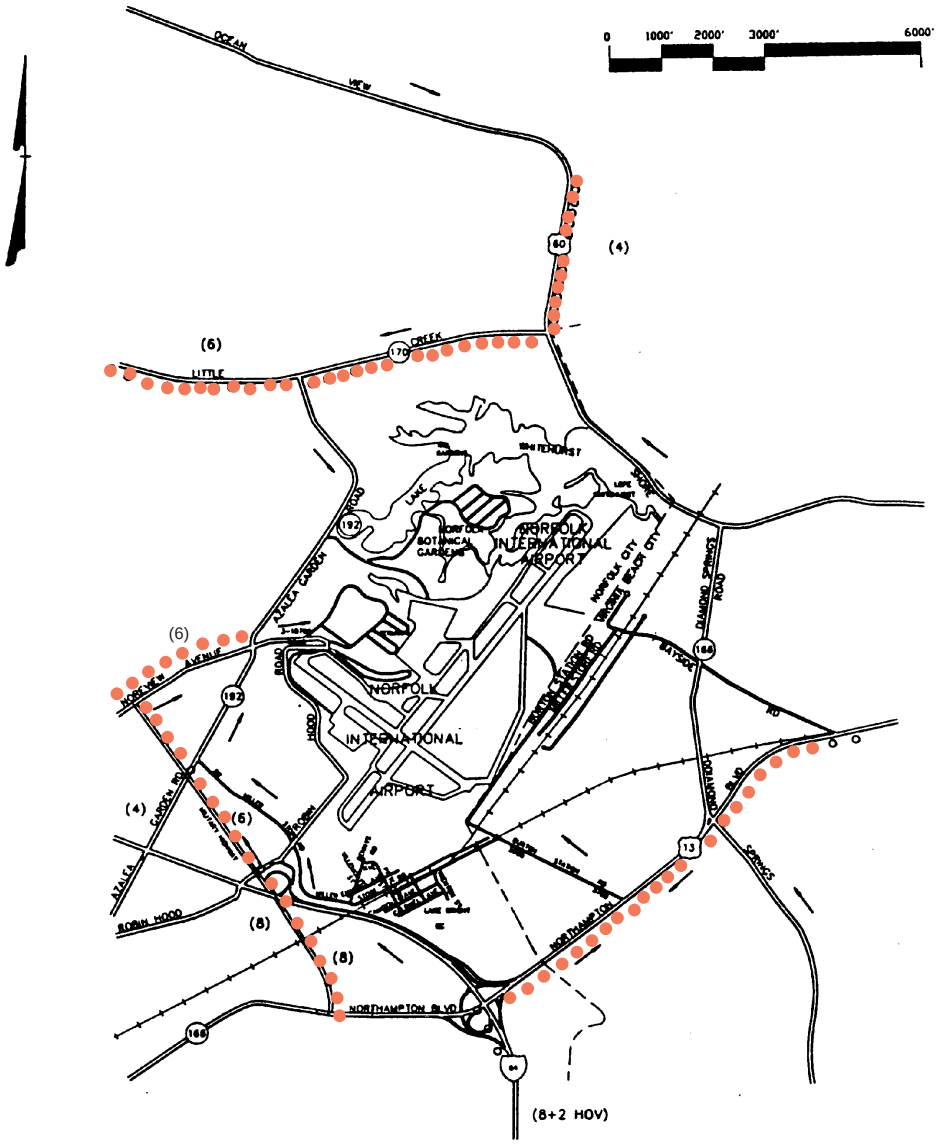
Elevated water storage tanks are typically installed along with water wells to provide storage for daily usage and fire flow demands. The size of the storage tank is normally one day's demand plus that required for fire protection. Fire protection is calculated using the maximum flow times the duration of the fire. Using a maximum flow of 1,000 gallons per minute and a duration of 90 minutes equals 90,000 gallons for fire protection. Therefore, two 600,000-gallon elevated water tanks would be required.



IMPROVEMENT SUMMARY
Route 10/32 – Widen to 4 lanes
Route 258 – New Interchange

Transportation Improvements
Norfolk International Airport

FIGURE 11-21



2015 PLAN

● ● ● ● Improvement Recommended

(4) Number of Proposed Lanes

IMPROVEMENT SUMMARY:

Little Creek Road	- Widen to 6 lanes	Norview Ave.	- Widen to 6 Lanes
Ocean View/U.S. Rte. 60	- Widen to 4 Lanes		
Military Highway	- Widen to 6 & 8 Lanes		

(All Improvements By VDOT)

Wastewater Discharge System

The search area has many wetlands and slow-moving streams. Therefore, the quality requirement for the wastewater effluent discharge is high according to the Virginia Department of Health. Alternatives such as the use of spray irrigation, wetlands, and infiltration were suggested by the Virginia Department of Health and would have to be considered if this option is selected.

Wastewater quantity is based on the amount of water demand, which is 1,000,000 gallons per day.

Gas, Electric, and Telecommunications Systems

Gas, electric, telephone, and cable systems would be provided at no cost by the local purveyors.

Utility Costs

Water Supply System

- Two deep water wells, 500,000 gallons per day each at $75,000 each = $150,000.
- One water treatment facility to remove fluoride from groundwater at $250,000.
- Two 600,000-gallon elevated water storage tanks at $600,000 each = $1,200,000.

Water distribution piping and appurtenances:

- 10,000 feet of 6-inch pipe at $24 per foot = $240,000.
- 10,000 feet of 8-inch pipe at $43 per foot = $430,000.
- 10,000 feet of 12-inch pipe at $56 per foot = $560,000.
- 25,000 feet of 16-inch pipe at $73 per foot = $1,655,000.

Wastewater Discharge System

- One 1,000,000-gallon per day wastewater treatment plant at $5,000,000.

Wastewater collection piping system and appurtenances:

- 20,000 feet of 8-inch piping at $32 per foot = $640,000.
- 5,000 feet of 10-inch piping at $40 per foot = $200,000.
- 5,000 feet of 12-inch piping at $45 per foot = $225,000.
- 5,000 feet of 24-inch piping at $53 per foot = $265,000.

Total capital cost for wastewater discharge system is $6,330,000.

11.7 PRELIMINARY FINANCIAL FEASIBILITY

The purpose of this section is to update the comparative financial feasibility of the three airport system alternatives using the financial framework developed in Phase I. This section contains a description of the measurement of financial feasibility, the methodological framework, construction costs, funding assumptions, and risk factors. The financial analysis has been carried out for the single-airport system alternative, the two-airport system alternative, and the three-airport system alternative. Consistent with the facility requirements and capital costs analysis (see Section 11.2), two versions of the two-airport system were examined, RIC and PHF, and RIC and search area 2C. For

each alternative, financial feasibility was estimated for 2020 and 2030 for the Base Case, and 2030 for the high forecast.

11.7.1 Measure of Financial Feasibility

To evaluate the relative financial feasibility of the alternatives, the airline cost per enplaned passenger (CPEP) was used as an indicator of comparative feasibility. To compare airline costs among airports, airline rates and charges are typically expressed on a per-enplaned-passenger basis. The CPEP measure, therefore, only addresses the financial feasibility of an airport in terms of attracting airline support.

Costs such as tenant-financed facilities, airline support facilities, or surrounding infrastructure requirements (such as highway widening) are not typically considered when comparing airline costs among airports, but nonetheless may represent a material impact on the financial feasibility of the project as a whole. Therefore, for evaluation purposes, the total CPEP was also calculated to address the gross magnitude of total project construction costs along with the CPEP to be faced by the airlines. For each alternative, the airline and total CPEP were estimated for 2020 and 2030 for the Base Case, and 2030 for the high forecast.

11.7.2 Methodology

As in Phase I, the analysis was conducted through a sequence of steps, as discussed below.

Step 1: Estimate Funding Requirements. Funding requirements were calculated based on construction cost estimates provided in Section 11.2. The estimates for the three airport system alternatives were developed by combining capital costs at the existing airports with expansion and new construction costs required to serve projected demand through the year 2030. Although new airport construction would not be expected until 2020 at the earliest, system funding requirements were estimated for 2020 and 2030 to properly incorporate the ongoing capital requirements of the existing airports.

Step 2: Assess Eligibility for Federal Assistance. Each alternative's potential eligibility for federal Airport Improvement Program (AIP) funds was assessed. The eligibility of each cost item was reviewed based on FAA guidelines. For large primary airports, AIP grants cannot exceed 75 percent of eligible costs. For smaller primary airports, AIP grants cannot exceed 90 percent of eligible costs. Given the magnitude of costs for this project and the limitations on AIP funds, the financial feasibility of each scenario was examined assuming that AIP funds cover only 20 percent of the required funding.

Step 3: Assess Eligibility for Passenger Facility Charges. Eligibility and potential funding from passenger facility charges (PFCs) was estimated for each airport and each alternative. PFCs of up to $3 per enplaned passenger may be levied by an airport for FAA-approved projects. For this analysis, PFCs were conservatively assumed to be applied on a pay-as-you-go basis. It was also assumed that PFCs would only be spent at the airport at which they were collected.

Step 4: Develop Financing Parameters. For the purposes of the comparative financial analysis, a traditional financing approach was assumed, including 30-year general airport revenue bonds (GARBs). Nontraditional financing alternatives, including private developers, are examined later in Chapter 16. The same type of

financing plan was applied uniformly to each alternative. The amount of the bond issuance was calculated after the estimated AIP and PFC funds were deducted from the capital costs.

Step 5: Estimate Operating Costs and Non-Airline Revenues. Per-enplaned-passenger operating costs and non-airline revenues were estimated for the alternatives. The estimates were based on current operating costs and non-airline revenues at the existing airports as well as national averages for operating costs and non-airline revenues at comparably sized airports.

Step 6: Integrate Demand Forecasts. The per-enplaned-passenger operating costs and non-airline revenues were combined with the revised demand forecasts for each alternative. These forecasts are described in Section 10.9.

Step 7: Analyze Ongoing Future Capital and Repair Costs. Ongoing future capital and repair costs for each alternative were estimated using an analysis of comparable airports. These costs were included on a per-enplaned-passenger basis to address potential investor/bondholder concerns regarding the future operations of the airport(s).

Step 8: Estimate Airline CPEP. The airline CPEP was estimated for each airport system alternative. This cost would be recovered through rates and charges paid by the airlines, and is based on a residual rate-making methodology. It helps assess the airport's financial feasibility because air carrier support for the project could be influenced by the expected level of rates and charges. The estimate was based on the construction cost estimates, the AIP- and PFC-funding assumptions described above, the GARB financing plan, the operating cost analysis, the non-airline revenue estimates, the annual capital and repair cost estimates, and the Base Case and high demand forecasts. A total CPEP (including airline and non-airline costs) was also estimated.

11.7.3 Preliminary Construction Cost Estimates

Capital cost estimates for each of the three airport system alternatives, including construction costs and allowances for A/E and contingencies, were obtained from Section 11.2.

These costs have been evaluated in 10-year increments (2010, 2020, and 2030 for existing airports, and 2020 and 2030 for new airports) and are assumed to be incurred over the next 33 years through a number of bond issues, grants, and other sources rather than by one revenue bond issue at a fixed point in time. Also, a portion of the construction costs outlined above for each of the three airport system alternatives represents preliminary capital costs at the existing airports. It is assumed that those airports that lose passenger service under the single-airport or two-airport system alternatives would maintain passenger service until 2020 and would expand facilities, in accordance with their master plans, to accommodate service up to that point. Actual demand will dictate what facilities would be constructed based on benefit/cost analyses and environmental approvals (for discretionary funding projects). The outstanding debt service requirement for airports that would lose passenger service was added to the debt service requirement for the new construction and expansion to 2030.

11.7.4 Passenger Enplanement Forecasts

The demand forecasts for each of the alternatives include the revised Base Case

and high passenger enplanement forecasts developed in Section 10.9. The financial feasibility of each alternative was evaluated using these forecasts.

11.7.5 Operating Cost and Non-Airline Revenue Assumptions

The preliminary financing plan for the various alternatives must address the operations of the airport(s) and the net operating revenues that may be available for the annual debt service payments. The Phase I assumptions regarding airport operating expenses and non-airline revenues were updated for this purpose.

Airport operating expenses include airfield and terminal costs, airline services provided by the airport, any airport costs for parking and other concessions facilities, airport utilities, and general and administrative costs. The assumed operating costs per enplaned passenger (OCPEP) for the various alternatives was the average of (1) the Richmond International Airport OCPEP, (2) the Norfolk International Airport OCPEP, (3) the national average OCPEP for medium-sized hub airports, and (4) the national average OCPEP for small hubs.[8] The OCPEP used in the analysis was $9.59 in 1997 dollars. Both RIC and ORF have OCPEP costs between the average for small hub and medium hub airports. Comparable information could not be obtained for PHF.

Non-airline revenues include concession revenues, parking revenues, rental revenues, air cargo or maintenance revenues, and fuel flowage revenues. The assumed non-airline revenues per enplaned passenger (NARPEP) for the various alternatives was the average of (1) the Richmond International Airport NARPEP, (2) the Norfolk International Airport NARPEP, (3) the national average NARPEP for medium-sized hub airport,[9] and (4) the national average NARPEP for small hub airports. The NARPEP used in this analysis was $7.95 in 1997 dollars. Both RIC and ORF have higher-than-average non-airline revenues per passenger.

Table 11.11 summarizes the estimates of the OCPEP and NARPEP used in the analysis.

These operating cost and non-airline revenue assumptions were consistently applied across all alternatives to enable accurate comparison of financial feasibility between alternatives.

11.7.6 Funding Sources

This subsection discusses potential funding from the FAA AIP program and from PFCs.

AIP Program

Federal airport grants are provided by the AIP for airport planning, airport development, airport capacity enhancement and preservation, and noise compatibility programs. Airports that are open for public use are eligible for AIP grants. A public-use airport can be: (1) publicly owned, (2) privately owned but designated by the FAA as a reliever airport, or (3) privately owned with scheduled service and a minimum of

[8] American Association of Airport Executives, *AAAE Survey of Airport Rates and Charges*.

[9] The NARPEP national averages for medium and small hub airports were obtained from comparable airport operating statistics reported in the *American Association of Airport Executives' 1991-1992 Survey of Airport Rates and Charges.*

Table 11.11

(1997 Dollars)

Revised Operating Costs and Non-Airline Revenues Per Passenger
(1997 Dollars)

Source	Operating Cost Per Enplaned Passenger (OCPEP)	Non-Airline Revenue Per Enplaned Passenger (NARPEP)
Richmond International Airport	$10.15	$9.14
Norfolk International Airport	$8.87	$8.30
National Average for Medium Hub Airports	$8.65	$6.18
National Average for Small Hub Airports	$10.70	$8.20
Average	$9.59	$7.95

Sources: AAAE Survey of Airport Rates and Charges, Capital Region Airport Commission Biennial Report 1995-1996, Norfolk International Airport Master Plan Update, and HNTB analysis.

2,500 annual enplanements. For an airport project to be eligible for AIP funding, the sponsor or recipient of the grant must meet several legal, financial, and miscellaneous requirements. These requirements are necessary to ensure that the sponsor is capable of fulfilling the provisions stipulated in the grant obligation. For the purpose of this analysis, it is assumed that the AIP would continue to function in the same manner in the future. The eligible federal AIP share, or percentage of total project costs, depends on both the type of project and the type of airport. In 1996, ORF was a medium hub airport and RIC was a small hub airport. For the purpose of this analysis, the following breakdown between medium hub and small hub airports was assumed over the forecast period:

One-Airport System

- Search area 1 - medium hub
- RIC, ORF, and PHF - non-hub

Two-Airport System - RIC & PHF

- RIC & PHF - medium hub
- ORF - non-hub

Two-Airport System - RIC & search area 2

- RIC & search area 2 - medium hub
- ORF & PHF - non-hub

Three-Airport System

- RIC & ORF - medium hub
- PHF - small hub

The federal AIP share of airport development projects for a medium hub airport is defined to be 75 percent, while small hub and non-hub airports are eligible for a 90 percent federal AIP share. These eligibility percentages apply to each of the following project areas (as defined in the AIP regulations) except as noted:

Land Acquisition. The acquisition of or any interest in land is eligible when it is necessary for airport purposes as supported by a real estate appraisal.

Site Preparation. Site preparation includes clearing, grading, grubbing, and drainage facilities. Activities such as wetland mitigation would be included as part of site preparation.

Utility and Road Relocation. The relocation of roads or utilities is eligible up to the cost of a "like" road or utility if they impede airport development. If the sponsor is obligated to pay for the relocation, then the costs are AIP-eligible.

Runway and Taxiway Pavement. Typical runway and taxiway development such as new construction, lengthening, strengthening, or leveling of existing facilities is eligible for AIP funding.

Access Roads. Eligible projects include the construction, reconstruction, and alteration of airport roads and related facilities exclusively serving airport ground access traffic. The eligible sections of the access roads (1) extend only to the nearest public highway and (2) must be on-airport property or within a right-of-way acquired by the airport sponsor. Related access road facilities include acceleration and deceleration lanes, exit and entrance ramps, street lighting, and bus stops. For this analysis, on-airport roads were assumed to be eligible for AIP funding while off-airport roads were not assumed to be eligible for AIP funding.

Navigational Aids. The funding of a necessary air traffic control tower and navigational aids for aircraft arrivals or departures is accomplished primarily through the FAA's Facilities and Equipment program, covering 100 percent of the costs (may also be funded under AIP).

Aircraft Rescue and Fire Fighting. The acquisition of ARFF equipment to meet federal safety requirements is eligible for AIP funding.

Terminal Development. Terminal development program eligibility at commercial service airports is limited to non-revenue-producing public-use areas. The areas must be directly related to the movement of passengers and baggage located in air carrier and commuter terminal facilities within the boundaries of the airport. Specifically, these areas include baggage areas, public corridors, waiting rooms, rest rooms, hold rooms, foyers or entryways, loading bridges, and terminal passenger vehicles. Terminal passenger vehicles must be used exclusively within the boundaries of the airport to move passengers between airline terminals or gates. Examples of ineligible areas include restaurants, concession areas, airline offices, and ticketing areas. For this analysis, the non-revenue-producing public-use portion of the terminal was assumed to be 30 percent of the total terminal costs.

Indirect Costs. Indirect costs such as administration, maintenance, engineering, and design, are eligible for AIP funding if they are allocated under an FAA-approved allocation scheme. For this analysis, A/E and contingency allowances were 22.5 percent of total costs for existing airports and 27.8 percent for new airports.

The guidelines listed above determine an airport project's eligibility for AIP funding. However, AIP eligibility may not be a reasonable method of approximating AIP project funding levels. Instead, AIP availability may be the best means of approximating expected AIP funding levels.

Over the past few years, the authorization levels for the AIP have ranged from $1.4 to $1.8 billion, and have not kept up with airport capacity requirements. Therefore, the pool of funds that may be available for new airport construction/expansion under the existing guidelines is limited. Based on these historical funding levels, the size of the annual AIP authorizations (particularly the portion of funding for airport development) may constrain funding below eligible levels. Therefore, to account for a possible shortfall of AIP funding below eligible levels and consistent with Phase I assumptions, this analysis examines the airline CPEP assuming AIP funding to be 20 percent of project costs; this percentage was achieved for the new Denver International Airport and has been considered for other new airport projects nationally.

State and Local Funding

For comparative purposes, it is assumed that no state or local funding will be contributed to any of the various alternatives. The consistent application of this assumption to each alternative allows for the comparison of financial feasibility between the alternatives. Since state entitlement funding is limited to $2 million per year per airport, the availability of state funding would not have a large effect on feasibility in percentage terms.

Passenger Facility Charges

Consistent with current federal regulations, it was assumed that each of the airports would impose and use PFCs over the forecast period. For the purpose of this analysis, it was assumed that PFCs would only be spent at the airport at which they were collected. Consequently, no PFC revenues were applied to the initial construction costs at either of the proposed airports at search area 1 and search area 2. It was also assumed that PFCs would be applied on a pay-as-you-go basis and that any PFC revenues not required for current projects would be used to reimburse the airport(s) for earlier eligible projects.

No increase above the $3 level in PFCs to keep pace with inflation was assumed. PFCs are viewed as a potential replacement for AIP funding, so if Congress were to raise the PFC limits, it would probably be to offset further reductions in AIP funding. It was assumed that airlines would continue to keep $.08 of every PFC collected, and it was estimated that PFCs would be imposed on 90 percent of enplaned passengers.

11.7.7 Preliminary Financing Plan

It is anticipated that general airport revenue bonds (GARBs) already defined would be a significant source of financing in any of the proposed alternatives. A GARB is tax-exempt municipal debt issued based on a pledge of airport revenues (or, in the case of new airport construction, future revenues). The focus of potential investors in GARBs is on the revenue-producing abilities of the airport instead of governmental taxing ability, as is the case with municipal general obligation bonds. The net operating revenue of the airport, after payment of operating costs and other required transfers, is the guarantee for payment of debt service and demonstration of coverage. Therefore, the amount to be financed with GARBs represents the net public facilities financing requirement after taking into account other available financing sources (i.e., grants or tenant financing).

The following assumptions used in the preliminary financing plan were similar to Phase I:

- Thirty-year terms.

- Market interest rate (illustrating the interest cost without credit enhancement) of 6.5 percent.

- A 1.25-coverage ratio, with a rolling coverage account funded in the first year of operations.

- Capitalized interest over a 4-year construction period.

- Principal amortization for 26 years from the date of beneficial occupancy (dbo) to term for the bond issue.

- A debt service reserve with one year's debt service.

- Issuance costs (including underwriter's discount, bond counsel, printing, and other costs) of 2 percent.

- A 5 percent return on available balances during the construction period, in the operations and maintenance fund, and in the debt service operating fund.

- A 6 percent return on the balances in the debt service reserve fund and on the coverage account.

- Inflation of 3 percent annually.

This preliminary financing plan has been developed only for comparative purposes to outline the relative financial feasibility of the various alternatives. The structure of the bonds, as described above, is standard for GARB issues. The bond interest rate, as well as the rates for calculated interest earnings, were developed based on estimated financial market conditions. The overall level of financial feasibility would be sensitive to these assumptions; however, the relative financial feasibility between airport system alternatives would not be sensitive to these assumptions since they are applied consistently across all alternatives. In further studies, additional research and analysis would be required to assess the marketability of the proposed GARB issues. The following issues are among those that would need to be addressed:

Competition. Public investors and rating agencies will examine the extent to which any of the alternatives would face competition from other airports. Regional consensus and a regional institutional structure should address concerns regarding demand allocation from the eastern Virginia region. However, investors would also examine any airport or airline expansion plans at nearby facilities such as Washington-Dulles International Airport or Raleigh-Durham International Airport, that may be envisioned for the next 30 to 60 years.

Airline Support. As with any airport project, investors would want assurances that the project would be supported by the airlines. This issue would be particularly important to this project for a number of reasons, including the following:

- As in the case of the new Denver International Airport, airline support is a critical factor in the construction of a new airport.

- A critical factor in the feasibility of any of the alternatives included in this analysis may be the presence of airline connecting activity at the proposed airport(s).

- Airline operating agreements, or some other long-term commitment, may need to be in place before financing can be obtained.

Passenger Enplanements. The successful consolidation of demand for the entire eastern Virginia region in the year 2030 would hinge largely on the passenger enplanements and the general usage of the

airport by businesses and residents in the region. Investors would examine the demographics of the expected service area, including population growth within the region, geographic movements of the population base within the region, and trends in air traffic growth, in order to evaluate the viability of the proposed demand consolidation alternative.

Credit Support/Enhancement. To alleviate investor concerns over possible construction delays, risks regarding future enplanement levels, or uncertain economic conditions in the future, it may be necessary to secure some additional form of credit support or enhancement, such as the following:

- *Bond Insurance*. A third-party guarantor insures the debt service payments to the bondholders, with the premium paid for the insurance reflecting the likelihood of non-performance of the bond issuer.

- *Credit Substitution*. The bond issuer purchases support from another entity to enhance the credit of the revenue bonds, thus raising the credit rating of the bonds and allowing for a lower interest rate.

- *Letter of Credit*. A contract between a credit provider and the bond issuer guarantees that the credit provider would pay a specified amount, over a certain time period, to a designated beneficiary upon the occurrence of some agreed-upon circumstances.

11.7.8 Cost Per Enplaned Passenger

The airline cost per enplaned passenger (CPEP) is the measure used to compare the financial feasibility of the three airport system alternatives. Airline and investor support, both institutional and financial, for the proposed alternatives may be affected by the expected level of airport rates and charges. The airline CPEP for each alternative was calculated for the years 2020 and 2030 for the Base Case, and 2030 for the High Case, based on a total airport residual rate-making methodology.

The CPEPs presented in **Table 11.12** represent the cost to be faced by the airlines at the airport(s) included in each alternative. The CPEPs assume AIP funding levels to equal 20 percent of capital costs, based on new airport development funding levels at the new Denver International Airport and other proposed airport projects. This figure represents reasonable availability of AIP funding given the constraints on the total AIP authorization levels. To achieve these levels of airline-revenue requirements, other financing sources would likely be necessary. Non-traditional funding sources are examined in detail in Chapter 16. Detailed calculations of airline and total CPEP are included in **Tables 11.13 through 11.15**.

In 2020, the CPEP figures estimated for the three airport system alternatives in this analysis are 250 to 800 percent higher than the national average for medium hub airports ($5.39), the national average for small hub airports ($5.86), and the national average for large hub airports ($6.96). The costs are significantly higher for all the airport system alternatives. In the case of the three-airport and two-airport (RIC and PHF) systems, the high CPEPs are driven by the major capital expansion programs envisioned in each airport's master plan. In 2020, the CPEPs are 100 to 150 percent higher for the alternatives involving new airports. The reasons for this are the high capital and financing costs associated with new airport construction/expansion combined with the high costs of the master plans associated with the existing airports. The new Denver International Airport was

Table 11.12

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Airline Cost Per Enplaned Passenger
(1997 Dollars)

Alternative	2020	2030	High Forecast 2030
One-Airport System	$49.03	$32.71	$23.07
Two-Airport System			
RIC & PHF	$19.17	$13.73	$12.53
RIC & 2C	$39.22	$24.83	$25.19
Three Airport System	$19.64	$14.29	$14.29

Source: HNTB analysis.

Table 11.13

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Estimate of Cost Per Enplaned Passenger
2020 Forecast

	1-Airport	2-Airport		3-Airport
		RIC&PHF	RIC&2C	
		Assumes 20 Percent AIP Funding		
Capital Charge (a)	250,145,000	100,036,000	227,151,000	104,393,000
Operating Cost	51,318,000	63,953,000	59,981,000	64,586,000
Capital and Repair Cost	5,151,000	6,419,000	6,021,000	6,483,000
O&M Reserve	13,879,000	17,297,000	16,222,000	17,468,000
Less: Interest on O& M Reserve	(694,000)	(865,000)	(811,000)	(873,000)
Revenue Requirement	319,799,000	186,840,000	308,564,000	192,057,000
Less: Non-Airline Revenue	42,547,000	53,023,000	49,730,000	53,548,000
Less Interest Income	15,009,000	6,002,000	13,629,000	6,264,000
Net Revenue Requirement	262,243,000	127,815,000	245,205,000	132,245,000
Enplanements	5,349,000	6,666,000	6,252,000	6,732,000
Airline CPEP	**$49.03**	**$19.17**	**$39.22**	**$19.64**
Total CPEP	**$56.98**	**$27.13**	**$47.17**	**$27.60**

(a) Includes new debt service, existing debt service and assumes 25 percent coverage. All figures in 1997 dollars.

Source: HNTB analysis.

Table 11.14

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Estimate of Cost Per Enplaned Passenger
2030 Base Case Forecast

	1-Airport	2-Airport		3-Airport
		RIC & PHF	RIC & 2A	
	Assumes Full 20 Percent AIP Funding			
Capital Charge (a)	207,787,000	81,299,000	174,048,000	87,306,000
Operating Cost	67,790,000	84,656,000	79,418,000	85,347,000
Capital and Repair Cost	6,805,000	8,498,000	7,972,000	8,567,000
O&M Reserve	18,335,000	22,896,000	21,479,000	23,083,000
Less: Interest on O& M Reserve	(917,000)	(1,145,000)	(1,074,000)	(1,154,000)
Revenue Requirement	299,800,000	196,204,000	281,843,000	203,149,000
Less: Non-Airline Revenue	56,205,000	70,188,000	65,845,000	70,761,000
Less Interest Income	12,467,000	4,878,000	10,443,000	5,238,000
Net Revenue Requirement	231,128,000	121,138,000	205,555,000	127,150,000
Enplanements	7,066,000	8,824,000	8,278,000	8,896,000
Airline CPEP	**$32.71**	**$13.73**	**$24.83**	**$14.29**
Total CPEP	**$40.66**	**$21.68**	**$32.79**	**$22.25**

(a) Includes new debt service, existing debt service and assumes 25 percent coverage. All figures in 1997 dollars.

Source: HNTB analysis.

Table 11.15

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Estimate of Cost Per Enplaned Passenger
2030 High Forecast

	1-Airport	2-Airport		3-Airport
		RIC & PHF	RIC & 2A	
	Assumes Full AIP Funding			
Capital Charge (a)	224,918,000	90,533,000	217,004,000	87,306,000
Operating Cost	112,671,000	109,380,000	97,272,000	85,347,000
Capital and Repair Cost	11,309,000	10,979,000	9,764,000	8,567,000
O&M Reserve	30,473,000	29,583,000	26,308,000	23,083,000
Less: Interest on O& M Reserve	(1,524,000)	(1,479,000)	(1,315,000)	(1,154,000)
Revenue Requirement	377,847,000	238,996,000	349,033,000	203,149,000
Less: Non-Airline Revenue	93,414,000	90,686,000	80,648,000	70,761,000
Less Interest Income	13,495,000	5,432,000	13,020,000	5,238,000
Net Revenue Requirement	270,938,000	142,878,000	255,365,000	127,150,000
Enplanements	11,744,000	11,401,000	10,139,000	8,896,000
Airline CPEP	**$23.07**	**$12.53**	**$25.19**	**$14.29**
Total CPEP	**$31.02**	**$20.49**	**$33.14**	**$22.25**

(a) Includes new debt service, existing debt service and assumes 25 percent coverage. All figures in 1997 dollars.

Source: HNTB analysis.

projected to charge a CPEP of $14.16 (in 1997 dollars) upon opening. Following are the factors that could reduce these CPEPs:

- Federal grants in excess of the 20 percent of total costs assumed in this analysis.

- Significant private participation.

- Significant state participation.

- Transfer of PFC funds from existing airports to new airports. (This could be accomplished if the airports were organized under a single authority).

- Changes in the phasing of improvements at either the existing airports or new airport sites.

- Reductions in the size of the new sites. For example, if the size were reduced from 16,000 acres to 10,000 acres, the CPEP would be reduced approximately 8 percent for the one-airport alternative and about 10 percent for the two-airport alternative with RIC and 2C. However, this would reduce development opportunities.

11.7.9 Risk and Uncertainty

Throughout this analysis, a number of significant assumptions were made with regard to the operation and financing of the various alternatives. Many of these assumptions would require further analysis before proceeding, and the failure of many of the assumptions to materialize may have a significant and material impact on the financial outcome of the project. Outlined below are some of the major risks in realizing the projections presented in this preliminary financial plan:

Demand. Total demand and the distribution of regional demand for commercial service are very important factors in the success of any of the various alternatives. Demand has financial implications on securing AIP grants within the airport system, and on the general marketability of the airport(s) to airlines, businesses, and users.

Airline Support. Airlines have been vocal about rising airport costs, particularly in Congress, requiring the FAA review of any increases in airport rates and charges felt to be unjust by the airlines. Although airport costs are a relatively small portion of total airline operating costs, airlines have become reluctant to support airport programs that they perceive as contributing to their cost burden. Therefore, it would be imperative that the projected airline revenue requirements of the proposed alternatives for the eastern Virginia region be as competitive as possible and that sufficient economic opportunities and benefits to the airlines exist to justify any increased costs to serving the eastern Virginia region.

Additionally, the financial feasibility of any of the various alternatives proposed for the eastern Virginia region may be enhanced by airline connecting activities at the proposed airport(s). There is considerable competition from airports attempting to attract a decreasing number of airline hubs nationally. Thus, obtaining an airline hub may need to be a priority as these studies proceed.

AIP Funding. The financial feasibility of the proposed airport(s) is sensitive to the level of federal AIP funding. Failure to secure these funds in the amounts assumed in this analysis could jeopardize the success of the project.

Debt Financing. The level of GARB financing may be difficult to secure without additional credit support. This report provides no assurances that such financing can be obtained. As such, emphasis should

be placed on securing alternate sources of funding, including additional AIP funding up to the level of eligibility, public/private financing sources, economic development grants, or other state and local sources of funding, in addition to the debt instruments described in this analysis. **Appendix D** contains a summary of the debt service scenarios.

Financing Terms. Additional analysis and discussions with rating agencies and investment banking firms would be necessary to better ascertain the market terms and conditions that would be required to support the proposed debt offerings. Changes in the assumptions contained in this analysis, such as the interest rate, could have a significant impact on the financial feasibility of the various alternatives. In addition, as discussed above, some form of credit support or enhancement may be required. This analysis makes no assumptions regarding the cost or availability of such credit support or enhancement.

Airport Operating Costs and Non-Airline Revenues. Changes in the operating cost or non-airline revenue assumptions can have a significant impact on the financial performance of the airport. The assumptions used in this analysis would need to be refined as a more defined description of the airport(s) and the functional components of their operation are developed.

11.8 ECONOMIC IMPACTS

11.8.1 Overview

This section evaluates the comparative level of economic impacts for the various demand management alternatives. Economic impact analysis is a method of measuring the importance of individual airports and the aviation system as a whole to the community. Economic impact is measured in terms of jobs and income provided by the airport, and expenditures for goods and services that the airport indirectly generates. Economic impact can be defined by three different types of impacts: direct, indirect, and induced impacts.

This section is divided into four main parts. The first part provides a general overview of the economic impact analysis methodology used in this study. The second part discusses the specific assumptions used to calculate the direct, indirect, and induced economic impacts associated with each of the alternatives analyzed in this report. The third part summarizes the quantitative results of the economic impact analysis of each potential alternative. The fourth part discusses the ways in which airports can catalyze economic development.

General Economic Impact Analysis Methodology

An airport's total economic impact is determined by summing its direct, indirect, and induced impacts. Definitions of the three types of impact are provided below.

Direct Impacts. Direct impacts are generated by economic activities carried out at the airport by airlines, airport management, fixed base operators, and other tenants with a direct involvement in aviation. Most direct impacts occur on the airport grounds. The distinguishing feature of a direct impact is that it is an immediate consequence of airport economic activity.

Estimates of direct impacts represent economic activities that would not have occurred in the absence of the airport. Expenditures by airlines, fixed base operators, and aviation-related tenants generate direct impacts. Only those impacts

that induce local business activity are considered relevant.

Indirect Impacts. Indirect impacts derive from economic activities that are attributable to the airport but are not considered part of the aviation industry. These activities include services provided to passengers by travel agencies, hotels, restaurants, and retail establishments. Indirect impacts originate primarily off site and are generated by the expenditures of airport users, including passenger expenditures.

Like direct impacts, indirect impacts theoretically represent economic activities that would not have occurred in the absence of the airport. The direct impacts, occurring mainly on site, are much easier to identify. Indirect impacts, largely driven by passenger expenditures, include only the employed labor, locally purchased goods and services, and capital investments for business enterprises which result from the presence of the airport.

Induced Impacts. Induced impacts are the multiplier effects of the direct and indirect impacts. These are the increases in employment and income, as well as the resulting increased expenditures which the region would realize over and above the combined direct and indirect impacts created by successive rounds of spending and new development around the airport.

The following example explains the multiplier-induced impacts. Most of the "take-home" income earned by airport employees is spent locally. Some of this spending becomes income to local individuals who provide services to the airport employees (non-local spending may include expenditures outside of the region, non-local taxes, etc.). Some of the spending by airport employees goes to local businesses and becomes income to the business owners and their employees, then part of these second-round incomes are spent locally and thus become income to another set of individuals. As successive rounds of spending occur, additional income is created. The total airport economic impact is the sum of the direct, indirect, and induced impacts.

The economic impacts of each of the various alternatives include both new business development and intra-region transfers. As new businesses move into the region, the economic impacts represent a net economic gain. However, as businesses relocate within a region, the economic impacts simply represent intra-region transfers of economic activity. It is important to note that economic impacts would not be distributed equally throughout the region.

For example, an alternative involving consolidated demand at PHF would more than likely generate greater economic impact around Newport News/Williamsburg than elsewhere in the region. Some of this economic impact may simply be a transfer of business from the eastern part of the Hampton Roads area; the remainder of the impact would be new business to the region and would represent a net economic gain. The analysis does not separate the different types of impacts. A more detailed analysis of the distribution of positive and negative impacts at the community level is provided in Chapter 16.

Assumptions

The economic impact analysis follows the general methodology discussed above and estimates the impacts associated with the various alternatives. The economic impacts were determined by estimating the construction impacts, visitor expenditure impacts, and airport and tenant operating impacts associated with each alternative.

Construction costs have a major one-time impact when the airport is built, but the remaining economic impacts occur continuously during the operation of the airport.

Many of the assumptions were based on methodologies and information developed during the course of the Phase I study and then updated. In addition, information was drawn from a study completed for Virginia Gateway 21 Developers entitled *The Economic Benefits of Hub and Gateway Airports*. The study contains economic impact estimates for a medium-sized connecting hub airport. The assumptions contained in the report were used in estimating passenger expenditure impacts and operating cost impacts.

Some of the assumptions made regarding the medium-sized connecting hub airport in *Economic Benefits of Hub and Gateway Airports* may not be consistent with those used in this analysis. For example, the airports in this analysis would serve many more passengers and would have a different origination and destination (O&D) mix of passengers. However, it is important to note that for consistency, the same assumptions were applied across all system alternatives in this analysis. The total economic impacts of the various alternatives would be sensitive to these assumptions, but the relative economic impacts between alternatives would not be sensitive to changes in these assumptions.

The following paragraphs detail the specific assumptions used in estimating the construction impact, and annual economic activity, earnings, and employment associated with each of the alternatives under consideration in this study.

Construction Impacts. Direct construction impacts were assumed equal to costs associated with the construction or expansion of airports in each alternative. The Regional Impact Multiplier System (RIMS) II model multiplier for new construction was applied to these direct impacts to calculate induced impacts. Total construction impacts equal direct plus induced construction impacts.

This section has been updated since the Phase I analysis to reflect revised construction costs, which include additional detail and are adjusted for inflation. The initial construction impacts were also revised using the ratio of revised construction costs to initial construction costs.

Annual Economic Activity. The annual economic activity associated with each of the alternatives was calculated by adding total airport and tenant operations impacts to total visitor expenditure impacts.

Annual economic activity has been updated since the Phase I analysis to reflect revised enplanement forecasts, which have been converted into 1997 dollars. The initial economic activity was adjusted by the ratio of revised total enplanements to Phase I total enplanements. In addition, the data in the initial report were adjusted for inflation of 7.0 percent during the 1994 to 1997 period.

Airport and Tenant Operations Impacts

Total airport and tenant operations impacts include direct costs associated with operating the various airports under consideration, as well as the aviation-related businesses around the airport, and induced impacts resulting from the multiplier effect. Direct operating costs of the airport and airlines were calculated by multiplying projected enplanements by airline and airport impacts per enplanement, from *Economic Benefits of Hub and Gateway*

Airports. Induced airport and tenant operations impacts were estimated by applying the RIMS II multiplier for transportation to the direct costs. Total airport and tenant operations impacts were then computed by summing total direct and induced airport and tenant operations impacts.

Visitor Expenditure Impacts

Total visitor expenditure impacts include indirect impacts associated with annual visitor expenditures and induced impacts resulting from the multiplier effect. To estimate visitor expenditure impacts, the following approach was taken. Based on *Economic Benefits of Hub and Gateway Airports*, it was assumed that 50 percent of enplanements were visitors to the local area/economy. Projected total enplanements associated with each alternative were multiplied by 50 percent to determine total visitors. The total O&D visitor figure was then multiplied by average expenditures per O&D visitor, as calculated in *Economic Benefits of Hub and Gateway Airports*, producing total indirect visitor expenditure impacts.

To estimate induced visitor expenditure impacts, a composite multiplier was applied to the indirect visitor expenditure result. The multiplier used was the average of RIMS II multipliers for (1) transportation, (2) hotels and lodging places and amusements, and (3) eating and drinking places. It was assumed that this average multiplier captures the various activities on which passengers spend money.

Total visitor expenditures impacts were then calculated by adding total indirect expenditures to induced visitor expenditures.

Earnings and Employment. Earnings and employment can be calculated from annual economic activity. Total earnings produced by this level of annual economic activity were determined by multiplying total economic activity impacts by employee earnings as a percentage of airport economic activity used in *Economic Benefits of Hub and Gateway Airports*. The report assumes earnings to be equal to the sum of all wages to all employed persons that the aviation industry paid directly, or indirectly, to deliver the output of final aviation demand. For the purposes of this analysis, it was assumed that the airport alternatives under consideration would have the same mix of job types as the medium-sized airport analyzed in the report.

In the same way, the number of employees supported by the annual economic activity levels produced by each alternative were computed by multiplying total earnings impacts (discussed above) by the estimated number of employees per earnings as in *Economic Benefits of Hub and Gateway Airports*. Again, a parallel employment profile was assumed.

Earnings and employment have been updated since the Phase I analysis to reflect revised enplanement forecasts. The initial earnings and employment estimates were adjusted by the ratio of revised total enplanements to initial total enplanements. The earnings data from the Phase I study were converted into 1997 dollars.

Base Case and High Forecast Scenarios

The impact of two scenarios on each alternative was considered. The 2030 Base Case scenario corresponds with the non-hubbing scenario of the Phase I report. The high forecast scenario uses the assumptions from the hubbing scenario of the same report. The calculation of construction impacts and airport and tenant operations impacts for the scenarios is identical,

however, a hub airport would have connecting passenger traffic, resulting in additional visitor spending by connecting passengers.

The impact of spending by connecting passengers was added to the visitor expenditure impacts associated with O&D visitors (assumed to be 50 percent of enplanements multiplied by average expenditure per visitor, as discussed previously). Visitor expenditure impacts per connecting passenger were developed by multiplying the number of projected connecting enplanements for each alternative by the expenditure per connecting enplanement, as in *Economic Benefits of Hub and Gateway Airports*.

Thus, for the high forecast scenario, total visitor expenditure impacts were estimated by using the following formula:

Total impacts = (O&D enplanements * % visitor * expenditure/O&D visitor) + (connecting enplanements * average expenditure/connecting visitor).

This methodology was used to calculate annual economic activity, earnings, and employment associated with the various alternatives for both the 2030 Base Case and the 2030 high forecast scenarios.

Results

The results of the economic impact analysis are presented in **Table 11.16**. Construction impacts range from $3.2 billion for the two-airport system (RIC and PHF) to the high forecast scenario of $6.9 billion for the single-airport alternative. The two alternatives involving new sites generate greater construction impacts than the other alternatives because of the higher construction costs.

Under the Base Case forecast, the single-airport system and the two-airport system (RIC and search area 2C) are estimated to generate less economic impact than the three-airport system. The two-airport system (RIC and PHF) generates the greatest amount of economic impact under the high forecast, approximately 8 percent more annual economic activity than the three-airport alternative. The annual earnings and job impacts parallel the economic activity impacts.

It should be noted that passenger demand and the associated economic impacts at the new sites would be sensitive to location and ground travel times. Consequently, the economic impact estimates associated with the new sites should be considered to be an "order of magnitude" calculation until a specific site is determined.

11.8.2 Catalytic Impacts

In addition to the economic impacts generated directly by airport activity discussed in the previous section, and an airport's impact on the real estate immediately surrounding an airport, airport expansion or new airport development would create broader economic development by acting as a catalyst for local and regional economic growth. Catalytic impacts occur when a business from outside the region relocates or an entrepreneur starts a new business due to advantageous factors that the area around the airport offers. These factors include general characteristics of any entity that may create catalytic impacts, as well as characteristics specific to an airport and its surrounding development. It is important to remember, however, that this discussion of catalytic impacts is necessarily qualitative, addressing the characteristics of the airport

Table 11.16

REGIONAL SYSTEM PLAN STUDY FOR EASTERN VIRGINIA

Summary of Economic Impacts
in Billions of 1997 Dollars (a)

Alternative	Construction Impacts (b)		Annual Economic Impacts (c)					
			Economic Activity		Earnings		Jobs	
	2030 Base Case	2030 High Forecast	2030 Base Case	2030 High Forecast	2030 Base Case	2030 High Forecast	2030 Base Case	2030 High Forecast
Three-airport System	$3.8	$3.8	$5.9	$5.9	$1.7	$1.7	72,000	72,181
Single-airport System	$6.4	$6.9	$4.7	$6.0	$1.5	$1.8	57,000	74,000
Two-airport System – Richmond and Newport News/ Williamsburg	$3.2	$3.3	$5.8	$6.4	$1.7	$1.9	72,000	79,000
Two-airport System – Richmond and Search Area 2c	$5.6	$6.5	$5.5	$5.8	$1.7	$1.7	68,000	71,000

(a) Unit impact data from May 1995 Final Phase I Report
(b) Ration of revised construction costs to initial construction costs applied to initial construction impact. Data from Tables 7.39 and 7.40 of May 1995 Final Phase I Report as well as updated information from HNTB
(c) Ratio of revised total enplanements to initial total enplanements applied to Annual Economic Impact variable. Date from Table 7.1 of May 1995 Final Phase I Report and updated information from HNTB. Unit impact data adjusted for inflation of 7.0% during 1994 to 1997 period.

Source: IMG analysis of HNTB data and May 1995 Phase I Final Report.

environs and the factors contributing to businesses' location decisions which the region can present. The qualitative nature of such commentary is even more pronounced in this case since the discussion relates to possible future growth surrounding airport development in 2020 or later at sites yet to be determined.

The purpose of this section is to provide an overview of characteristics encouraging development, and to evaluate the economic development and associated land use impacts of each of the alternatives under consideration in this phase.

This section is divided into five subsections. The first subsection discusses which industries are most likely to be influenced by catalytic development. The second subsection summarizes the combination of factors and circumstances that may result in catalytic impacts. The third subsection describes economic development potential and land uses associated with the individual existing airports: RIC, ORF, and PHF. The fourth subsection discusses the economic development potential that could be stimulated by a new airport. The fourth subsection addresses the economic development potential for each of the three alternatives currently under consideration, focusing on the attractiveness of each to new businesses and the likelihood of catalytic impacts.

It is important to note that catalytic impacts would not be distributed equally throughout

economic gain. However, as businesses relocate within a region, the catalytic impacts simply represent intra-region transfers of economic activity. The catalytic impacts of each of the various alternatives assessed here include both new business development and intra-region transfers. This analysis does not separate these two types of impacts. For example, when an airport is downsized, there may be economic losses to that community, and communities surrounding a consolidated demand airport may realize a majority of the catalytic impacts for the region. The economic losses to a community served by a downsized airport may include the following:

- Loss of jobs directly related to the airport and its tenants.
- Loss of hotel, restaurant, and other service industries catering to air travelers.
- Loss of business at nearby tourist attractions dependent on air travelers.
- Loss of businesses with interstate clientele, which are dependent on air transportation.

These losses may be offset, in part, by new development on land the airport no longer needs. This development could be comprised of businesses which value proximity to urban centers and labor markets more than immediate access to air transportation. Positive and negative community development impacts are discussed in Chapter 16.

Potential Industries Attracted by Catalytic Development

Almost every type of business or industry depends on air transportation to some degree. However, the levels of dependence on air transportation can vary significantly from industry to industry. The U.S. Department of Commerce has collected information on the relative requirements for air transportation by different industry types, as shown in **Table 11.17**

As shown in Table 11.1, the average U.S. industry's expenditure on air transportation is equal to 1.0552 percent of its total contribution to employee income. Some industries have a significantly greater-than-average dependence on air transportation. The most significant of these is air transportation, which has expenditures for other air transportation industries equal to more than 10 percent of its total contribution to employee income. Other industries with a significant dependence on air transportation include agricultural services, fishing, and forestry; oil and gas extraction; printing and publishing; chemicals and allied products; petroleum and coal products; electric and electronic equipment; pipelines; transportation services; security and commodity brokers and services; business services; legal services; and educational services. These types of businesses are more likely than most to require a nearby airport for air transportation services. Many of these businesses, particularly electronic equipment, security and commodity brokers, and business and legal services, are characterized by high wages and little pollution or other negative external impacts, precisely the types of businesses that many communities desire to attract.

In assessing industry requirements for air transportation, it should be noted that variations in air transportation requirements occur within each industry and within each firm. A given firm's corporate headquarters will generate more traffic through executive and sales trips than a local branch. Also, this methodology only analyzes the business, corporate, and government

Table 11.17

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Industry Air Transportation Requirements Relative to Earnings

Industry Category	Air Transportation Requirements as a Percentage of Employee Earnings
Farm	0.3977%
Nonfarm	
Private	
Ag. Services, Fishing, Forestry and Other	2.4663%
Mining	
Coal Mining	0.2525%
Oil and Gas Extraction	2.5882%
Metal Mining	0.6764%
Nonmetallic Minerals, Except Fuels	0.6175%
Construction	0.2964%
Manufacturing	
Nondurable Goods	
Food and Kindred Products	0.9641%
Textile Mill Products	0.4225%
Apparel and Other Textile Products	0.8722%
Paper and Allied Products	1.3734%
Printing and Publishing	2.6037%
Chemicals and Allied Products	1.9745%
Petroleum and Coal Products	2.4594%
Tobacco Manufacturers	1.8065%
Rubber and Miscellaneous Plastics Products	0.6498%
Leather and Leather Products	0.8109%
Durable Goods	
Lumber and Wood Products	0.4182%
Furniture and Fixtures	0.9581%
Primary Metal Industries	0.4227%
Fabricated Metal Products	1.0260%
Machinery Except Electrical	0.9931%
Electric and Electronic Equipment	1.8021%
Trans. Equipment Except Motor Vehicle	1.6442%
Motor Vehicles and Equipment	0.6129%
Ordnance	1.1387%
Stone Clay and Glass Products	0.6473%
Instruments and Related Products	1.0673%
Miscellaneous Manufacturing Industries	1.1262%
Transportation and Public Utilities	
Railroad Transportation	0.3173%
Trucking and Warehousing	0.2660%
Water Transportation	0.6450%
Transportation and Public Utilities (continued)	
Other Transportation	
Local and Interurban Passenger Transit	0.0923%
Transportation by Air	10.4080%
Pipelines, Except Natural Gas	5.5721%
Transportation Services	6.3540%
Communication	0.4685%

Table 11.17 (cont'd)

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Industry Air Transportation Requirements Relative to Earnings

Industry Category	Air Transportation Requirements as a Percentage of Employee Earnings
Electrical, Gas and Sanitary Services	1.1918%
Wholesale Trade	1.4032%
Retail Trade	0.3694%
Eating and Drinking Places	0.7262%
Finance, Insurance and Real Estate	
Banking and Credit Agencies	0.5641%
Other Finance Insurance and Real Estate	
Security and Commodity Brokers and Services	2.7383%
Insurance Carriers	1.0533%
Insurance Agents, Brokers and Services	0.4515%
Real Estate	1.4736%
Services	
Hotels and Other Lodging Places	0.0939%
Personal Services	0.4519%
Business Services	1.8606%
Auto Repair, Services and Garages	1.4033%
Miscellaneous Repair Services	0.3028%
Amusement and Recreation Services	0.4739%
Motion Pictures	1.7593%
Health Services	0.4950%
Legal Services	2.5836%
Educational Services	2.2716%
Social Services	0.8744%
Membership Organizations	1.3518%
Government and Government Enterprises	
Federal, Civilian	1.0630%
Military	1.9048%
State and Local	0.4022%
Average	1.0552%

Source: "Structure of the U.S. Economy," 1977 and "Regional Economic Information System," 1986.

demand for air transportation. Personal and recreational travel demand are more dependent on population and income rather than on industry type, and would, therefore, show somewhat different geographic demand patterns than the business requirements.

The statewide distribution of industries by type was evaluated as part of the Minnesota State Aviation System Plan.[10] The study determined that the areas immediately surrounding Minneapolis-St. Paul International Airport had the highest concentration of air transportation-dependent firms. Other regions served by small and non-hub commercial airports had lesser concentrations of air transportation-dependent firms. Areas with no commercial air service had the least number of air transportation-dependent firms. The study demonstrated that those firms with a need for air transportation definitely consider the availability of air service in their location plans.

Factors Contributing to Catalytic Development Around Airports

Economic development in the environs of the airport is typically affected by the characteristics of the surrounding airport locale, as well as the aviation facility itself. The type of development that occurs in the airport environs and the speed with which it occurs depend on a number of factors, including the following:

Geographic direction of growth in an urban area prior to establishment of the airport. Because airports require a large area of undeveloped, reasonably priced land, they tend to be located opposite the predominant direction of urban growth. An airport is a strong enough magnet to pull the path of development in a new direction or to modify existing patterns. The pace at which such development occurs is related to the distance between existing development and the airport, and to the presence of any specific physical barriers, such as mountains or bodies of water.

Distance to the urban core. When an airport is closer to the urban center or closer to more highly populated areas in general, development would occur more quickly provided that speculation has not driven land prices beyond market levels and that land is available for growth. The perception of an airport as “far out” or “close in” depends more on the presence of undeveloped areas between the city and the airport and the quality of transportation linkage than on actual mileage.

Air service. Potential new businesses may favor airports that offer a large number of air service destinations or serve a large number of passengers. In particular, businesses that frequently use air transportation, have a geographically diverse customer base, or ship significant cargo would tend to be more attracted to alternatives that include many air destinations and passengers.

The development of transportation infrastructure/access. Businesses evaluating location options may weigh access to intermodal transportation systems—air, highway, rail, and water—in their decision-making process. The development of highway infrastructure is particularly relevant, as most businesses’ employees and customers would reach the establishment via highway. Thus, locations around airports with multiple approach routes and correspondingly less congestion may be considered more desirable. However, for the potential catalytic impacts related to cargo, companies such as freight

[10] Minnesota State Aviation System Plan, Volume VIII, Economic Impact Study, September 1989.

shippers would examine highway access, possible links to railroad lines or spurs, or port access in their location decision.

Regulatory environment. Businesses suffering from excessive regulation in their current region would be attracted to locations that offer less regulation (i.e., fewer zoning restrictions).

Real estate prices. Potential new businesses considering location near an airport site would evaluate real estate prices when making their investment decisions. Rural or undeveloped airport sites with related lower real estate prices may therefore have greater appeal to such companies.

Tax rates. Like regulation, higher tax rates may discourage catalytic development. Entrepreneurs and businesses contemplating relocation would consider city and county tax rates when making their investment decisions.

Labor rates. Airports located in areas offering lower labor rates and a greater pool of skilled and experienced workers would be more attractive to businesses and therefore may have greater catalytic impacts.

These factors may affect a business' decision to locate or relocate in the environs of an airport and should be considered when assessing the possible catalytic impacts of different demand management alternatives in eastern Virginia. The regulatory environment, tax rates, and labor rates will not be discussed in this analysis since it is assumed that they will be fairly similar across the various system alternatives in 2020 or later. Of course, should an airport be built/expanded in a specific area within the region, it is possible that the regulatory environment or the tax rates would be very different within that jurisdiction in order to address the presence of the airport and to induce businesses to the area. However, before such a decision is made, the regulatory and tax rate attractiveness to businesses of the potential consolidated airport locations cannot be differentiated across the various alternatives.

Economic Development and Land Use Impacts Associated with Existing Airports

This section provides a brief overview of the possibilities for additional growth and development of RIC, PHF, and ORF. This overview is significant as several of the system alternatives under consideration in this study involve expansion of an existing airport.

Richmond International Airport. Located in Sandston, RIC is situated to the east of the City of Richmond in Henrico County. Compared to either ORF or PHF, RIC has a relatively large amount of undeveloped and modestly developed land between the city and the airport; however, RIC is close enough to the city that its expansion could pull the path of development east. In addition, in comparison to the other regional airports, RIC is relatively free of geographical limitations such as mountains or bodies of water.

Because RIC is only eight miles from downtown Richmond, businesses may be induced to locate in the surrounding areas, which would allow them access to air services as well as convenience to the urban center. The existence of well-developed highway infrastructure may further enhance the attractiveness of the RIC site. RIC can be reached by two major routes, I-64 and I-295, both of which allow quick travel times to Richmond and areas west and north, as well as to the eastern Virginia Peninsula. RIC is also convenient to a rail line serviced by both CSX and Amtrak, which provides intermodal transportation options for freight

shippers and passengers. The construction of I-895 will provide direct access to the Port of Richmond, a facility equipped to handle contained and other ships, as well as having rail access.

RIC served over two million total passengers in 1993. In addition, air carriers serving RIC operate 13 daily all-cargo flights. Future expansion of these services could attract additional businesses that desire an international gateway or serve a diverse clientele. The RIC site is also able to accommodate a future global industrial park.

Newport News/Williamsburg International Airport. PHF is centrally located on the eastern Virginia Peninsula in the City of Newport News. The PHF site is located in a populated, developed area and is constrained geographically to the north and west by the Colonial National Historical Park, and by nearly five miles of urban development to the south. In addition, there is nearby existing development associated with the Cities of Newport News and Hampton, as well as Fort Eustis.

However, expansion of PHF could trigger catalytic business expansion primarily to the northeast of the site, where there is some vacant land. Also, the PHF location may be particularly attractive to businesses in the future since it is convenient to a number of urban centers, including Norfolk, Hampton, Newport News, and even Richmond. However, this urban location may contribute to high land prices.

PHF has already taken steps to expand its service to international and additional domestic destinations. Additional expansion of the airport could attract businesses with significant air service requirements.

The PHF site is located close to a major interstate, I-64, and can be approached via several smaller arteries, such as Routes 60 and 143. The rail line that runs parallel to I-64 may provide the opportunity for intermodal access to the airport. Catalytic development resulting from expansion of PHF might thus increase due to the existing well-developed transportation infrastructure.

Norfolk International Airport. Although it currently serves over 2.5 million passengers annually, ORF is not being considered for expansion in any of the system alternatives addressed in this study. Regarding the site's potential catalytic impact, the airport is constrained on virtually every side by existing development, military holdings, and, significantly, various bodies of water. These constraints contribute to transportation constraints as visitors to the airport and employees of nearby businesses must travel across the James River and/or Chesapeake Bay via bridge or tunnel, which can significantly increase trip lengths. These and other factors combine to suggest that the catalytic impact of the ORF site may reach a threshold point beyond which little additional development would occur.

Economic Development and Surrounding Land Use Potential for Proposed New Airports

This section addresses the potential for catalytic developments resulting from the construction of a new airport. Construction of a new airport with a large number of air service destinations, particularly one that could serve as an international point of departure, could attract a significant number of new or relocating businesses into either area from both inside and outside the eastern Virginia region. It should be noted that a new greenfield site, with the relatively large and undeveloped land holdings that are likely to surround it, would offer a unique opportunity to promote development through the kind of industrial/commercial/high-tech business park that would not be feasible in

proximity to the existing airports. It is important to note that site selection studies have not been performed; this analysis only addresses broad search areas in rural Virginia. Therefore, the discussion of catalytic impact potential for the one-airport system alternative would largely be structured around the general advantages and disadvantages of rural "greenfield" airport sites.

Also, as discussed above, it is difficult to predict the catalytic impacts of airport construction due to the length of time over which such development would occur. Over such a lengthy time period, other factors, including population growth and natural urban sprawl, may lead to development in these broad search areas by 2020 or 2030. The fact that specific locations have not been identified further limits the scope of this analysis.

In general, the potential for economic growth and development around a completely new site would be greater than the corresponding catalytic development resulting from expansion of an existing site since undeveloped areas have more open space and fewer existing businesses, facts which usually suggest lower real estate prices. Airports at both search area 1 and search areas 2A, 2B, and 2C would be located in more rural areas than the existing three airports in eastern Virginia.

Search area 1, southeast of Richmond and southwest of Newport News, would be accessed by Route 460. Although Route 460 is not an interstate, it is anticipated that by 2030, additional traffic volume will require an additional lane in each direction, as noted in Section 11.6.1. Because of its southern location, search area 1 is not easily reached by existing rail service, nor is there immediate access to port facilities. However, depending on the actual site chosen, an airport in search area 1 could have some intermodal access through rail spurs and trucking via Route 460.

Search areas 2A, 2B, and 2C, located along a crescent south of Newport News and west and south of Norfolk, could be accessed via Route 460, I-264, or I-664, depending on its location. Such additional highway access could make these search areas attractive to new businesses, and some of these potential locations might allow for a port connection on the James River.

Although the search areas are relatively removed from current urban development, an airport in search area 2A, 2B, or 2C would be situated closer to the various urban centers in the eastern Virginia region, while search area 1 is closer than search areas 2A, 2B, or 2C to Richmond. Assuming that highway access to each site is adequate, as expected, neither airport would be particularly distant from urban centers. Both sites, therefore, might be attractive to new businesses in terms of distance from urban centers and land costs, as real estate costs would be lower than the cost of locating in the environs of an existing airport, around which some development has already occurred.

Evaluation of Economic Development Potential for Airport System Alternatives

This section evaluates the economic development potential associated with each of the airport system alternatives addressed in this study using the area-specific characteristics. It outlines the projected air service associated with each alternative and addresses the advantages and disadvantages of each potential location.

Projected service. The projected air service associated with each alternative is displayed in **Table 11.18**.

Table 11.18

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Projected Air Service in 2030

Alternative	Enplanements (in millions)		Domestic Markets		International Markets	
	Base Case	High Forecast	Base Case	High Forecast	Base Case	High Forecast
Single-Airport System	7.1	11.7	40	66	7	10
Two-Airport System - Richmond and Newport News/Williamsburg	8.8	11.4	31	50	5	7
Two-Airport System - Richmond and Search Area 2C	8.3	10.1	25	39	5	6
Three-Airport System	8.9	8.9	27	27	5	5

Source: IMG update of May 1995 Phase I Final Report, Table 10.7 and Table 11.9.

The three-airport system is projected to have 8.9 million enplanements and to serve 27 domestic markets and 5 international markets. The single-airport system is expected to generate between 7.1 million and 11.7 million enplanements and to serve from 50 to 66 domestic markets and 7 to 10 international markets. The two-airport system located at RIC and PHF would serve between 31 and 50 domestic markets and 5 to 7 international markets; it is anticipated to attract 8.8 million to 11.4 million enplanements. The two-airport system at RIC and search area 2C would create between 8.3 million and 10.1 million enplanements and serve from 25 to 39 domestic hubs and 5 to 6 international markets.

The single-airport system would be anticipated to attract fewer enplanements than the two-airport system alternatives under the Base Case scenario; however, it would generate the greatest number of enplanements under the high forecast. It would also serve more domestic and international markets. Of the other system alternatives, the RIC/PHF alternative is expected to generate more enplanements than the RIC/search area 2C alternative. All alternatives are anticipated to attract slightly fewer enplanements than the three-airport alternative under the Base Case scenario.

Advantages and Disadvantages. This subsection presents the potential advantages and disadvantages of each system alternative compared to the existing three-airport system alternative. The analysis outlines the relative advantages and disadvantages of one site as compared to another within the context of implementation in 2020 or later. This time frame renders concrete predictions difficult. Ranking of these alternatives depends on the needs and demands of individual businesses (e.g., priority given to site near airport serving high number of passengers versus site serving a large number of international destinations). The data are summarized in **Table 11.19**.

Table 11.19

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Catalytic Impacts(a)

Catalytic Impact Factors	Three-Airport System RIC, ORF, PHF	Single-Airport System Search Area 1	Two-Airport System RIC/PHF	Two-Airport System RIC/Search Area 2C
Proximity to Urban Cores	+	-	+	+
Access to Highway	+	+	+	+
Access to Rail and Water	+	=	+	=
No Major Geographic Constraints	-	+	-	=
Air Service	-	+	-	-
All Major Markets Served	+	-	+	+
Opportunity to Initiate Major Associated Industrial Park	=	+	=	+
Land Prices	-	+	-	+
Regulatory Environment	=	=	=	=
Tax Rates	=	=	=	=
Labor Rates	=	=	=	=
Net Positive Factors (b)	1	3	1	4

(a) "+" indicates that the alternative has an advantage with regard to economic development, while "-" indicates that the alternative is at a relative disadvantage. "=" indicates no relative advantage or disadvantage.
(b) Number of positive categories less number of negative categories.

Source: IMG and HNTB update of May 95 Phase I Final Report.

One-Airport System: Consolidated Service at Search Area 1

Advantages:

- Concentrated service at a single airport site for entire eastern Virginia may dramatically increase traffic through area, increasing number of potential customers, etc.

- New, large airport with service to domestic and international destinations may attract businesses with significant stake in extensive air service.

- Search area could accommodate a global industrial park.

- Rural site allows space for substantial development, with probable low land prices.

- Central location allows business to draw from multiple markets, reaching as far as Virginia Beach to the east and Richmond to the west.

- Expansion of State Route 460 would allow easy access to businesses in the airport environs, perhaps making this region more appealing to businesses with commuting employees. In addition, search area 1 has access to rail.

Disadvantages:

- Limited intermodal access might discourage businesses seeking comprehensive transportation network.

- Rural location south of major existing development might make employee commute problematic, thereby reducing the desire of businesses to locate in environs of airport.

- A single airport site for entire eastern Virginia might increase highway congestion.

Two-Airport System: Consolidated Service at Richmond and Newport News/ Williamsburg

Advantages:

- Consolidation of passenger demand at PHF would stimulate some additional air service.

- Sufficient space for a global industrial park around RIC.

- Dual sites result in reduced congestion around each site, as compared to the single-airport system, which might attract businesses interested in easy access.

- Potential for rail service at each site and between the two, further enhancing transportation opportunities for potential firms.

Disadvantages:

- Dual sites reduce the number of passengers at each site, thereby decreasing the number of potential customers to a new business.

- Both sites are already functioning and less rural, which may result in higher land prices.

- Neither airport would have as much passenger demand as a single airport serving the entire region, resulting in a decrease in the breadth of air service at each, which might discourage businesses for which this factor is significant.

- The existing PHF site is limited in the ability to accommodate a global industrial park.

Two-Airport System: Consolidated Service at Richmond and Search Area 2C

Advantages:

- Consolidation of demand at two sites would stimulate some additional air service.

- Both search area 2C and RIC could accommodate a global industrial park.

- Both RIC and search area 2C are surrounded by parcels of undeveloped land, which allows room for business development and suggests that real estate prices would not be prohibitive.

- Dual sites result in reduced congestion around each site, as compared to the single-airport system, which might attract businesses less interested in easy access.

- Search area 2C might provide the possibility of water transportation connection, while the RIC site could be linked to existing rail, producing combined network with intermodal capabilities.

- Distance between two sites is such that, in combination, they may attract the greatest portion of the entire business market—search area 2C draws east to Virginia Beach; RIC site draws west to Charlottesville, possibly north to Fredericksburg and southern DC metropolitan market.

Disadvantages:

- Dual sites reduce the number of passengers at each site, thereby decreasing the number of potential customers to a new business.

- Access to both sites is constrained for part of the Hampton Roads market north of the James River due to the need to cross the river; this constraint might limit employee choices for residence and commuting.

- New site at search area 2C may be less convenient due to highway access limitations, which might discourage business development.

11.8.3 Summary of Economic Impacts and Catalytic Impacts Analysis

The preceding sections analyze the economic and catalytic impacts of three proposed system alternatives.

Under the Base Case forecast, the single-airport system is estimated to generate less annual economic impact than the other system alternatives, but would generate the highest construction impact. Factors that would encourage development include highway access, lack of geographic constraints, a consolidated market, and favorable land prices. Lack of proximity to urban cores and access to all major markets are factors that would discourage catalytic development.

Consolidation of service at RIC and PHF is anticipated to provide more annual economic impact than the other system alternatives under the high forecast. Its economic impact is slightly less than the three-airport system under the Base Case scenario. Positive catalytic impacts include its proximity to urban cores, highway, rail and water access, and access to all major markets served. Negative catalytic impacts of this alternative include geographical constraints, lack of consolidated market, and potentially higher land prices.

The two-airport system located at RIC and search area 2C creates slightly less economic activity than that of the other system alternatives. It is also anticipated to create fewer jobs than those of the other alternatives. Net positive catalytic factors (the number of positive categories compared to the number of negative categories) are highest for this option. Positive factors include proximity to urban cores, highway access, access to major markets served, and land prices. The only major negative factor is the lack of consolidated market.

Again, it should be noted that many of the economic impacts associated with the new airport system alternatives are sensitive to the ultimate location of those airports, which will determine access to markets and services. Consequently, the economic analysis, especially as it relates to the new sites, should be considered to be "order of magnitude."

11.9 COMMUNITY DEVELOPMENT POTENTIAL

11.9.1 Crater Planning District Commission (PDC)

One-Airport System

Using the one-airport system search area, as depicted in Figure 10-7, the construction and annual operation of a new airport would mean positive economic impacts of a large magnitude for the Crater Planning District. The estimated year 2030 construction impact of $2.0 billion would be a very large economic stimulus within the Crater Planning District and points beyond. (The only development of a comparable level would be the construction of I-295 during the 1980s. The portion of this phased highway improvement from I-64 east of Richmond to I-95 south of Petersburg was completed during the 1980s at a cost of less than $400 million.) In addition, the projected annual economic impacts of a single-airport system in the amount of $4.7 billion would be a long-term economic development center, unlike any existing development in the region. The estimated 57,367 jobs to be created by the year 2030

would be approximately equal to the total present-day employment in the Tri-Cities Area by place of work.

In terms of physical impact, a suitable site should be able to be obtained with minimal, if any, local opposition. Existing comprehensive plans would need to be amended to accommodate large-scale development, and appropriate rezoning of large tracts of forest land would need to be made for more intense land uses. The availability of large tracts of undeveloped land east of the Route 460 Corridor offers a unique opportunity for this magnitude of development near the geographic center of eastern Virginia population base.

Additional infrastructure, such as water and sewer, would be developed to service a new airport facility and associated development. Local governments in the Crater Planning District have been advised of the possibility of the future location of a large regional airport facility in the general vicinity of the one-airport system search area for the past several years. Obviously, this alternative offers the highest service level option for residents and businesses located in the Crater Planning District. As mentioned earlier, amendments to existing community plans and polices would be made with the one-airport system. The one-airport concept has been well received among the local government membership of the Crater Planning District Commission.

Two-Airport System (RIC and PHF)

This alternative offers a future air service scenario similar to the three-airport system, with some enhanced service likely at the Richmond facility. Residents and businesses located in the Crater Planning District would economically benefit from this option because of likely improved connections in scheduled service. Service levels would probably gradually improve at Richmond. Over time, Richmond would likely increase its share of the air service travel activity originating in the Crater Planning District.

In terms of economic impacts, the location of the Richmond airport facility adjacent to the I-295 Corridor, and just 20 minutes north of the Tri-Cities Area, holds some potential for spill-over development, should significant future development occur south of the airport property. The potential for gradual improvement in service levels, especially in the availability of more direct flights to more major domestic markets, would positively impact air service users. This alternative would probably not create major economic impacts and would, therefore, be consistent with community plans and policies.

Two-Airport System (RIC and Search Area 2C)

Using the two-airport system search area C, the overall community impact on the Crater Planning District would be much less than the single-airport system alternative but probably greater than the Richmond and Newport News/Williamsburg two-airport system alternative. Physically, neither of these locations is within the Crater Planning District. The longer ground travel times associated with search area 2C as compared to Richmond would likely mean the majority of air service users originating in the Crater Planning District would continue to use Richmond because most of the populated jurisdictions are located in the northern portion of the District. Furthermore, commuting patterns for work trips are oriented much more heavily northward toward the Richmond portion of the metropolitan area than in all other directions. From an economic impact perspective, the development of a new

airport facility in search area 2C would create employment opportunities during the construction and operation of the facility. This alternative would probably have some impact and would be consistent with community plans and policies.

Three-Airport System

This alternative is a continuation of the present operation of existing airport facilities. None of these airport facilities are located within the Crater Planning District. Therefore, no environmental or physical impacts need to be considered from the Crater PDC perspective.

The resident population and businesses use these airport facilities on a regular basis. Also, Chesterfield County is a member of the Capital Region Airport Commission. No significant change in this current behavior pattern or in the frequency of use of these facilities is anticipated should the three-airport concept continue to the year 2030. However, the potential development of high-speed rail connections to northern Virginia and Charlotte before the year 2030 would likely attract a significant percentage of related air travel activity among the resident population and businesses. The airport facilities that offer higher service levels and enhancements would be more likely to command a greater share of the air services used by residents and businesses.

In addition, previous observations note that a three-airport system for eastern Virginia cannot be expected to include a hub for airline services as do some other service areas with comparable demographics. Therefore, this option would not offer optimal air service levels for the community from an economic impact viewpoint. However, this option would be considered to be consistent with existing community plans and policies.

11.9.2 Hampton Roads PDC

The purpose of identifying Community Development Potential is to estimate the community development impacts associated with each system.

As previously stated, the annual economic activity impacts in the year 2030 range from a low value of $4.7 billion to a high of $6.3 billion. It is reasonable to assume that the local governments in search areas A, B, and C, as well as those within a 5-mile radius of the Newport News/Williamsburg International Airport, are not prepared in their Comprehensive Plans, Zoning Ordinances, or Development Regulations to accommodate a facility with the potential economic impact defined in Section 11.8.

If not for the fact that the development anticipated in Section 11.8 includes a major airport, it would also be reasonable to assume that Comprehensive Plans, Zoning Ordinances, and Development Regulations would present no problems to any local government desiring to gain the potential income and jobs associated with the evaluation in Section 11.8.

Although not of the same magnitude, an announcement in Richmond that Colonial Williamsburg would sell 4,000 acres of land in the early 1970s to Anheuser Busch for a brewery, theme park, and residential development was a 180-degree change in development policy for the environs of Williamsburg. Plans were changed, and infrastructure planned for a 15- to 20-year time frame was immediately under development. A publicly-owned wastewater treatment facility was designed and constructed within 18 months, compared with the normal planning, design, and construction period of 8 to 9 years.

The acceptability of a facility with the impacts associated with Section 11.8 would be dependent upon the size of the benefits to the host community and the risks associated therewith.

As the more detailed financial and institutional analyses develop in the later Phase II tasks, local governments would be in a much better position to make the difficult planning decisions and changes required to realize the potential impacts to their community.

The maps in **Appendix E** show some of the more significant features that would also limit the development of a site within the Hampton Roads PDC search areas. Many of these limitations would produce significant reductions in the potential economic development impacts associated with the economic impact table in Section 11.8.

11.9.3 Richmond Regional PDC

One-Airport System

A summary of economic impacts implies that a one-airport system appears to have the least favorable economic impacts for the Richmond-Petersburg MSA. Construction costs could run to $2.5 billion, with the study showing little potential for this region recouping these costs. Estimates for annual economic, earnings, and job impacts are lowest for each category in this scenario. Average combined travel times are up to 19 minutes more for this scenario. In summary, while the potential for and increase in non-stop flights is considerable, off-setting costs from other facility requirements, capital, travel time, and economic losses to the study area, including the Richmond-Petersburg MSA, appear to be considerable.

Two-Airport Systems (RIC and PHF, RIC and Search Area 2)

According to the Henrico County *2010 Land Use Plan*, a substantial portion of the area around the airport is designated as being used for light, planned, or heavy industrial uses. The Plan includes a substantial portion of land for planned industry on the site that is now under construction for the White Oak semiconductor facility, a joint venture of Siemens and Motorola. This $1.5 billion investment in the Richmond-Petersburg MSA is projected to bring 1,500 jobs to within one mile of the existing RIC. In addition, the total development potential of the entire Elko Tract, of which the White Oak facility is only a small part, appears to be considerable. In addition, the Henrico County *2010 Major Thoroughfare Plan* specifically states that the area around the airport is "subject to change due to the Airport Master Plan." Therefore, it appears that the land use and thoroughfare plans allow for substantial development around the existing RIC.

Regarding transportation, RIC is located adjacent to two major interstate corridors. I-64, the only east-west interstate in the study area, is located within one mile of the airport property and has direct access. In fact, I-64 links RIC and PHF, providing faster travel between the two. The scheduled widening of I-64 to six lanes from a point just east of RIC to Newport News will further improve travel time in this corridor. This work will be complete well before 2030.

I-295, a 6- to 8-lane bypass that connects to I-95, the major north-south interstate along the east coast of the United States, is just east of the airport. I-895, linking the airport to northern Chesterfield County and the southern portion of the City of Richmond, should be constructed well before 2030.

These various interstates make RIC easily accessible from throughout the study area. The advantages of including RIC in any scenario are demonstrated by the fact that any scenario that includes RIC tends to create the highest output, ranging from originations to economic impacts.

RIC and PHF

This option has the potential for the highest annual economic activity, earnings, and jobs annual impacts on eastern Virginia and, therefore, for the Richmond-Petersburg MSA, with as much as $6.3 billion in annual economic activity, $1.9 billion in earnings, and 77,687 jobs in the 2030 forecast. In addition, it has the lowest construction costs of all the airport systems. Based on the economic input advantages of this system versus the costs, this appears to be the most advantageous for the central Virginia region as well as the whole study area.

RIC and Search Area 2

This option includes all of the obvious advantages of RIC. However, base construction cost estimates in the study exceed even the single-airport system. Furthermore, annual economic impacts, while exceeding the Base Case for the single-airport option, lag behind the RIC and PHF scenario, as well as the three-airport option.

Three-Airport System

The three-airport system offers many advantages, according to information presented in the study. Construction costs are substantially lower for this system than for any other option. Economic activity, earning, and jobs for the Base Case are, in all cases, greatest in the three-airport system. In addition, total passenger originations are greatest for the three-airport system and average combined travel times are lowest.

11.10 EVALUATION OF ALTERNATIVE SYSTEMS

The characteristics of the four alternatives were evaluated as follows:

- The technical performance of each with respect to a series of factors was summarized (see **Table 11.20**).

- The performance of each alternative with respect to each factor was rated on a scale of 0-5, with 0 indicating poor performance and 5 indicating good performance.

- The factors were weighted according to the importance of each, given the objectives of the project. Weights totaling 100 points were first assigned to each group of factors based upon the project objectives. The group assign-ment was then allocated to individual factors in each group based on relative importance, extent of double-counting, and ease with which potential problems (such as with airspace conflicts) could be resolved.

TABLE 11.20

2030 Factors Summary, Alternative Airport Systems

Eastern Virginia Airport System Study

	Three Airport System		**Single Airport System**		**Two Airport Systems**			
Factors	**RIC/ORF/PHF)**		**(Search Area 1)**		**(RIC/PHF)**		**(RIC/Search Area 2C)**	
	Basecase	High	Basecase	High	Basecase	High	Basecase	High
Air Service Provided								
Originations	8,186,000	8,186,000	6,397,000	7,172,000	7,984,000	8,194,000	7,484,000	7,603,000
Daily Departures	1,251	1,251	1,191	1,294	1,128	1,038	1,253	1,277
Domestic Non-Stop Jet Markets	27	27	40	66	30	46	27	39
International Non-Stop Jet Markets	5	5	7	10	5	7	5	6
Travel Time (E. Virginia Residents)								
Average ground time (minutes)	53.1		85.8		59.1		61.5	
Costs								
Capital Costs (Airport + Ground)	$380,136,000	$380,136,000	$942,880,000	$1,124,472,000	$558,630,000	$ 626,832,000	$999,186,000	$1,017,442,000
Annual Operating Costs (Full A/E Funding)	$85,366,000	$85,366,000	$67,906,000	$112,853,000	$83,755,000	$107,816,000	$85,366,000	$96,121,000
Operational Factors								
Avg. Delays (Min/Op)	1.8		< 0.5		1.5		1	
Airspace Conflicts (a)	none		none		none		minor	
Cost per Enplaned Passenger								
Cost Per Enplanement ($)	$ 7.37	$ 7.37	$11.08	$9.66	$ 8.09	$7.77	$ 10.19	$9.36
Flexibility								
Ability to respond to unanticipated change (b).	moderate		excellent		good		good	
Environmental Factors								
Aircraft Noise (a)	moderate		moderate		moderate		severe	
Wetlands (d)	severe		severe		severe		severe	
Air Quality (e)	moderate		moderate		moderate		moderate	
Water Quality (f)	minor		moderate		minor		severe	
Economic Impact (Airport Development)								
Construction Impact	$900,000,000	$900,000,000	$2,200,000,000	$2,600,000,000	$1,300,000,000	$1,400,000,000	$2,300,000,000	$2,300,000,000
Economic Activity Generated	$5,900,000,000	$5,900,000,000	$4,700,000,000	$6,000,000,000	$5,800,000,000	$6,300,000,000	$5,400,000,000	$5,700,000,000
Earnings	$1,700,000,000	$1,700,000,000	$1,500,000,000	$1,800,000,000	$1,800,000,000	$1,900,000,000	$1,700,000,000	$1,700,000,000
Redistribution of Airport Economic Activity (j)	none		severe		minor		moderate	
Jobs Created	72,181	72,181	57,367	73,741	71,712	77,687	67,297	69,997
Catalytic Development								
Land Availability, Associated with Industrial Park	moderate		excellent		poor		excellent	
Implementation Factors								
Institutional Complexity (i)	minor		severe		minor		severe	

(a) General assessment of level of conflict on a scale of "severe/moderate/minor/none."
(b) General assessment of ability to respond to major unanticipated changes in demand or to new technologies on a scale of "good/moderate/poor."
(c) General assessment of impacts given proximity of residential development to existing airport or potential new airport search area on a scale of "severe/moderate/minor/none."
(d) General assessment of potential for wetlands impact on a scale of "severe/moderate/minor/none."
(e) General assessment of potential for infringement of air quality standards on a scale of "severe/moderate/minor/none."
(f) General assessment of potential for water quality problems on a scale of "severe/moderate/minor/none."
(g) General assessment of availability of land at pre-airport prices for airport sponsored industrial/commercial development proceeds of which could offset construction costs of the airport, on a scale of "excellent/good/moderate/poor."
(h) General assessment of other factors affecting potential for catalytic development, as evaluated in Table 2.21, on a scale of "excellent/good/moderate/poor."
(i) General assessment of the institutional/political/administrative difficulty of implementing the alternative, on a scale of "severe/moderate/minor/none.
(j) General Assessment of the redistribution of economic activity around the existing airports, on a scale of "severe, moderate, minor, none."

Source: HNTB

The rating for each factor was then multiplied by the assigned weight for that factor to yield a score for the factor for each alternative. The weighting was modified based on discussion with the **Technical Advisory Committee**. **(Study Participants)**

- The sum of the scores for individual factors represents the overall perform-ance for each alternative relative to other alternatives. **Table 11.21** presents the evaluation matrix for the 2030 base forecast and high forecast.

The results shown in Table 11.21 indicate that in the short term, the two- and three-airport systems are similar in terms of overall costs and benefits, with the one-airport system being the less favorable. However, in the long term, when the high forecast scenario becomes more likely, the one-airport system could provide the highest overall benefits. The **Policy Advisory Committee (Study Participants)** weighed the importance of the short-term and long-term goals and opportunities of the study in order to decide which alternative is the best airport system for eastern Virginia.

11.11 SELECT PREFERRED AIRPORT SYSTEM

Chapter 11 of EVASS called for the selection of a preferred airport system by the EVASS Policy Advisory Committee (PAC) after careful review of various factors relating to the three alternative airport systems. The systems analyzed under this task included (a) a one-airport system that involved a new airport located between Richmond and Newport News, (B) a two-airport system that involved Richmond International Airport (RIC) and either Newport News/Williamsburg International Airport (PHF) or a new airport located south of the James Rivers, and (c) a three-airport system involving the continued expansion of RIC, PHF, and ORF. Figure 10-7 depicts the three airport systems in question. Several items were used to evaluate and compare the three systems, including, but not limited to, operational factors, total travel times, level of service factors, and economic impacts. Based on the evaluation criteria, the PAC reached a decision to continue the EVASS effort by evaluating the two-airport system that would include both RIC and a new regional airport, as well as RIC and PHF. The decision to include RIC and PHF in future tasks of the study was reached by the PAC in order to provide a comparison of the impacts, both positive and negative, of a new airport versus an existing facility.

TABLE 11.21
2030 High Forecast Evaluation Matrix, Alternative Airport Systems
Eastern Virginia Airport System Study

					Three Airport System		Single Airport System		Two Airport Systems			
Rating Score		Units	Factors	Weight	RIC/ORF/PHF)		(Search Area 1)		(RIC/PHF)		(RIC/Search Area 2C)	
Low	High				Rating	Score	Rating	Score	Rating	Score	Rating	Score
0.0	5.0		**Air Service Provided**	**21**								
6	10	Millions	Originations	4	2.8	11.0	1.5	6.0	2.9	11.5	2.1	8.5
100	550		Daily Departures	3	4.2	12.7	4.2	12.7	4.6	13.8	4.1	12.3
20	70		Domestic Non-Stop Jet Markets	7	0.7	4.9	4.6	32.2	3.0	21.0	1.9	13.3
1	10		International Non-Stop Jet Markets	7	2.2	15.6	5.0	35.0	3.3	23.3	2.8	19.4
			Travel Time (E. Virginia Residents)	**7**								
120	20	Minutes	Average ground time	7	4.6	31.9	2.6	17.9	4.1	28.7	3.7	25.9
			Costs	**6**								
$3.0	$1.0	Billions	Capital Costs (Airport + Roadways)	4	3.3	13.0	0.1	0.5	3.9	15.5	0.5	2.0
$120	$60	Millions	Annual Operating Costs (Full A/E Funding)	2	2.9	5.8	0.6	1.2	0.9	1.8	1.9	3.8
			Operational Factors	**7**								
4	0	Minutes	Avg. Delays (Min/Op)	6	2.8	16.5	4.4	26.3	3.1	18.8	3.8	22.5
Severe	None		Airspace Conflicts (a)	1	5	5	5	5	5	5	4.5	4.5
			Cost per Enplaned Passenger	**15**								
$40	$2		Airline Cost Per Enplanement ($)	15	3.4	50.7	2.2	33.4	3.6	54.2	1.9	29.2
			Flexibility	**3**								
Poor	Excel.		Ability to respond to unanticipated change (b).	3	3.0	9	5	15	4	12	4.5	13.5
			Environmental Factors	**6**								
Severe	None		Aircraft Noise (c)	2	2	4	2	4	2	4	0	0
Severe	None		Wetlands (d)	2	1	2	0.5	1	1	2	0	0
Severe	None		Air Quality (e)	1	2	2	2	2	2	2	2	2
Severe	None		Water Quality (f)	1	4	4	2	2	4	4	0	0
			Economic Impact (Airport Development)	**12**								
3	7	Billions	Construction Impact	4	1.0	4.0	4.9	19.5	0.4	1.5	4.4	17.5
4	7	Billions	Economic Activity Generated	4	3.2	12.7	3.3	13.3	4.0	16.0	3.0	12.0
1	2	Billions	Earnings	1	3.5	3.5	4.0	4.0	4.5	4.5	3.5	3.5
Severe	None		Redistribution of Airport Economic Activity	2	5	10	1	2	3	6	2	4
50	80	Thous.	Jobs Created	1	3.7	3.7	4.0	4.0	4.8	4.8	3.5	3.5
			Catalytic Development	**20**								
Poor	Excel.		Land Availability, Associated with Industrial Park	10	3	30	5	50	3	30	5	50
No. of "+" Eval. factors			Other Development Factors(h)	10	1	10	3	30	1	10	4	40
			Implementation Factors	**3**								
Severe	None		Institutional Complexity (i)	3	4	12	1	3	3	9	2	6
TOTAL SCORE				100		274		320		299		293

(a) General assessment of level of conflict on a scale of "severe/moderate/minor/none."
(b) General assessment of ability to respond to major unanticipated changes in demand or to new technologies on a scale of "good/moderate/poor."
(c) General assessment of impacts given proximity of residential development to existing airport or potential new airport search area on a scale of "severe/moderate/minor/none."
(d) General assessment of potential for wetlands impact on a scale of "severe/moderate/minor/none."
(e) General assessment of potential for infringement of air quality standards on a scale of "severe/moderate/minor/none."
(f) General assessment of potential for water quality problems on a scale of "severe/moderate/minor/none."
(g) General assessment of availability of land at pre-airport prices for airport sponsored industrial/commercial development proceeds of which could offset construction costs of the airport, on a scale of "excellent/good/moderate/poor."
(h) General assessment of other factors affecting potential for catalytic development, as evaluated in Table 2.21, on a scale of "excellent/good/ moderate/poor."
(i) General assessment of the institutional/political/administrative difficulty of implementing the alternative, on a scale of "severe/moderate/minor/none.
(j) General Assessment of the redistribution of economic activity around the existing airports, on a scale of "severe, moderate, minor, none."
Note: Rating = (factor-low range)/(high range-low range)*5

Souce: HNTB

Chapter Twelve
IDENTIFY ALTERNATIVE SEARCH AREAS FOR SELECTED REGIONAL AIRPORT SYSTEM

12.1 INTRODUCTION

The purpose of this task was to collect additional data on the preferred airport system study and update and refine data previously collected in Phase I (EVASP). The data collected under this task were used to provide the information necessary to support decisions in later tasks regarding the comparative economic, financial, and environmental feasibility of the development of a regional airport in alternative search areas. Subsequently, this information was used to identify the alternative search areas for a new regional airport.

Data collected under this task include natural environmental factors, utility systems, historic structures, schools and churches, highway access, planned development and land use patterns, travel times, and airspace obstructions. This information was used to evaluate the search areas and to quantify the effects of a new regional airport within each area.

IDENTIFICATION OF TASK 12 STUDY AREA

Based on the results and direction of Chapter 11, members of the EVASS team identified a refined study area for the two-airport seach area located south of the James River in eastern Virginia, as shown in **Figure 12-1**. This area was chosen based on input received from the Hampton Roads Planning District Commission (HRPDC) and the Crater Planning District Commission (CPDC). Search areas A and B of the two-airport search area were excluded from further consideration due to development currently underway in these areas or other natural and manmade constraints.

Figure 12-2 presents the new airport in a two-airport system study area located in the Counties of Surry, Sussex, Isle of Wight, Southampton, and the City of Suffolk, centered on U.S. Route 460 and extending out ten miles on each side of this road. Route 460 was determined to be the optimal access route to a new airport due to its orientation between Richmond and Suffolk and its planned upgrade to interstate standards. This area consists of mostly undeveloped land in eastern Virginia, but encompasses several small cities and farmland.

12.2 UPDATE GEOGRAPHIC INFORMATION SYSTEM DATABASE

In an effort to obtain the most current data available within the study area, the study team obtained updated information from local jurisdictions and Planning District Commissions (PDCs) for use in the Geographic Information System (GIS) database. Data obtained from these sources included the following:

- Historic properties.

Alternative Airport Systems

New Airport Search Areas
Urbanized Area
County Boundary

FIGURE 12-1

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

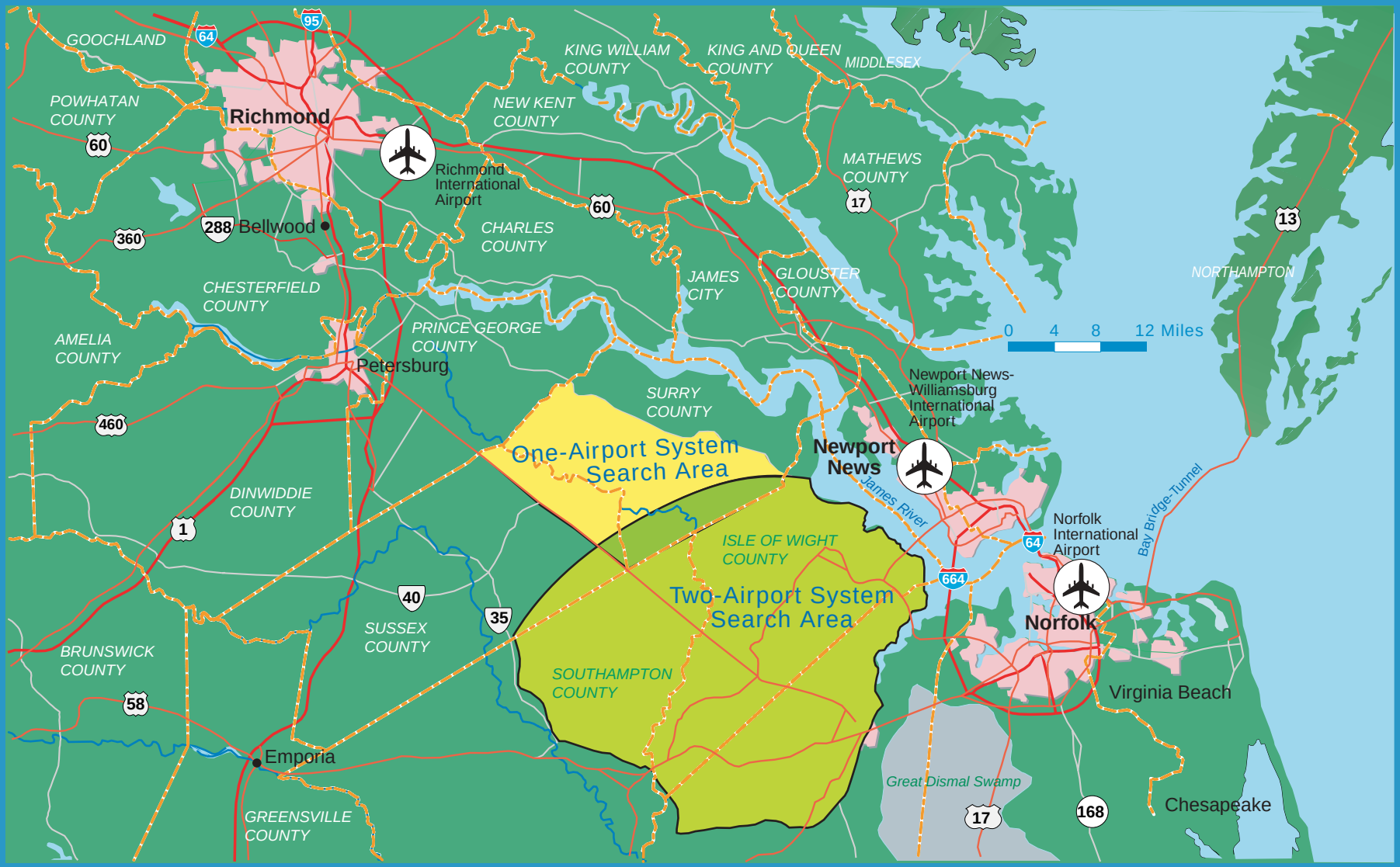
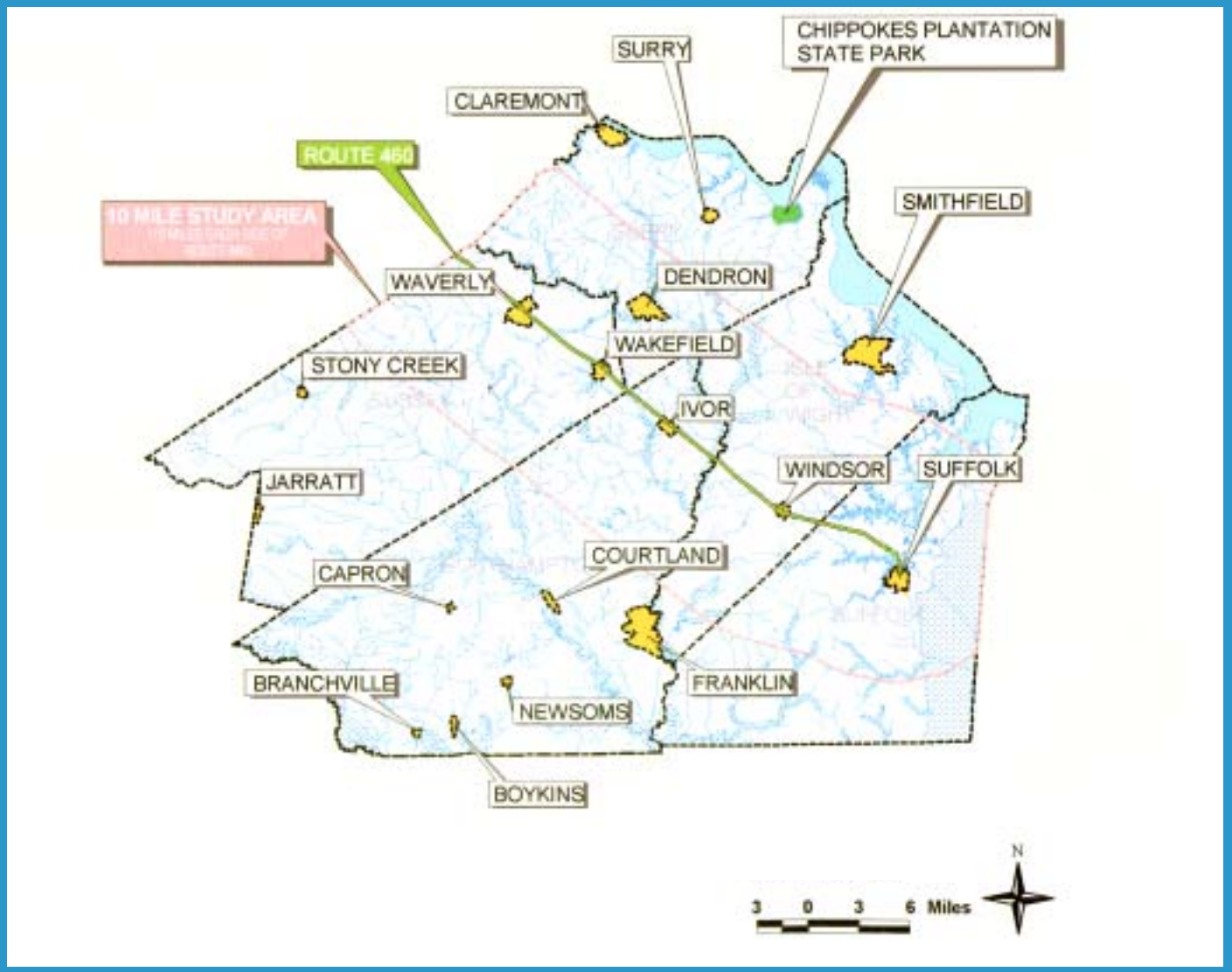


FIGURE 12-2


LEGEND
SURRY
CHIPPOKES PLANTATION STATE PARK
CLAREMONT
ROUTE 460
10 MILE STUDY AREA
SMITHFIELD
WAVERLY
DENDRON
WAKEFIELD
STONY CREEK
IVOR
WINDSOR
SUFFOLK
JARRATT
COURTLAND
CAPRON
BRANCHVILLE
FRANKLIN
NEWSOMS
BOYKINS
3 0 3 6 Miles
N

- Churches/places of worship.
- Major roadways.
- Schools.
- Generalized existing and future land use and land cover.
- Utility lines.
- Railroads.
- National wetlands inventory.
- Generalized Chesapeake Bay Resource Management Area boundaries.
- Water bodies.
- FAA registered height obstructions.
- Census block data.

This information was imported and analyzed using ArcView software to assess the potential impacts of each set of data on the study area. **Figures 12-3 through 12-17** present the data overlaid on a base map of the study area. This information was reviewed by the EVASS study team for accuracy, and subsequently accepted as credible information that should be utilized in the remaining tasks of the study.

12.3 IDENTIFICATION OF POTENTIAL SEARCH AREAS

Fourteen individual search areas, each consisting of a 5-mile by 5-mile square, were identified within the entire study area, using the information contained within the GIS database. Areas were chosen based on the following criteria:

- Minimize impacts on historic sites/cemeteries.
- Minimize impacts to schools and churches.
- Maximize highway/railway access and minimize relocations.
- Assess environmental justice per National Environmental Policy Act (NEPA) standards.
- Maximize utility connections and minimize utility relocations.
- Minimize environmental impacts.
- Minimize total travel times and maximize level of service.

The GIS was used to perform a cursory overview of the entire study area, and placed the 5-mile by 5-mile squares in the optimal locations, evaluating such items as access to existing infrastructure while avoiding potential areas of conflict, such as schools, churches, and wetlands.

In addition to the greenfield area, the existing Newport News/Williamsburg International Airport (PHF) was evaluated using the same criteria in order to assess the potential of the RIC/PHF alternative.

The greenfield sites and the existing PHF site identified under this task are evaluated in detail in Chapter 13. The data have been compiled and included in **Appendix F** for use as part of a future site selection study.

ONE MILE SCORING GRID

FIGURE 12-3

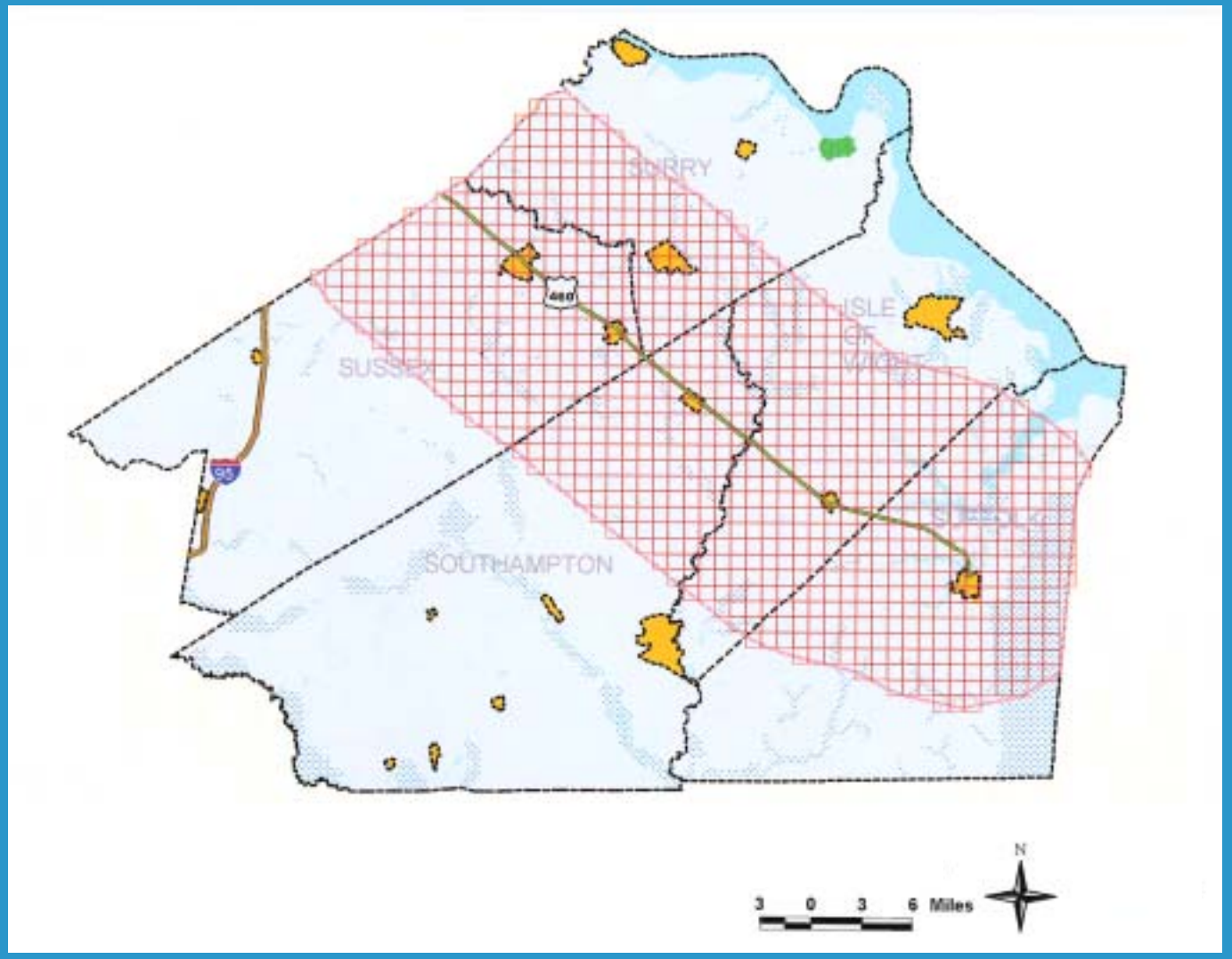


FIGURE 12-4

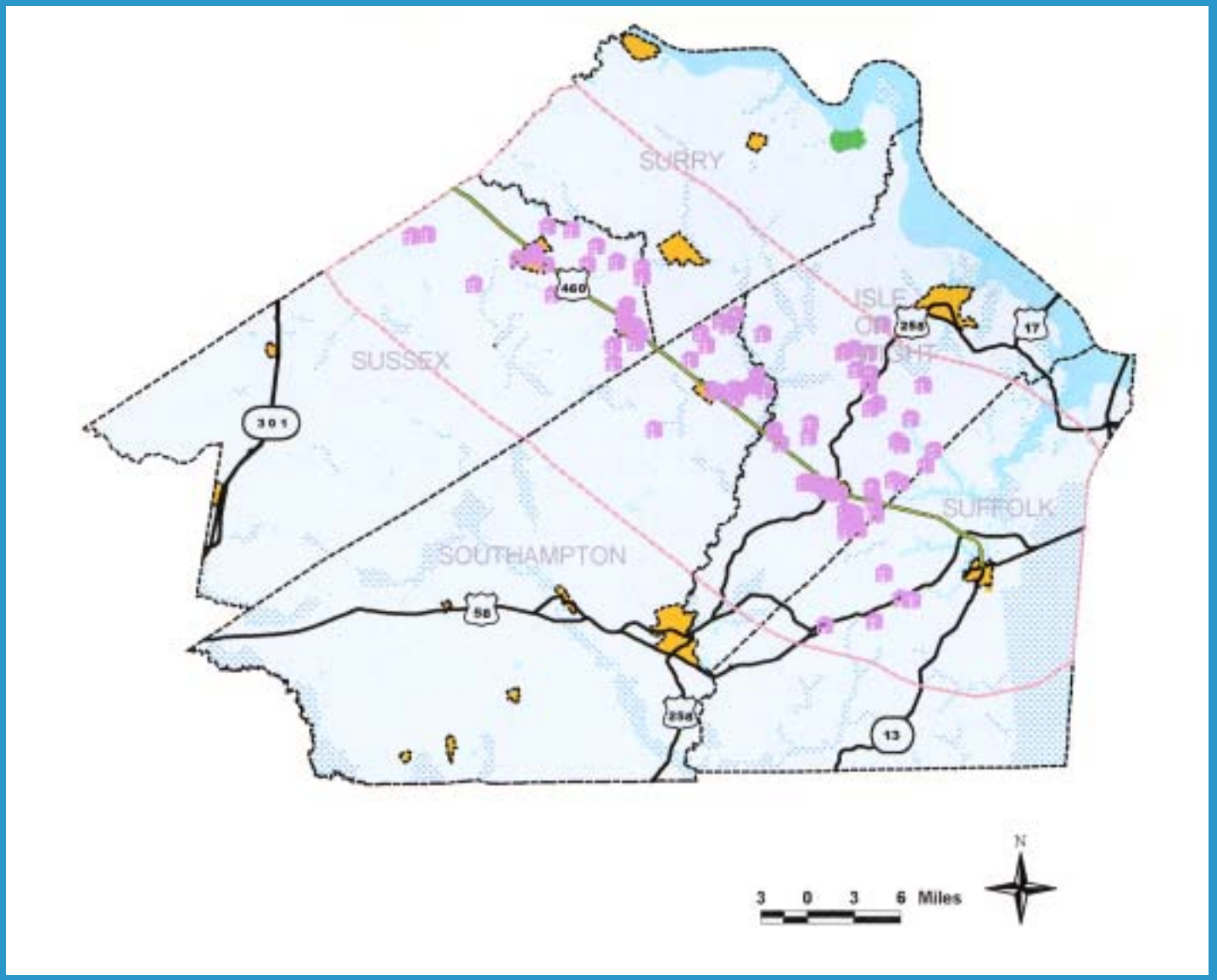

LEGEND
Political Area Boundaries
Water Bodies
SURRY
SUSSEX
SOUTHAMPTON
SUFFOLK
460
301
58
258
13
17
3 0 3 6 Miles
N

FIGURE 12-5

LEGEND
Church
Jurisdictional Boundaries
Political Area Boundaries
Water Bodies

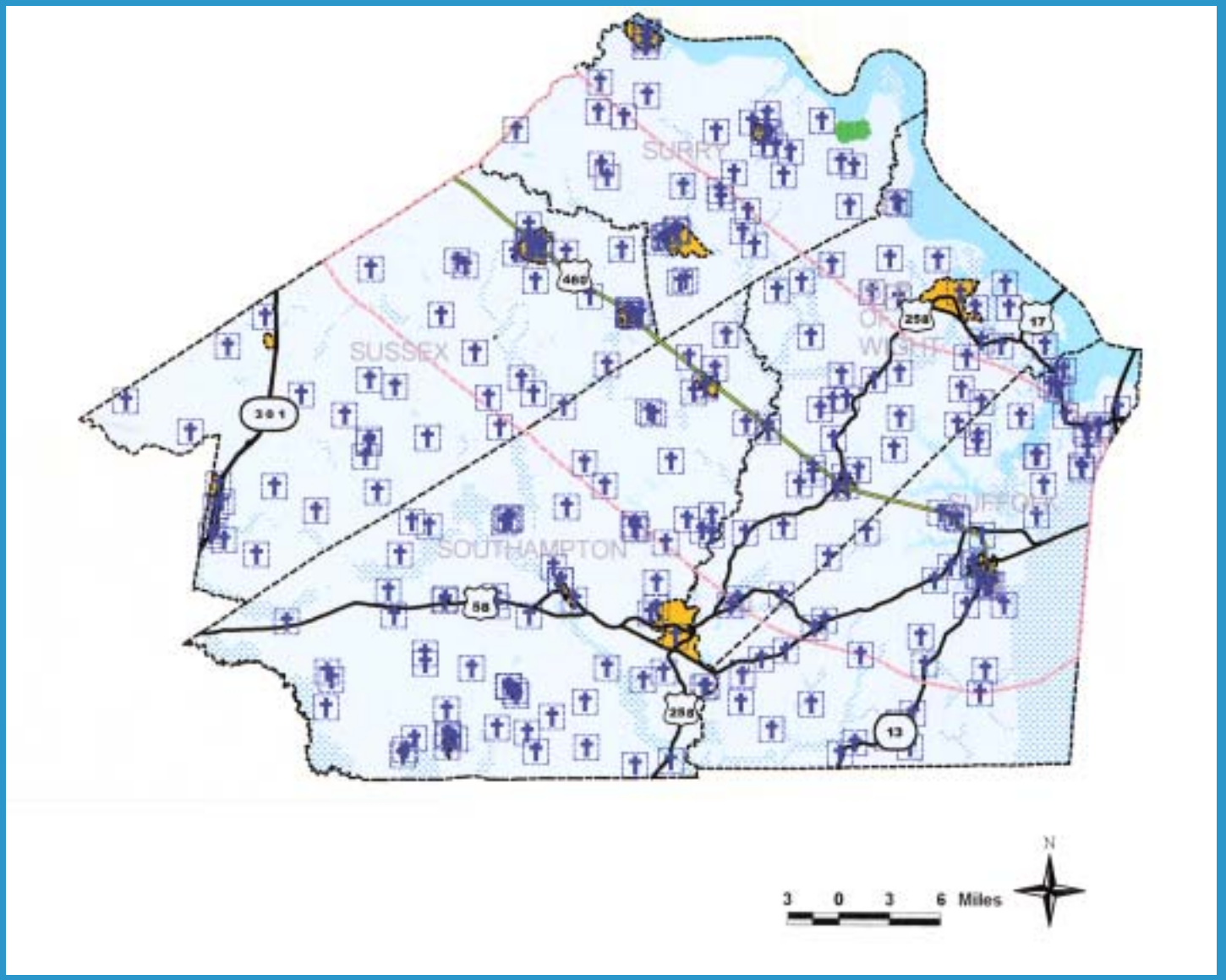

SURRY
SUSSEX
SOUTHAMPTON
460
258
17
301
58
13
3 0 3 6 Miles
N

FIGURE 12-6

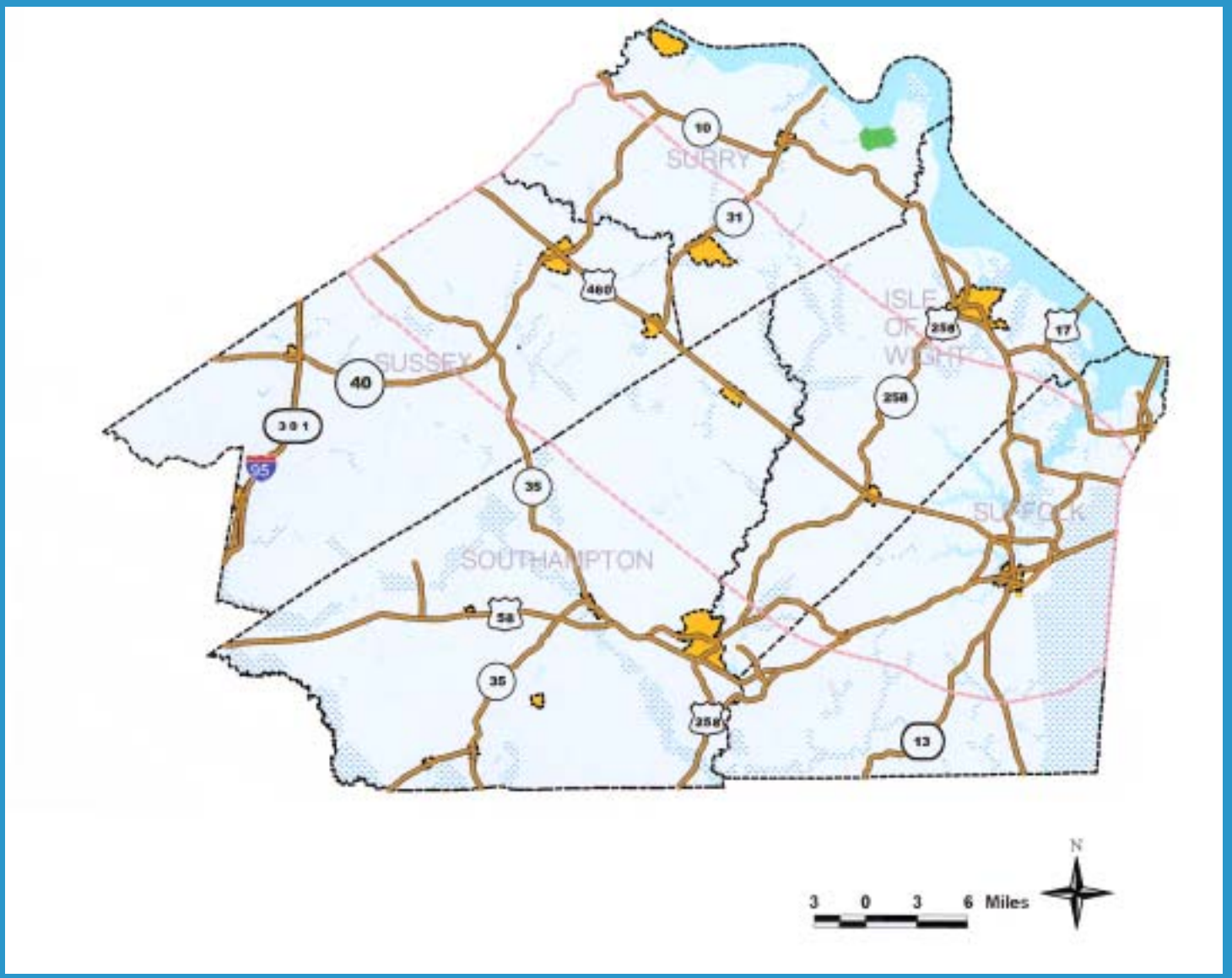
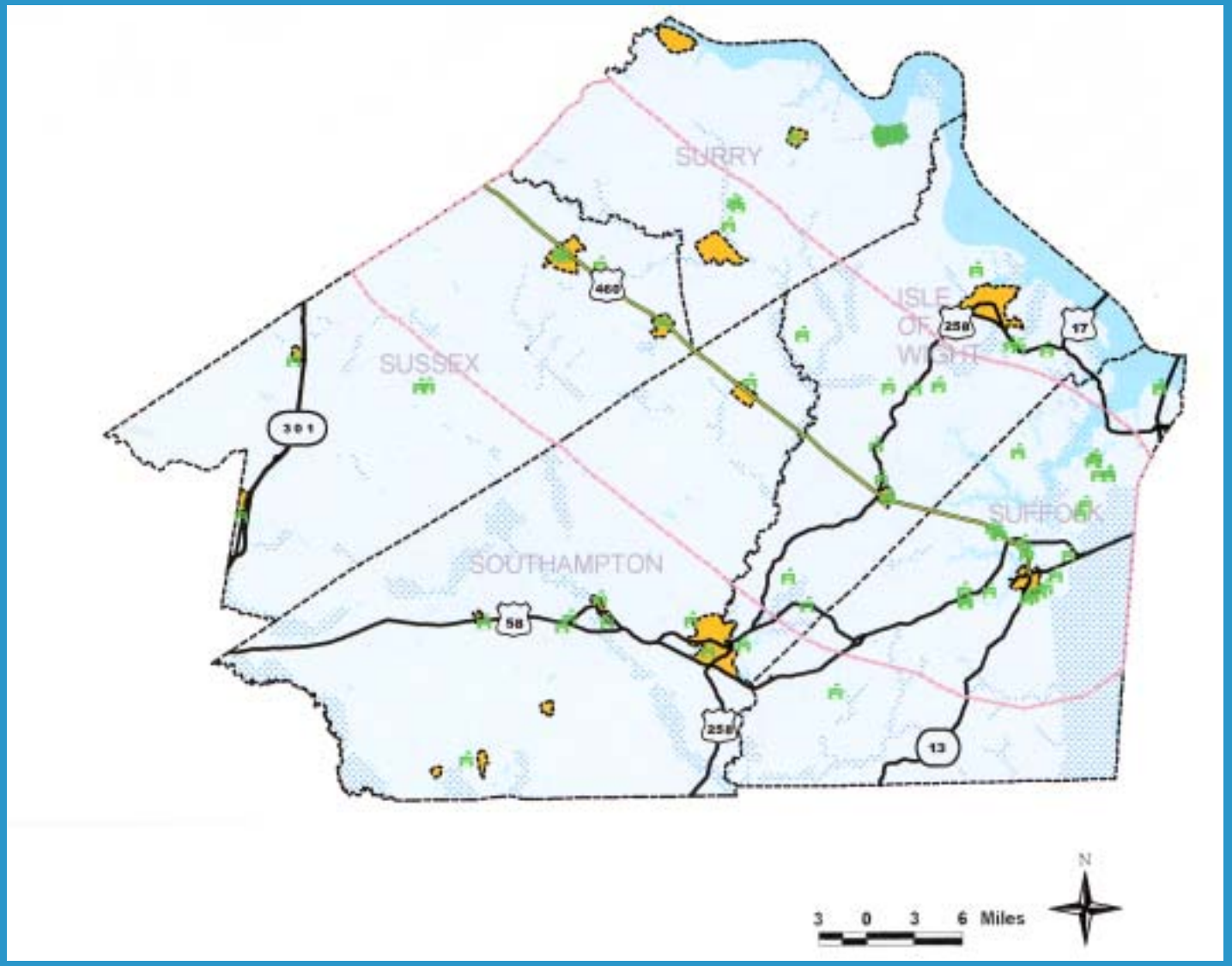
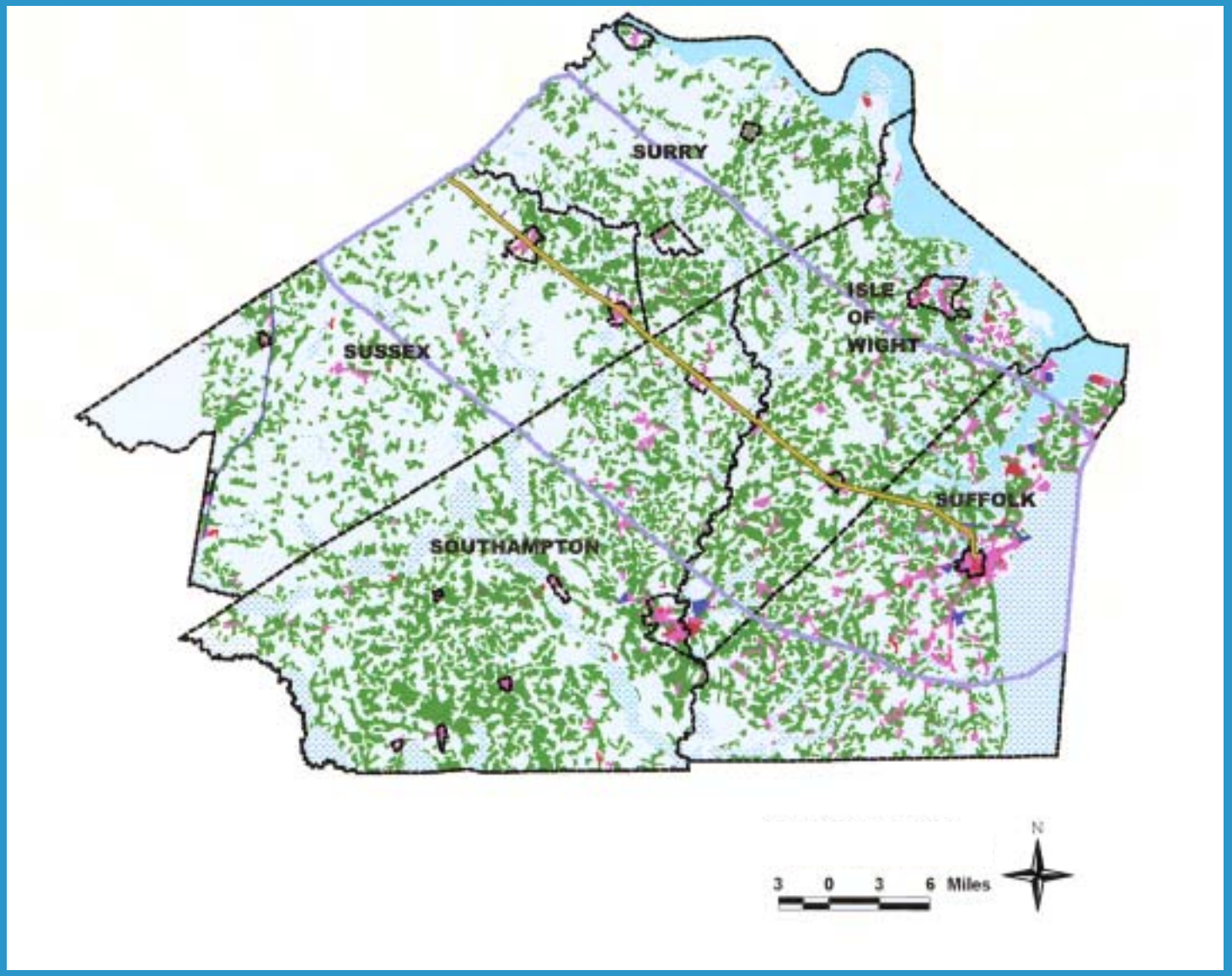

LEGEND
Jurisdictional Boundaries
Political Area Boundaries
Water Bodies
SURRY
SUSSEX
ISLE OF WIGHT
SUFFOLK
SOUTHAMPTON
10
31
460
258
17
40
301
95
35
58
13
3 0 3 6 Miles
N

FIGURE 12-7


LEGEND
SURRY
SUSSEX
ISLE OF WIGHT
SUFFOLK
SOUTHAMPTON
460
258
17
301
58
13
N
3 0 3 6 Miles

GENERALIZED EXISTING
LAND USE LAND COVER

FIGURE 12-8



GENERALIZED FUTURE LAND USES

FIGURE 12-9

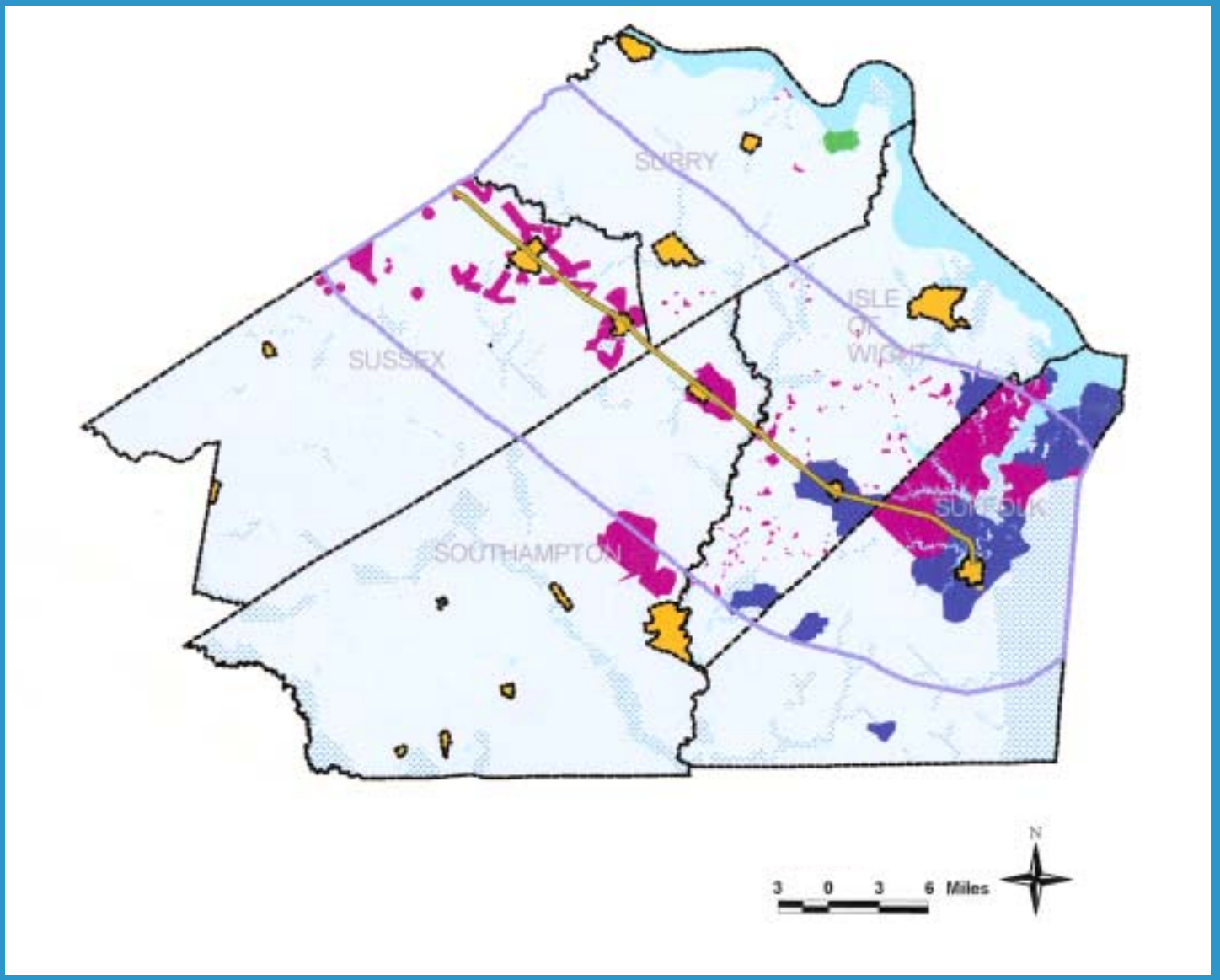


FIGURE 12-10

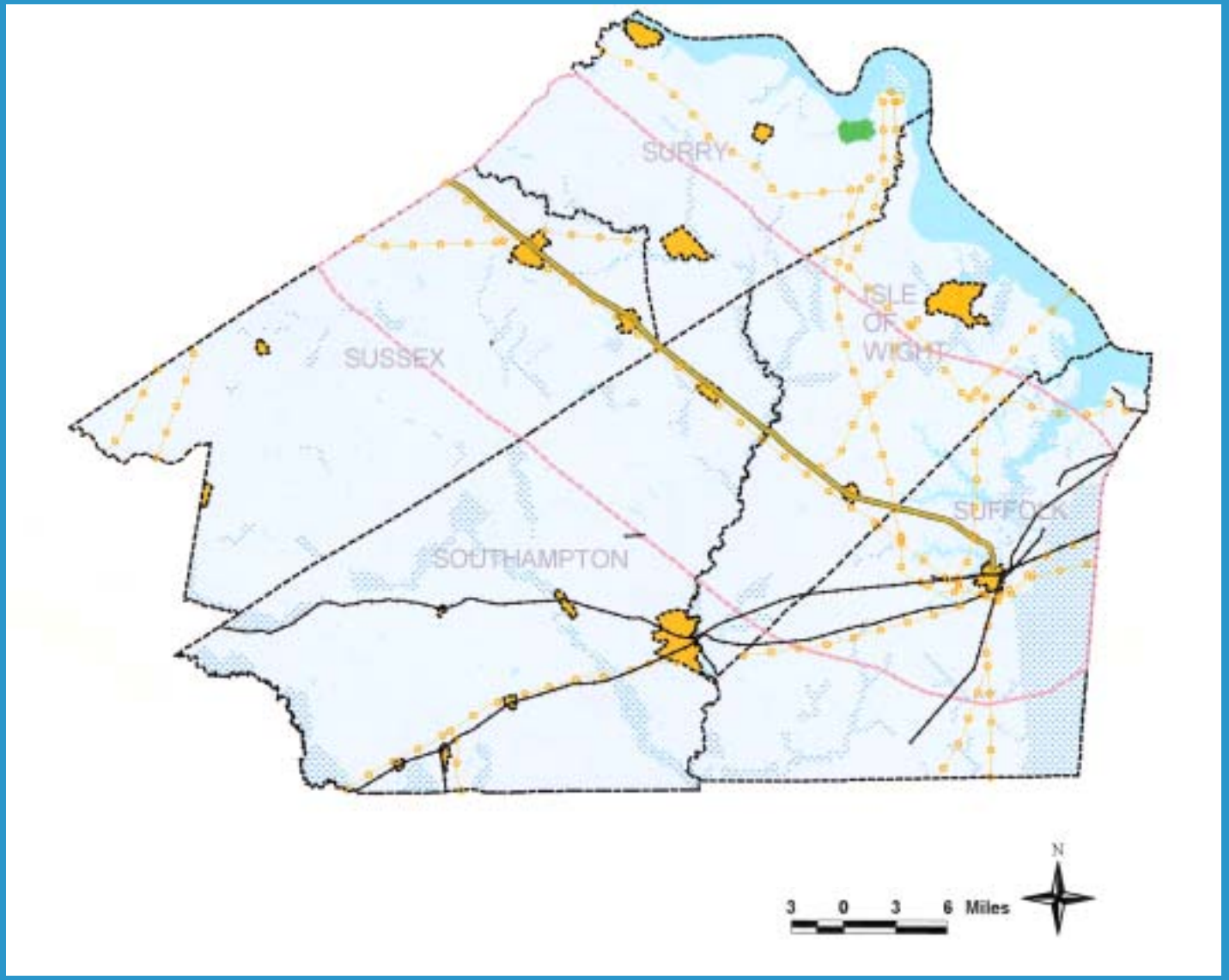
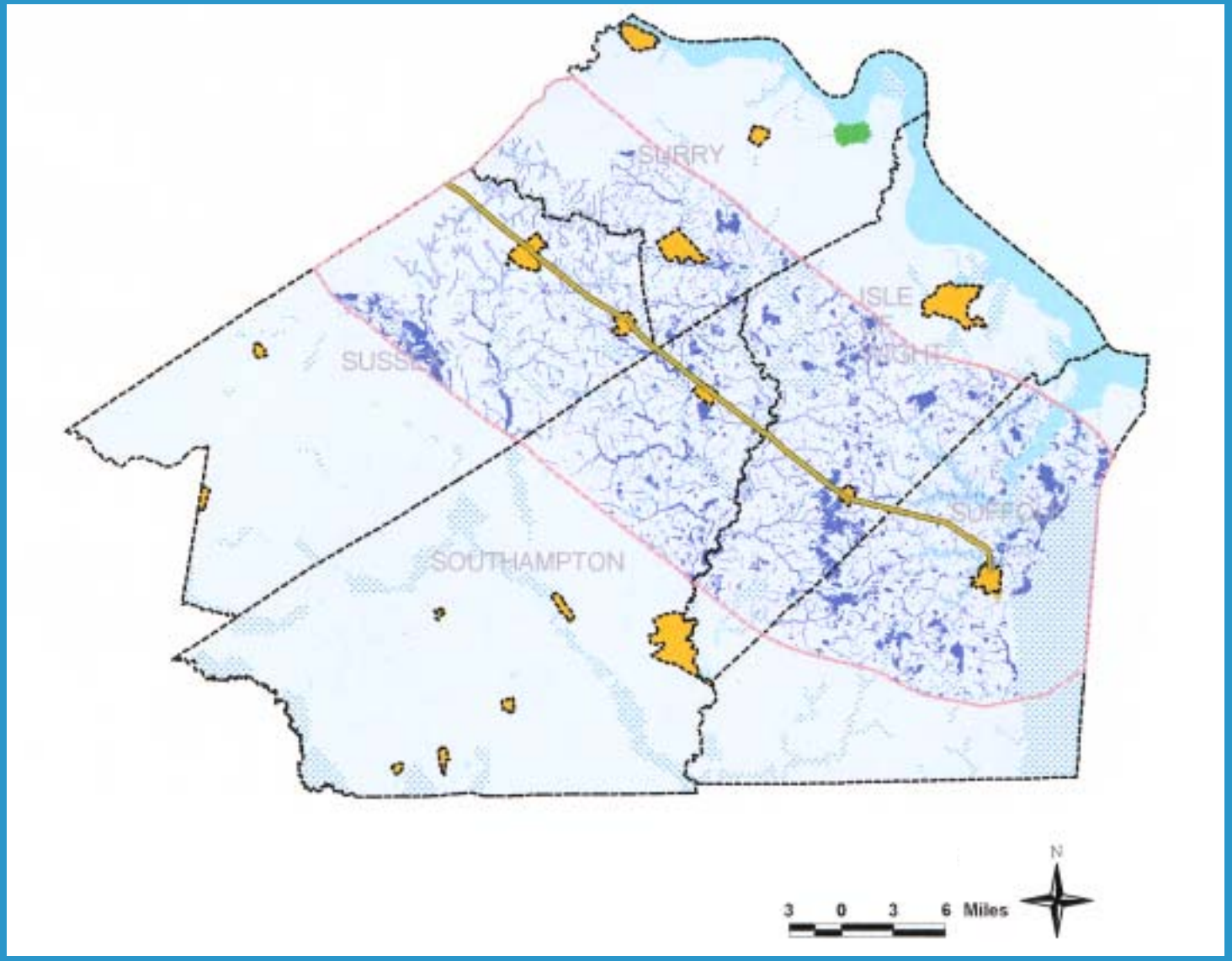
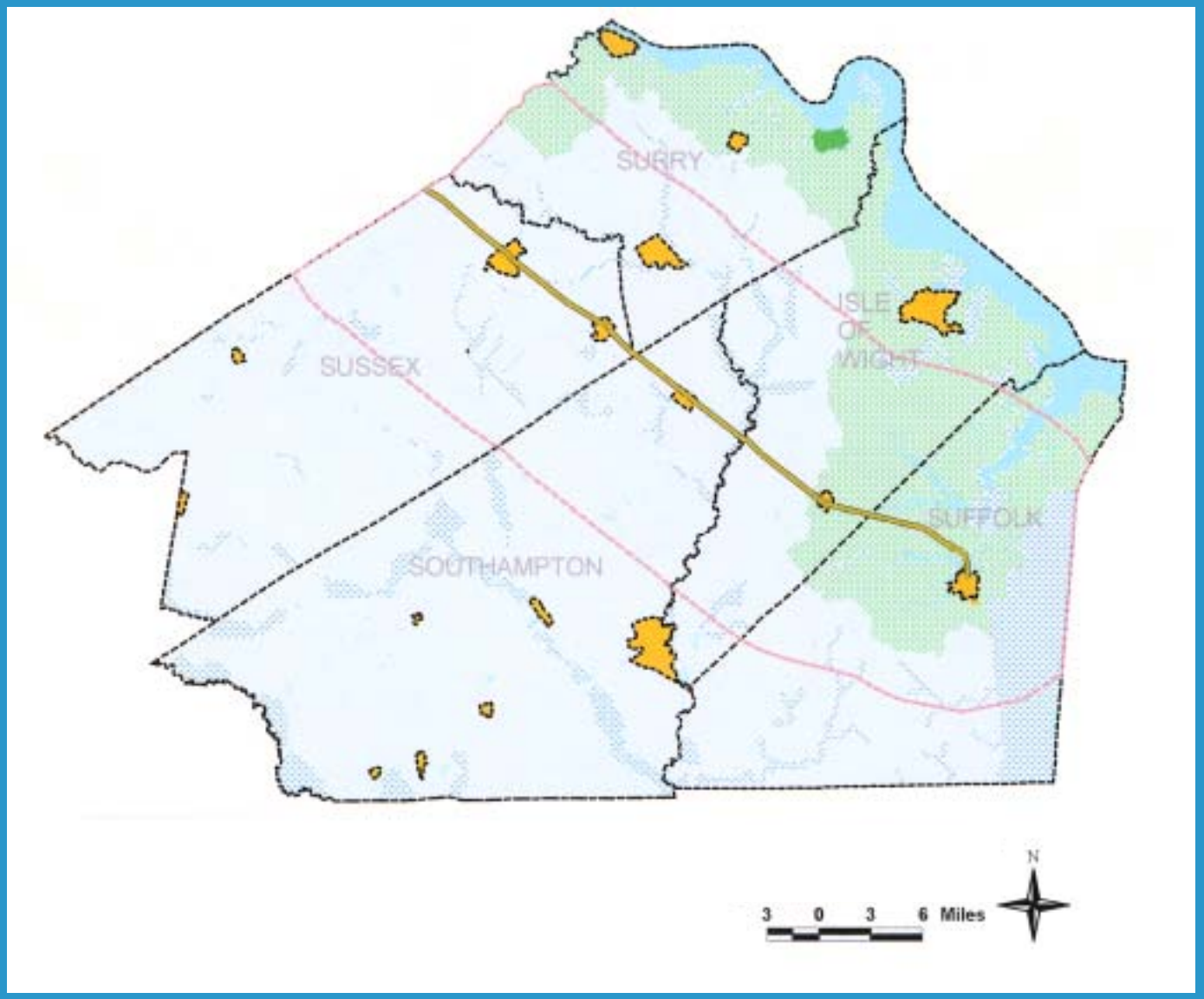

LEGEND
SURRY
SUSSEX
ISLE OF WIGHT
SUFFOLK
SOUTHAMPTON
3 0 3 6 Miles
N

FIGURE 12-11



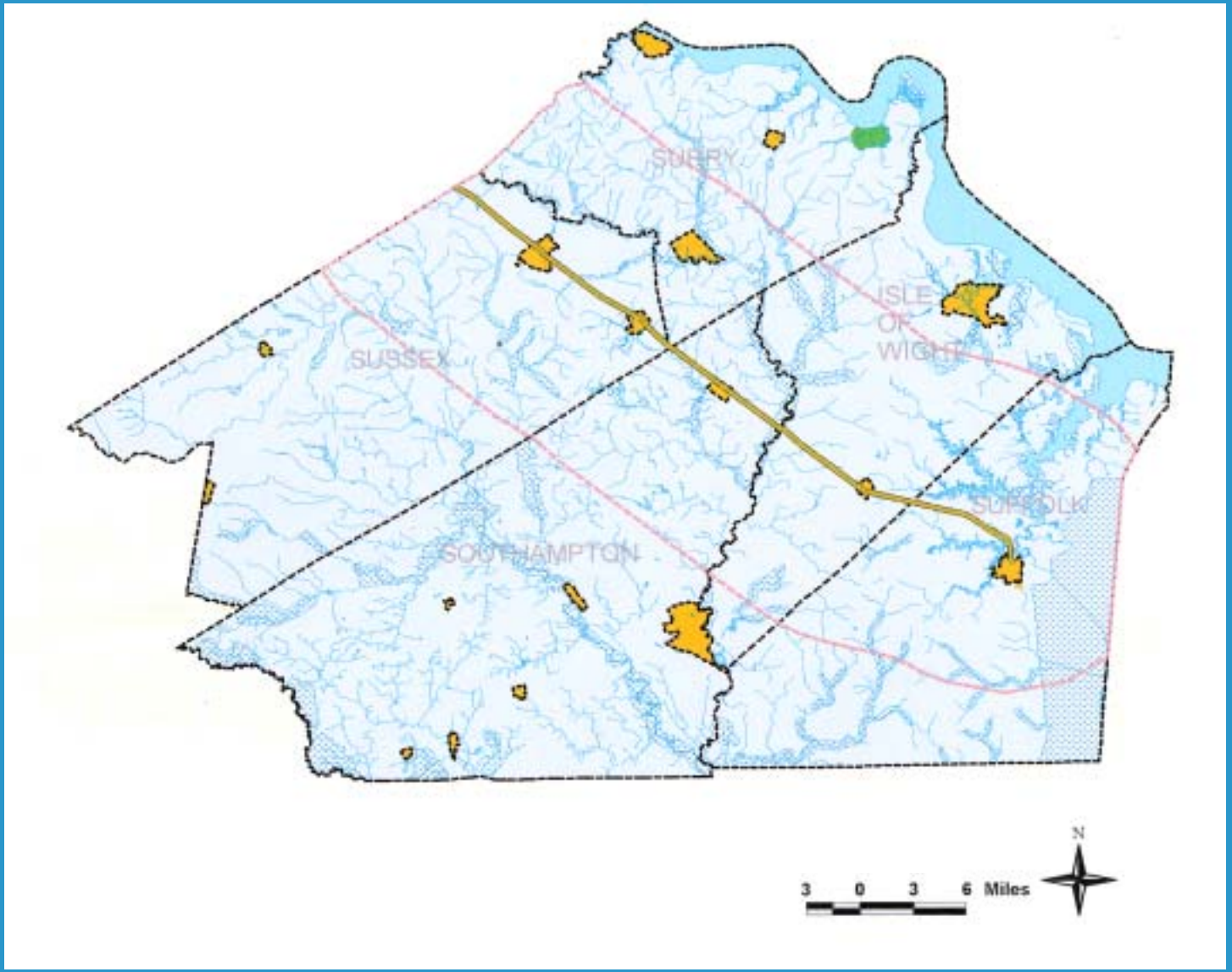
GENERALIZED CHESAPEAKE BAY RESOURCE MANAGEMENT AREA BOUNDARIES

FIGURE 12-12



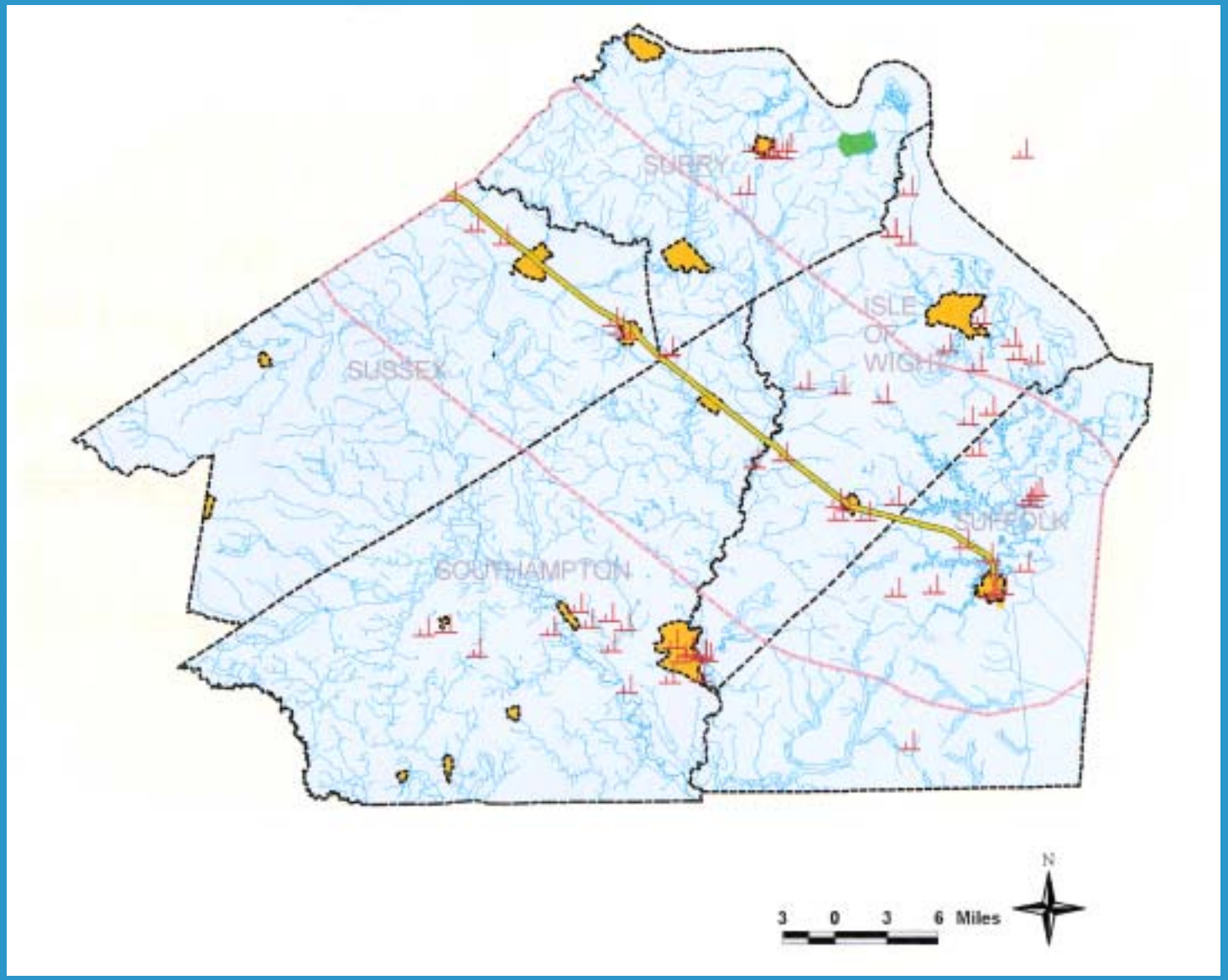
WATER BODIES

FIGURE 12-13



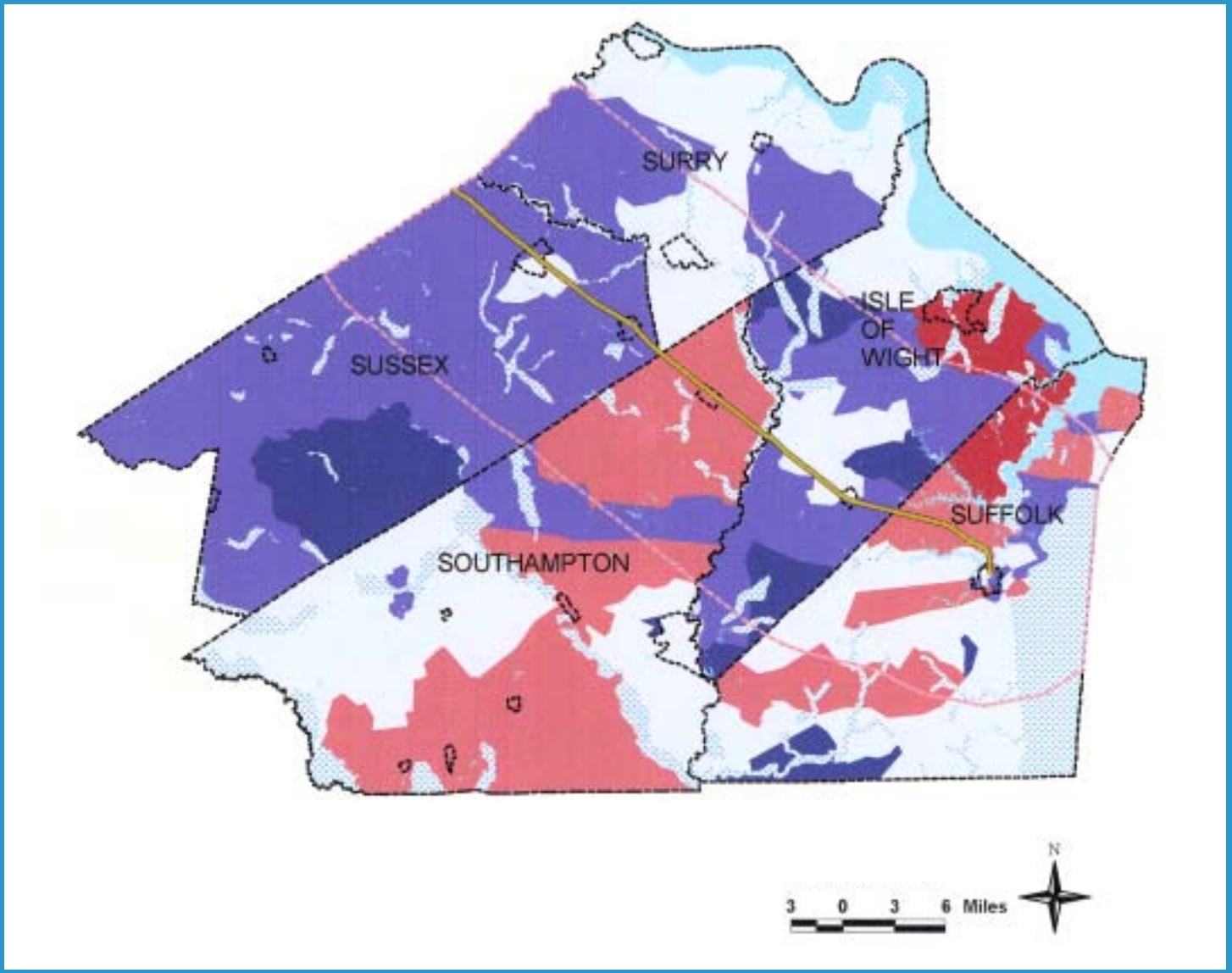
FAA REGISTERED HEIGHT OBSTRUCTIONS

FIGURE 12-14



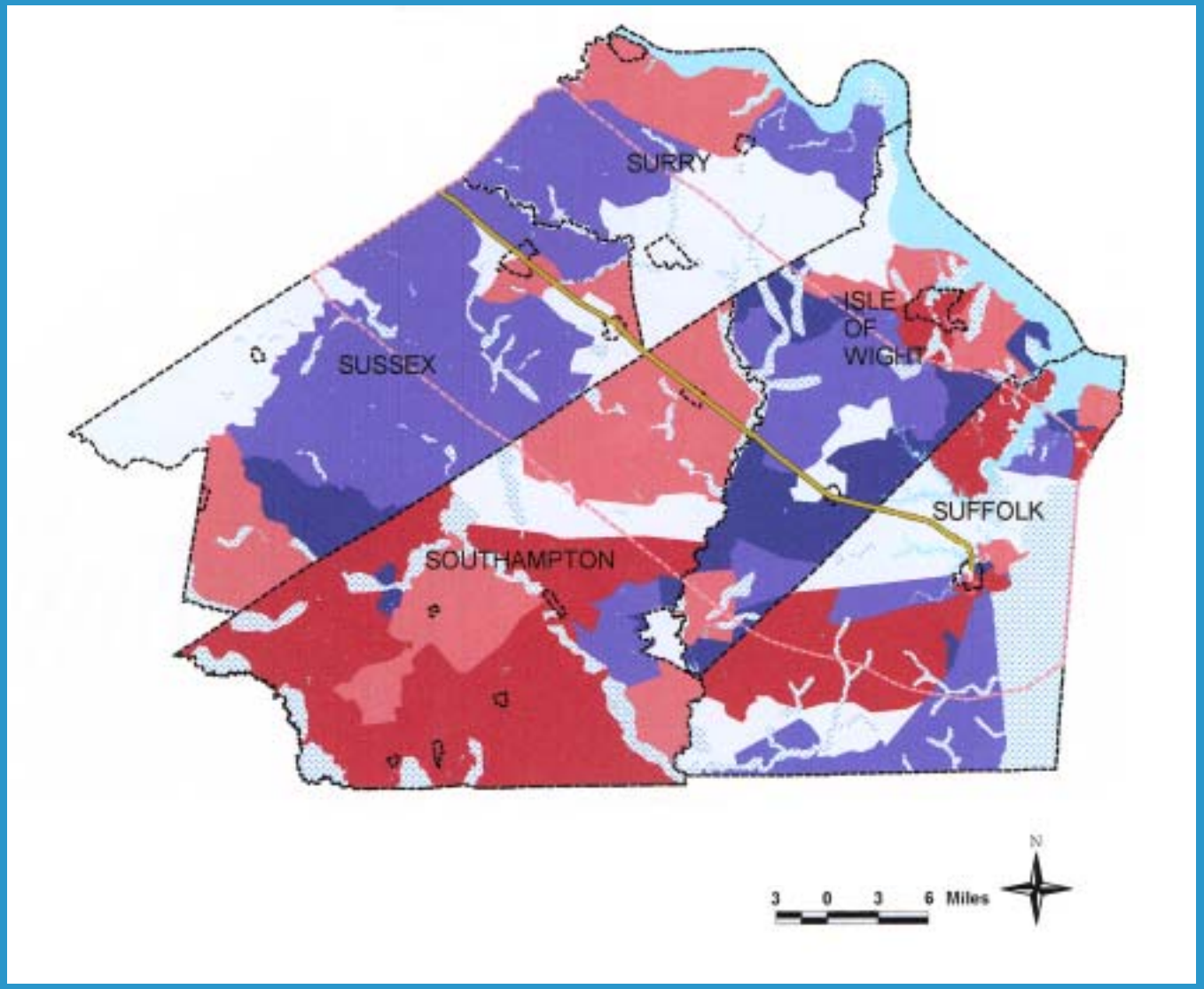
CENSUS BLOCKS: TOTAL POPULATION

FIGURE 12-15



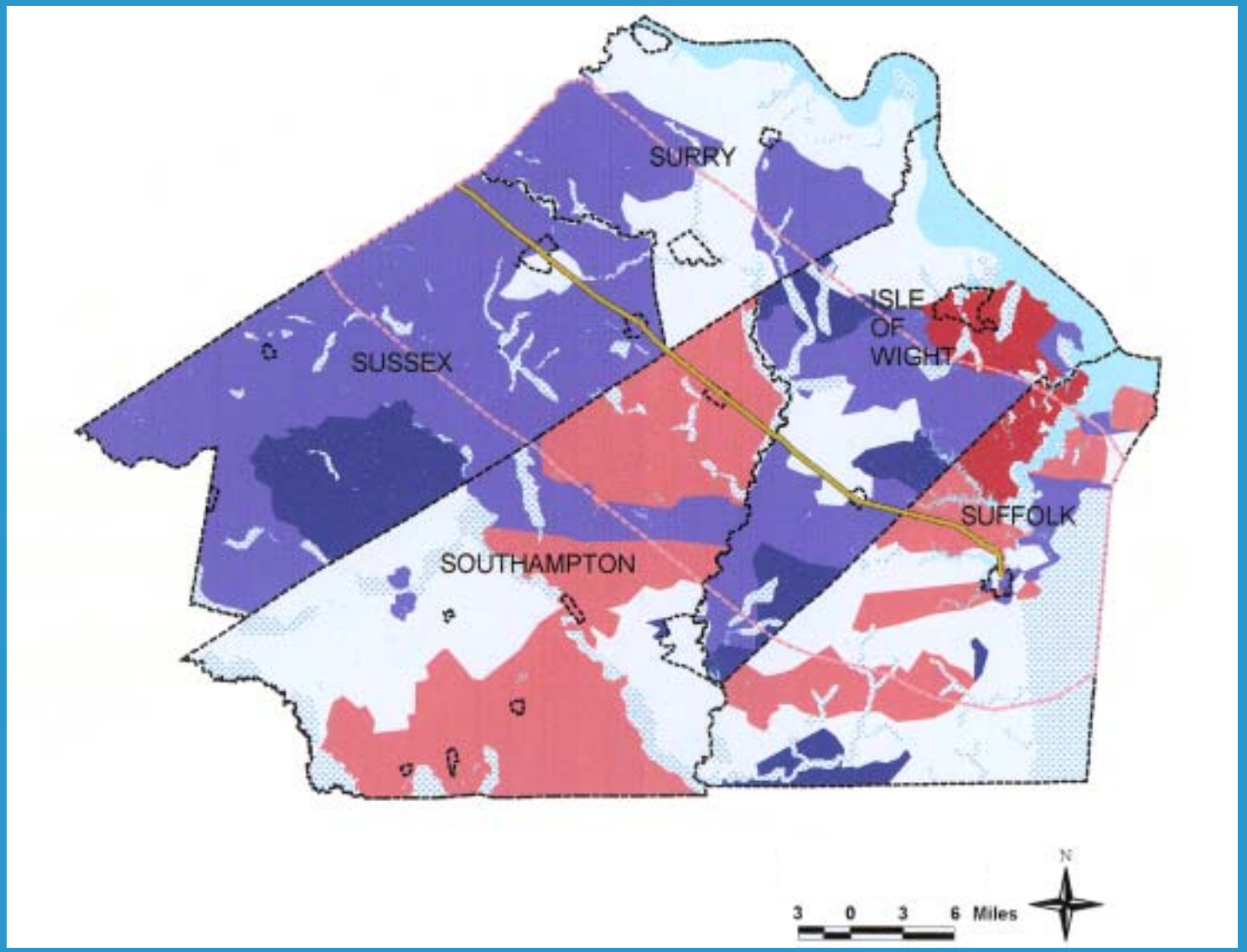
CENSUS BLOCKS: HOUSEHOLDS BELOW POVERTY LEVEL

FIGURE 12-16



CENSUS BLOCKS:
MINORITY HOUSEHOLDS

FIGURE 12-17



Chapter Thirteen
SCREENING OF ALTERNATIVE SEARCH AREAS FOR SELECTED REGIONAL AIRPORT SYSTEM

The purpose of this task was to evaluate the seven greenfield search areas based on search area screening criteria in order to come up with the four most feasible search areas to compare with the existing Newport News/Williamsburg International Airport site. This section presents a description of the screening criteria used and the method by which the criteria were implemented.

FAA and DOAV agreed to alter the study and not define a particular site, but to collect all pertinent data. It was then assumed the center of the search region would be used to compare factors with PHF.

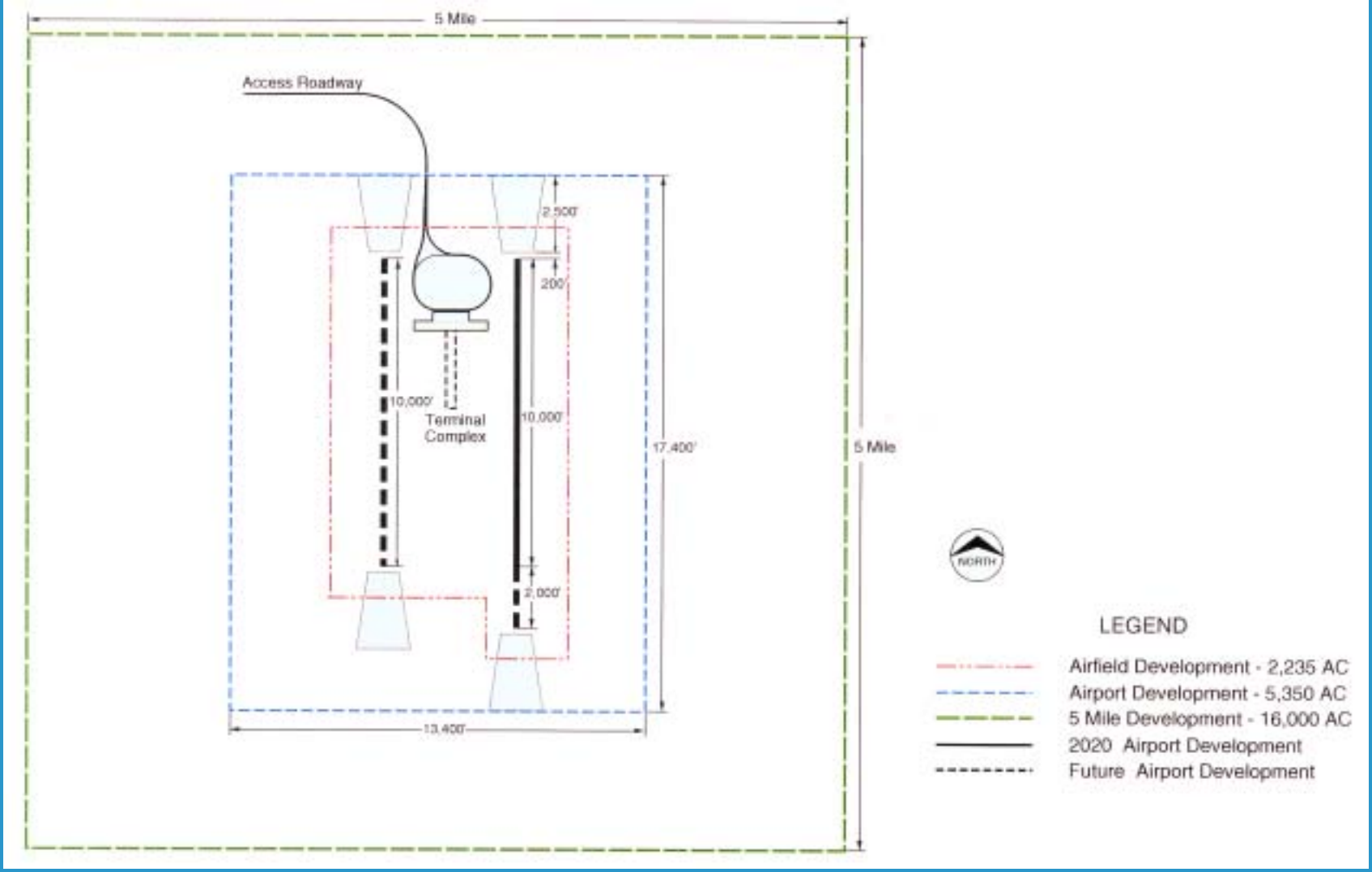
13.1 ULTIMATE AIRPORT REQUIREMENTS AND LAYOUT

To meet the demand associated with a new airport, ultimate requirements for the new airport were developed, including airside and landside facilities. At the onset of this effort, the initial idea was to develop and construct a new regional airport in the eastern Virginia region that could grow to the scale of Washington Dulles International Airport. As such, it was determined that the airport must consist of an area encompassing approximately 16,000 acres, with roughly 5,000 acres incorporating the following elements in order to meet the anticipated demand:

- Two 10,000-foot parallel runways with associated taxiways, with the ability to expand one runway to 12,000 feet.
- Air traffic control tower.
- Associated NAVAIDs.
- Terminal building and apron.
- Terminal parking facilities.
- Air cargo building and apron.
- General aviation facility and apron.
- Fuel storage facility.
- ARFF facility and maintenance facility.
- Associated airport roadways.

Figure 13-1 presents the ultimate layout of the airport based on the above criteria. As shown in Figure 13-1, the parallel runways are aligned in a north-south configuration due to prevailing winds and airspace concerns related to the military and commercial airports to the east. The two runways would be separated by at least 4,300 feet in order to allow dual simultaneous precision instrument approaches under instrument flight rules (IFR) conditions and to maximize midfield terminal growth potential. Also shown in Figure 13-1 are anticipated areas of development associated with the airport: airfield development, consisting of the physical requirements of the airport itself

FIGURE 13-1


5 Mile
Access Roadway
2,500'
200'
10,000'
Terminal
Complex
10,000'
17,400'
5 Mile
2,000'
13,400'
NORTH
LEGEND
Airfield Development - 2,235 AC
Airport Development - 5,350 AC
5 Mile Development - 16,000 AC
2020 Airport Development
Future Airport Development

including runways, taxiways, runway protection zones, safety areas, etc.; airport development, such as cargo and GA facilities, aviation support facilities, maintenance facilities, and any other development directly related to the operation of the airport; and other development within the 5-mile by 5-mile boundary, including hotels, retail, industrial, etc, which would likely arise due to the presence of the airport. Master planning efforts subsequent to this effort will be necessary to provide a more detailed and refined layout for the airport.

13.2 IDENTIFICATION OF SEARCH AREA SCREENING CRITERIA

To logically evaluate the seven potential airport search areas, a list of initial evaluation criteria was established and agreed upon by the Virginia Department of Aviation, the regional Planning District Commissions and the consultant team. A priority-weighting system was developed to rank the selected search areas with respect to the evaluation criteria. Evaluation criteria include historic sites, schools, churches, highway access, railroad connections, environmental justice, primary agriculture, air quality, utility systems, planned development, wetlands, Chesapeake Resource Management Areas (RMAs), water bodies, travel time, cemeteries, and airspace obstructions.

Table 13.1 presents the original evaluation criteria priority-weighting system developed for this task. As shown in Table 13.1, the criteria were ranked in comparison to each other; the criteria listed in the columns of the table were compared and scored with respect to the criteria listed along the rows. Inferior criteria received a score of 0. Equal criteria received a score of 1. Superior criteria received a score of 2. Each column was summed and the row of summations was added for total points available. Next, the proportion of each column's sum was divided by the total points to derive a weighting. Finally, the weighting system was used in the evaluation of the criteria present within the potential airport search areas. A description of each of the criteria is presented below.

13.2.1 Historic

Historic places that were included in the analysis of the search areas were obtained from the *National Register of Historic Places* and the *Virginia Department of Historic Sites*. Historic data maintained by the counties were obtained but could not be analyzed because there were no specific locations associated with each site. Historic places identified within the search areas were considered a negative factor when considering potential search areas for a new airport.

13.2.2 Schools

A current listing of elementary and secondary schools in the Counties of Isle of Wight, Southampton, and Sussex was included in the analysis and was obtained from *Patterson's Elementary and Secondary Education, 1999.* The presence of schools within the airport search areas was considered a negative factor when analyzing the viability of an airport.

13.2.3 Churches

The category of churches was obtained from the *National Directory of Churches,*

Table 13.1

Eastern Virginia Airport System Study

Evaluation Criteria Priority Weighting System

	Historic	Schools	Churches	Highway Access	Railroad Connections	Environ-mental Justice	Primary Agriculture	Air Quality	Utility Systems	Planned Development	Wetlands	Chesapeake Bay Resource Mgmt. Area	Water Bodies	Travel Time	Cemeteries	Airspace Obstructions
Historic	-	1	0	2	1	1	0	1	1	2	2	2	2	1	1	0
Schools	1	-	1	0	0	1	0	1	0	1	2	2	2	2	2	0
Churches	2	1	-	2	1	2	0	1	2	2	2	2	2	1	2	0
Highway Access	0	2	0	-	0	1	1	0	0	1	1	2	1	1	1	1
Railroad Connections	1	2	1	2	-	2	1	2	2	2	2	2	2	2	2	1
Environmental Justice	1	1	0	1	0	-	1	1	0	1	2	2	2	2	2	1
Primary Agriculture	2	2	2	1	1	1	-	1	1	1	2	2	2	2	2	0
Air Quality	1	1	1	2	0	1	1	-	0	1	2	2	2	2	2	2
Utility Systems	1	2	0	2	0	2	1	2	-	2	2	2	2	2	2	2
Planned Development	0	1	2	1	0	1	1	1	0	-	2	2	2	1	0	1
Wetlands	0	0	0	0	0	0	0	0	0	1	-	0	0	0	0	0
Chesapeake Bay Resource Mgmt. Area	0	0	0	0	0	0	0	0	0	0	0	-	0	0	0	0
Water Bodies	0	0	0	1	0	0	0	0	0	0	1	1	-	0	0	0
Travel Time	1	0	1	1	0	0	0	0	0	1	1	1	2	-	1	0
Cemeteries	1	0	0	1	0	0	0	0	0	2	2	2	2	1	-	0
Airspace Obstructions	2	2	2	1	1	1	2	0	0	1	2	2	2	2	2	-
Total Points	13	15	10	17	4	13	8	10	6	18	25	26	25	19	19	8
Percent of Total	6%	6%	4%	7%	2%	6%	3%	4%	3%	8%	11%	11%	11%	8%	8%	3%

Each column item is compared to each row:
* a column item that is more important in choosing a site over another to the row item receives a "2"
* if it is equal, it receives a "1"
* if it is less important it receives a "0."

Source: EVASS Team

Synagogues, and Other Houses of Worship Vol. 3 Southern States, 1994. The churches included in the analysis were cross-referenced via the Internet to obtain location-specific information and were considered a negative factor in the analysis of potential search areas.

13.2.4 Highway Access

Roads that were included in the analysis consisted of state and county highways. Smaller county routes and rural routes were not considered in the analysis. Search areas with existing highway access were rated higher due to the presence of existing infrastructure and a means to provide access to a new airport.

13.2.5 Railroad Connections

All railroads located within the search areas were included in the search area analysis. The presence of railroad connections within the various search areas was considered a positive factor in terms of multimodal opportunities for the search areas.

13.2.6 Environmental Justice

Consideration of environmental justice impacts was included in the analysis to determine the effect of a new airport on minority and low-income populations. Findings of injustice within the search areas were considered to be a negative impact to the search area.

13.2.7 Primary Agriculture

Agriculture data were extracted from VDOT classifications. The presence of primary agriculture within the search areas was considered a negative impact to the search area.

13.2.8 Air Quality

Analysis was conducted to determine whether the search areas were located within a non-attainment area. Search areas that are located within a non-attainment area were considered to be negatively impacted.

13.2.9 Planned Development

Development boundaries and generalized land uses located near the study center were collected from the comprehensive plans of Isle of Wight, Southampton, and Sussex Counties. Land uses compatible with an airport site were considered to be positive to the search area, and incompatible land uses were considered to be negative to the search area.

13.2.10 Utility Systems

Utility systems located within and near the search areas were included in the analysis, and were obtained from VDOT. Existing utilities located within a search area could be a major financial benefit and were considered to be a positive factor. High-tension power lines were considered as part of the airspace obstructions analysis.

13.2.11 Wetlands

Wetlands data were collected through the National Wetlands Inventory, and included records of wetlands location and classification within the Counties of Isle of Wight, Southampton, and Sussex, as defined by the U.S. Fish and Wildlife Service. The amount of wetlands present within a search area negatively affected the overall outcome of the search area.

13.2.12 Chesapeake Bay Resource Management Area

The Chesapeake Bay Resource Management Area (RMA) serves to protect waters related

to the Chesapeake Bay. RMAs include land types that, if improperly used or developed, have the potential to cause significant water quality degradation or to diminish the functional value of the Chesapeake Bay RPAs. The presence of RMAs within a search area was a major negative impact on the overall outcome of the search area.

13.2.13 Water Bodies

This criterion includes bodies of water, such as permanent lakes and streams. The presence of this criterion within the search areas was considered to be a negative impact.

13.2.14 Travel Time

Travel times from the major population centers to the search areas were analyzed. Search areas with the highest travel times were treated negatively. Conversely, search areas with the lowest travel times were considered positively.

13.2.15 Cemeteries

Cemeteries located within the Counties of Isle of Wight, Southampton, and Sussex were obtained from *Virginia Cemeteries – A Guide to Resources.* Cemeteries that are located within the search areas were treated as a negative impact to the search area.

13.2.16 Airspace Obstructions

Airspace obstructions identified by FAA and located within a ten-mile radius of each of the search areas were collected and analyzed. The presence and amount of obstructions located within a specific search area were considered a negative impact.

The original weighting system presented in Table 13.1 was subsequently distributed to the members of the Technical Advisory Committee (TAC) for their review and concurrence. Based on this review process and the comments received from the TAC members, several of the environmental-related factors, including primary agriculture, air quality, wetlands, Chesapeake Bay RMA, and water bodies, were consolidated into one criteria factor titled "environmental." The revised criteria priority-weighting system is presented in **Table 13.2**. It is important to note that, due to the significance of the evaluation matrix in this task, this weighting system was reviewed in great depth and, subsequently accepted by the members of the TAC.

13.3 CONCLUSION

Following review by FAA, the potential search areas were considered to be too detailed, resulting in the potential for the study to be construed as a site selection study, which it is not. EVASS is a system planning study. Therefore, the potential search areas were combined into one search region and were used to compare the positive and negative impacts of a new airport and PHF.

Table 13.2

Eastern Virginia Airport System Study

Revised Evaluation Criteria Priority Weighting System

Criteria Factor	Historic & Cemeteries	Schools & Churches	Highway Access	Railroad Connections	Environmental Justice	Utility Systems	Planned Development	Environmental	Travel Time	Airspace Obstructions
Historic & Cemeteries	-	1	2	1	1	0	1	2	2	0
Schools & Churches	1	-	2	1	1	0	1	2	2	0
Highway Access	0	0	-	0	0	0	1	1	1	0
Railroad Connections	1	1	2	-	2	1	2	2	2	1
Environmental Justice	1	1	2	0	-	0	1	1	2	0
Utility Systems	2	2	2	1	2	-	2	2	2	1
Planned Development	1	1	1	0	1	0	-	1	1	0
Environmental	0	0	1	0	1	0	1	-	2	0
Travel Time	0	0	1	0	0	0	1	0	-	0
Airspace Obstructions	2	2	2	1	2	1	2	2	2	-
Total Points	8	8	15	4	10	2	12	13	16	2
Percent of Total	9%	9%	17%	4%	11%	2%	13%	14%	18%	2%

Each column item is compared to each row:
Overall Total Points
* a column item that is more important in choosing a site over another to the row item receives a "2"
* if it is equal, it receives a "1"
*if it is less important it receives a "0."

Note: Environmental includes Federal Endangered Species, Air Quality, Wetlands, Chesapeake Bay Resource Management Area, and Water Bodies.

Source: EVASS Team

Chapter Fourteen
EVALUATION OF OPTIONS FOR PREFERRED REGIONAL AIRPORT SYSTEM UPDATE

14.1 INTRODUCTION

The purpose of this task was to evaluate RIC and either the new airport search areas or PHF. The evaluations included forecasts of activity, facility requirements and costs, travel times, level of service factors, environmental factors, economic impacts, community development potential, and financial feasibility. This report presents the updates to these items based on comments received from the Technical Advisory Committee (TAC). This section evaluates both alternative two-airport systems in terms of their economic impact and community development potential within the eastern Virginia region. In particular, consideration was given to the following:

- Revised facility costs and financial data.
- New airport search region centered around search area 2 for analysis purposes.
- Case studies of catalytic development at comparable airports.
- Potential for partial redevelopment of Newport News/Williamsburg International Airport (PHF) and Norfolk International Airport (ORF).

As the impacts of a new airport have been evaluated, a broad assumption was made that the existing airports would be assessed as having a role change such as from a Commercial Service to a General Aviation airport or as the market dictates. Chapter 16 and Chapter 17 consider several options, including an analysis of potentially closing PHF and/or ORF, and the impacts this could have on the region.

14.1.1 Revisions Based on Comments from TAC Members

Based on comments received from the TAC, several items used in the Chapter 14 analysis were revised and incorporated into the analysis discussed below. The following describes the primary changes made to the data.

In an effort to avoid the issue that the new airport search areas are being treated as a site selection, the Federal Aviation Administration (FAA) and the Virginia Department of Aviation (DOAV) recommended that a search region, centered around the original search area 2 in Isle of Wight County, be used for analysis purposes. This new region, as shown in **Figure 14-1**, was used in the financial and economic analyses completed for the new airport in this task and will be used in all analyses for the remaining tasks. The environmental factors previously presented to the TAC will be provided as an inventory for both the new airport search region and PHF. A summary of the environmental factors data is provided in **Appendix G**.

Discussions and comments during the TAC meeting prompted several modifications and/or updates to the facility costs presented. The following items highlight the primary changes:

Task 14: Evaluation of Options for Preferred Regional Airport System

FIGURE 14-1

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

- PHF costs were updated to reflect 1999 dollars.

- The unit costs for site preparation; wetland mitigation; and construction of a runway/taxiway, terminal building, and terminal parking structure were updated.

- A planning factor representing ARFF/ Maintenance/Support was added to the facility cost analysis.

Tables 14.1 through 14.3 present the 2020, 2030, and 2030 high forecast development cost estimates for PHF and a new airport. The revised 2030 development cost for PHF is $618 million, and the cost for a new airport increased to $1 billion. All of the changes and/or additions discussed above were subsequently utilized to update both the financial data and economic impact analyses.

14.2 CATALYTIC DEVELOPMENT CASE STUDIES

The following case studies examine development in the proximity of the commercial service airports of Dallas/Fort Worth International Airport (DFW), Denver International Airport (DEN), Kansas City International Airport (MCI), and Washington Dulles International Airport (IAD), and help illustrate the dynamics that affect catalytic development around airports. These particular airports were chosen because they are major commercial airports with the following traits: recently developed (DEN), geographically similar (IAD), successfully developed (DFW), and stagnant development (MCI). The sources for this information can be found in the bibliography in **Appendix H**.

14.2.1 Dallas/Fort Worth International Airport

The Dallas/Fort Worth metropolitan area is among the most populated in the Southwest. The nine county Dallas/Fort Worth Consolidated Metropolitan Statistical Area (CMSA) is generally known as the Metroplex. Dallas is a wholesale, manufacturing, and financial center with many regional headquarters and distribution facilities. Although well diversified, the Metroplex economy has shown some dependence on the oil, defense, and high-technology sectors.

DFW, which opened in 1974, is located midway between the Cities of Dallas and Fort Worth, and is owned, operated, and managed by the Dallas/Fort Worth International Airport Board. The Board is composed of seven members from the City of Dallas and four from the City of Fort Worth. DFW is physically located within five cities: Grapevine, Euless, Irving, Coppell, and Fort Worth. In July 1998, the estimated population of the Dallas/Fort Worth CMSA was 4.8 million.

Prior to the opening of DFW, Love Field was the only scheduled air carrier airport in Dallas. Fort Worth had Meacham Airport and Southwest Airport. In 1960, the Federal Civil Aeronautics Board announced that it would no longer approve capital improvements for both Love Field and Southwest Airport. Due to geographic constraints at each of these airports, the two cities elected to construct a new airport between the two municipalities. When DFW opened in 1974, both Meacham Airport and Southwest Airport terminated commercial service operations. Love Field continues to function and to handle a significant number of passengers (6,715,596 in 1998) and operations. In 1974, DFW served 13 million passengers and, by 1983, it processed 26

Table 14.1

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Facility Costs through 2020 for Two-Airport System[1]

Planning Factor	Units	Unit Costs			PHF[2]	
			Req.	Cost Est.	Req.	Cost Est.
Land Acquisition, Airport	acre[3]	$1,700	353 [4]	$3,250,000	5,500	$9,350,000
Land Acquisition, Non-Airport [5]	acre[3]	$1,700	n/a	n/a	10,500	$17,850,000
Site Preparation	acre	$7,000	n/a	n/a	5,500	$38,500,000
Utilities (Install/relocate)[6]	various	n/a	n/a	n/a	Lump	$23,985,000
Wetland Mitigation[7]	acre	$80,000	160[8]	n/a	1,660	$132,800,000
Runway/Taxiway	lump sum	$150,000,000	MP	$73,036,000	2	$300,000,000
Airport Roadways	Lane Mile	$1,300,000	MP	$1,400,000	24	$31,200,000
Off-Airport Road & Railways[6]	Lane Mile	$1,300,000	MP	$3,154,000	5	$6,431,000
NAVAIDS	per ILS	$3,000,000	MP	$60,000	4	$12,000,000
Air Traffic Control Tower	lump sum	$21,000,000	MP	$21,000,000	1	$21,000,000
ARFF[9]	per bay	$200	MP	$388,000	10,000	$2,000,000
Fuel Storage Facilities	lump sum	$4,000,000	MP	$500,000	1	$4,000,000
Terminal Building	sq. ft.	$200	201,300[8]	$20,765,000	297,000	$59,400,000
Terminal Parking - at grade	spaces	$1,000	1,556[8]	$1,484,000	5,300	$5,300,000
Terminal Parking - structure	spaces	$10,000	0[8]	$0	2,257	$22,572,000
Air Carrier Gates	gates	n/a	17[8]	n/a	12	n/a
Apron Area	sq. yd.	$150	79,100[8]	n/a	80,528	$12,079,000
Air Cargo Building	sq. ft.	$70	0	$0	70,357	$4,925,000
Air Cargo Apron	sq. yd.	$150	0	$0	19,544	$2,932,000
General Aviation	n/a	n/a	MP	$33,348,000	Lump	$10,300,000
A/E & Contingency	n/a	25%	n/a	n/a		$179,156,000
TOTAL				**$158,385,000**		**$895,780,000**

Note: All costs are in 1999 dollars rounded to nearest 1,000.
(1) Does not include cost for Richmond International Airport improvements.
(2) Costs from latest Airport Master Plan through 2015.
(3) Cost estimate based on Task 11 input from PDCs
(4) Excludes 396 acres of avigation easements
(5) Remaining search area acreage
(6) Assumes construction to center of search area (4-lane roads)
(7) Includes wetlands of entire search area, 2:1 mitigation ratio for wetland credits at an average $40,000 per acre.
(8) PHF Master Plan quantities and costs
(9) Assumes ARFF equipment would be transferred from ORF/PHF.

Source: HNTB Team Analysis, 1999.

Table 14.2

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Facility Costs through 2030 for Two-Airport System[1]

Planning Factor	Units	Unit Costs	PHF[2] Req.	PHF[2] Cost Est.	New Airport (Area 2) Req.	New Airport (Area 2) Cost Est.
Land Acquisition, Airport	acre[3]	$1,700	353 [4]	$3,250,000	5,500	$9,350,000
Land Acquisition, Non-Airport [5]	acre[3]	$1,700	n/a	n/a	10,500	$17,850,000
Site Preparation	acre	$6,875	n/a	n/a	5,500	$37,812,500
Utilities (Install/relocate)[6]	various	n/a	n/a	n/a	Lump	$2,315,000
Wetland Mitigation[7]	acre	$70,000	160[8]	$0	1,660	$116,200,000
Runway/Taxiway	lump sum	$83,000,000	MP	$120,191,000	2	$166,000,000
Airport Roadways	Lane Mile	$1,300,000	MP	$9,400,000	24	$31,200,000
Off-Airport Road & Railways[6]	Lane Mile	$1,300,000	MP	$3,154,000	5	$6,431,061
NAVAIDS	per ILS	$2,500,000	MP	$60,000	4	$10,000,000
Air Traffic Control Tower	lump sum	$21,000,000	MP	$21,000,000	1	$21,000,000
ARFF	sq. ft.	$150	MP	$3,388,000	10,000	$1,500,000
Fuel Storage Facilities	lump sum	$4,000,000	MP	$1,500,000	1	$4,000,000
Terminal Building[9]	sq. ft.	$160	1,120,000[8]	$299,765,000	500,000	$100,000,000
Terminal Parking - at grade[9]	spaces	$1,000	1,556[8]	$1,484,000	8,984	$8,984,000
Terminal Parking - structure[9]	spaces	$8,500	7,500[8]	$64,000,000	3,850	$38,504,000
Air Carrier Gates[9]	gates	$250,000	95[8]	n/a	379,170	$56,875,000
Apron Area[9]	sq. yd.	$150	609,000[8]	n/a	112,306	$7,889,000
Air Cargo Building	sq. ft.	$70	0	$0	112,700	$4,696,000,00
Air Cargo Apron	sq. yd.	$150	0	$0	31,306	$10,3000,000
General Aviation	n/a	n/a	MP	$33,348,000	Lump	$205,673,500
A/E & Contingency	n/a	20%	n/a	n/a		
TOTAL				**$618,730,000**		**$1,028,367,500**

Note: All costs are in 1999 dollars rounded to nearest 1,000.
(1) Does not include cost for Richmond International Airport improvements.
(2) Costs from latest Airport Master Plan through 2015.
(3) Cost estimate based on Task 11 input from PDC's
(7) Assumes 2:1 mitigation ratio, wetland banks range $25,000 - $65,000 per acre.
(8) PHF Master Plan quantities and costs
(9) Terminal facilities requirements held constant for comparison purposes.

Source: HNTB Team Analysis, 1999.

Table 14.3

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Facility Costs through 2030 (High Forecast) for Two-Airport System[1]

Planning Factor	Units	Unit Costs	PHF[2] Req.	PHF[2] Cost Est.	Req.	Cost Est.
Land Acquisition, Airport	acre[3]	$1,700	353 [4]	$3,587,000	5,500	$9,350,000
Land Acquisition, Non-Airport [5]	acre[3]	$1,700	n/a	n/a	10,500	$17,850,000
Site Preparation	acre	$7,000	n/a	n/a	5,500	$38,500,000
Utilities (Install/relocate)[6]	various	n/a	n/a	n/a	Lump	$2,315,000
Wetland Mitigation[7]	acre	$80,000	160[5]	n/a	1,660	$132,800,000
Runway/Taxiway	lump sum	$150,000,000	MP	$132,668,000	2	$300,000,000
Airport Roadways	Lane Mile	$1,300,000	MP	$10,376,000	24	$31,200,000
Off-Airport Road & Railways[6]	Lane Mile	$1,300,000	MP	$3,481,000	5	$6,431,000
NAVAIDs	per ILS	$3,000,000	MP	$66,000	4	$12,000,000
Air Traffic Control Tower	lump sum	$21,000,000	MP	$23,180,000	1	$21,000,000
ARFF/Maintenance/Support[9]	various	n/a	MP	$3,740,000	Lump	$25,000,000
Fuel Storage Facilities	lump sum	$4,000,000	MP	$1,656,000	1	$4,000,000
Terminal Building	sq. ft.	$200	1,120,000[8]	$330,884,000	900,000	$180,000,000
Terminal Parking - at grade	spaces	$1,000	1,556[8]	$1,638,000	9,890	$9,890,000
Terminal Parking - structure	spaces	$10,000	7,500[8]	$70,644,000	4,239	$42,385,000
Apron Area	sq. yd.	$150	609,000[8]	n/a	581,736	$87,260,000
Air Cargo Building	sq. ft.	$70	0	n/a	112,700	$7,889,000
Air Cargo Apron	sq. yd.	$150	0	n/a	31,306	$4,696,000
General Aviation	n/a	n/a	MP	$36,810,000	Lump	$10,300,000
A/E & Contingency	n/a	20%	n/a	n/a		$188,573,200
TOTAL				**$618,730,000**		**$1,131,439,200**

Note: All costs are in 1999 dollars rounded to nearest 1,000.
(1) Does not include cost for Richmond International Airport improvements.
(2) Costs from latest Airport Master Plan through 2030.
(3) Cost estimate based on Task 11 input from PDCs.
(4) Excludes 396 acres of avigation easements.
(5) Remaining search area acreage.
(6) Assumes construction to center of search area (4-lane roads).
(7) Includes wetlands of entire search area, 2:1 mitigation ratio for wetland credits at an average $40,000 per acre.
(8) PHF Master Plan quantities and costs.
(9) Includes ARFF facility, equipment, training facility, and maintenance/support facility & equipment.

Source: HNTB Team Analysis, 1999.

million passengers. In 1998, the airport was the fifth busiest airport in the world, serving 60.5 million passengers and handling 801,968 metric tons of cargo, with a world rank of 21st in terms of cargo traffic.

The airport is situated on 17,800 acres of former farmland, as shown in **Figure 14-2**, and is 17.5 miles from the central business districts of both Dallas and Fort Worth. It occupies one of the largest parcels of airport land in the country. It should be noted that 16,000 acres have been considered for a new airport search area for this study.

Type of Development

Historically, airport development within-the-fence at DFW has focused on airport-related uses (e.g., flight kitchens, aircraft maintenance, freight forwarders), with the exception of the Free Trade Zone. Recently, additional uses have located on the airport, including cargo, airline facilities, hotels, and government agencies (e.g., U.S. Customs).

Additional areas surrounding the airport have been developed into mixed-used industrial and residential developments. The five major developments within the airport environs are Las Colinas, Freeport, Westport, Centreport, and Port America Place. Development at Las Colinas began in 1973, Freeport in 1979, Centreport in 1982, and Port America Place in 1987, which brought 40 additional acres. The most recent industrial parks are Westport and Northfield Distribution Center, where development began in 1998. **Figure 14-3** illustrates several of the developments introduced above, which are discussed in greater detail below.

Las Colinas is a 12,000-acre, master-planned development in the center of the Metroplex. The Master Plan for Las Colinas was unveiled in 1973, one year prior to the opening of DFW, by representatives of Southland Corporation after 15 years of planning. Many real estate specialists considered Las Colinas to be one of the next logical development areas, with or without DFW.

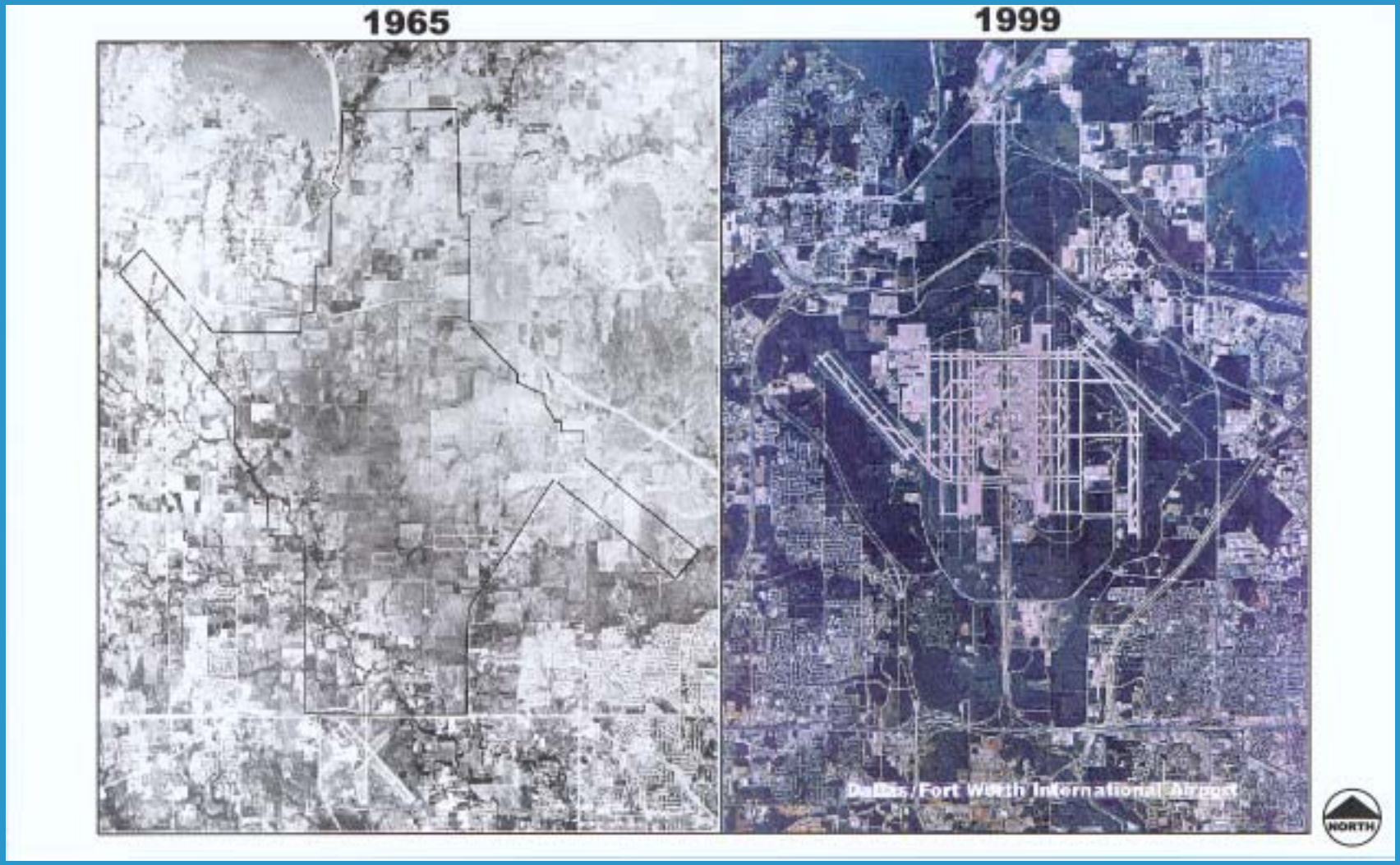
Las Colinas is a mixed-use development of commercial, residential, educational, and retail land use areas. Only 7,000 acres were proposed for for-profit development, with the remaining land dedicated to buffer parks, university, and hospital facilities. Of the 7,000 acres proposed for development, one-half was designated for open spaces and educational, cultural, and recreational facilities.

Developed by the Woodbine Development Corporation, **Freeport** is a 500-acre, multi-use business park, which began in 1979 on a site immediately adjacent to DFW. To begin construction, Woodbine had to acquire water and electricity from DFW. Since demand for commercial real estate was high at the time, Freeport sold sites even before the roads were completed. It was designed to have 40 percent office, 10 percent hotel, 10 percent retail, and 40 percent warehouse uses. By 1987, all the warehouse and retail/hotel sites were sold. As of 1998, 130 of the 200 office-use acres were developed. Woodbine requires purchasers to build-out within 18 months or sell the land back to minimize speculation.

Two business parks were developed in 1998. The 500-acre **Westport** development began in 1998 and will contain more than one million square feet of warehouse and distribution space upon completion. In the first year of development, 90 acres were sold. Tenants include warehousing and distribution companies, as well as freight forwarders. The development is close to the air cargo businesses on DFW's West Airfield Drive.

Dallas / Fort Worth International Airport

FIGURE 14-2



Dallas / Fort Worth International Airport
Catalytic Development

FIGURE 14-3

Centreport is a 1,300-acre, mixed-use development south of DFW, on what was formerly Southwest International Airport. The development contains primarily low-intensity industrial, office, and distribution uses and some apartments. Although it does not offer the amenities of Las Colinas (e.g., golf courses, polo club), it is an upscale development. Construction began in 1982, the site was one-third developed by 1987, and 700 acres were developed by 1998.

Port America Place is a small (40-acre) development in Grapevine that caters to freight forwarders and other direct airport-related users.

The **Northfield Distribution Center** is composed of 64 acres. The development began in 1998 and will cater to air cargo and freight forwarding companies. Construction of this facility is being undertaken on a speculative basis.

The DFW industrial submarket is growing faster than the overall Metroplex development pace. For example, land permitted for industrial use within the Metroplex grew by approximately 11.7 percent from the beginning of 1995 to year-end 1997; the DFW industrial submarket grew by more than 59 percent within this time period. In addition to its attractiveness as an office location, it is a popular location for distribution and warehousing facilities.

Timing of Development

Prior to the construction of DFW, there was practically no industrial space in the airport environs. By 1979, five years after construction of DFW, less than 500,000 square feet of industrial space had been developed. As of 1988, approximately 12 million square feet of industrial space had been developed in the airport environs.

Placement

By the mid-1960s, the Cities of Irving, Grand Prairie, and Arlington had grown to form an urban corridor between Dallas and Fort Worth. Therefore, placement of DFW in the center of the Metroplex was reinforced and expedited but did not alter the major thrust of development activity.

Development Impacts

In 1998, according to DFW staff, the airport contributed $11.2 billion to the north Texas economy. Businesses in the area employ nearly 211,000 people because of jobs created directly or indirectly by DFW. For every 100 persons employed in the Metroplex, eight have jobs directly or indirectly related to the airport. The jobs generated a total of $6.1 billion in personal income in 1998.

The airport also plays a pivotal role in the attraction and retention of businesses, not only in the airport environs but also in the larger metropolitan area. Surveys show that, while few businesses cite the airport as their <u>only</u> reason for locating in the area, most consider access to the airport one of the top factors.

Factors Driving Catalytic Development

When DFW opened, the airport environs had access to all utilities (electric service, natural gas, telephone) except water. Development in the airport environs, with the exception of Las Colinas, Freeport, and the City of Grapevine, was severely constrained until 1984, when water lines were completed and water was provided by the City of Dallas. As a result, between 1974 and 1984, development only occurred in the Las Colinas, Freeport, and Grapevine areas.

In addition to the State Department of Commerce, there are nine local agencies engaged in economic development within the airport environs. Since it was formed in July 1971, the North Texas Commission has coordinated economic development activities in the airport environs. Initially, its role was to market DFW to the airlines and airport-related industry. Over time, its role evolved to include the development and promotion of the technology, research, and international trade sectors of the Metroplex. The Dallas Partnership, which is funded by private businesses, works to market the entire area. The individual cities' Chambers of Commerce are also extremely involved. Historically, the Metroplex has invested considerable effort and money in attracting international business to the area. A variety of economic incentives, such as tax exemptions and municipality-funded infrastructure upgrades, are provided for the airport industrial submarket.

Residential growth has been dramatic. The fastest-growing residential area within the Metroplex is the area directly north and northeast of DFW. One important ingredient for a successful residential development in the Dallas/Fort Worth area is master planning, where the amenities and environment sell the housing while minimizing future constraints on development at DFW. The residential developments surrounding the airport cater to a wide range of income levels.

14.2.2 Denver International Airport

DEN provides an interesting case study for two reasons. First, it demonstrates the benefits of preplanning and research in the development of areas surrounding the airport (the airport sponsor, the City/County of Denver, and the business community planned extensively for the economic development of the airport site). Second, with the extensive plans for the redevelopment of Stapleton Airport, DEN also demonstrates the value of planning for the redevelopment of closed facilities.

Built on 53 square miles (28,000 acres) of suburban Denver land, the DEN property is the largest space allocated for airport development in the world. The area surrounding the airport is under multiple jurisdictions, including the City and County of Denver, Adams County, and the City of Aurora. The Denver MSA includes 1.9 million persons. Reportedly, little cooperation occurs between Denver and Adams County (the jurisdiction most directly affected) regarding land-use planning in the airport area.

Type of Development

While development at DEN tends to be airport-oriented, off-airport development is mixed-use. DEN has four cargo-handling buildings adjacent to 22 acres of cargo apron for aircraft parking and service. The space is used by DEN's cargo-hauling tenants, which include United, Delta, Northwest, and Continental. Future development could include additional cargo warehousing space, JIT inventory buildings, and support facilities, such as a food court for truck drivers and Commerce Center workers. A fixed base operator, AMR Combs, occupies a 9,200-square-foot executive terminal and 54,000-square-foot maintenance hanger. The U.S. Postal Service owns a 60,000-square-foot mail sorting facility. United Airlines, SkyChefs, and Continental Airlines operate flight kitchen facilities. The airlines also have maintenance facilities that occupy almost 600,000 square feet of space. Adjacent to the cargo buildings, 77 acres are designated for a commercial center to be developed by LC Fulenwider.

LC Fulenwider owns 7,500 acres of land adjacent to the airport, which is divided into several business parks. The Denver International Business Center is a 450-acre, master-planned business park for hotel, office, retail, and light industry uses. The first tenants of the facility were hotel-related: a Marriott Courtyard, a Fairfield Inn, and a La Quinta Inn, as shown in **Figure 14-4**. The headquarters for Frontier Airlines will also be located in the Denver International Business Center. The International Airport Commerce Center is an 880-acre site directly south of air cargo operations. The Buffalo Hills Ranch community will be a 2,500-acre residential development surrounding a new golf course. Access to these developments is facilitated by the construction of a toll road, E-470, which operates as a beltway. Highway E-470 opened in May 1999.

Gateway/DEN is a 4,400-acre, planned development adjacent to DEN. Twenty-four million square feet have been zoned for commercial and industrial uses, and 15,000 new housing units have been permitted. Construction is underway at Gateway Park, a 1,200-acre, residential and commercial development; Parkfield, a 390-acre, residential and mixed-use project; and Denver Gateway Center, a 159-acre, mixed-use development. The location is eligible for enterprise and foreign trade zone incentives sponsored by the Denver Mayor's Office of Economic Development and International Trade (MOED/IT).

Majestic Realty Company's Commercenter is an 825-acre site. Since Majestic bought the site in 1995, the developer has built 380,000 square feet of industrial space, with another 325,000 square feet under construction. Some of the site lacks infrastructure and may not be developed in the near future. At build-out, Majestic Commercenter is slated to include 15 million square feet of high-end industrial space.

Factors Driving Catalytic Development

The Colorado Forum, a business association, and the Colorado National Bank analyzed land-use impact around airport projects at Dallas-Fort Worth, Atlanta, and Kansas City. The research indicated that, with proper planning, large mixed-use planned developments incorporating commercial, office, and residential land uses could be successful. As a result, the County and City of Denver have based some aspects of the plans for the Denver International Airport Gateway development on the DFW plan.

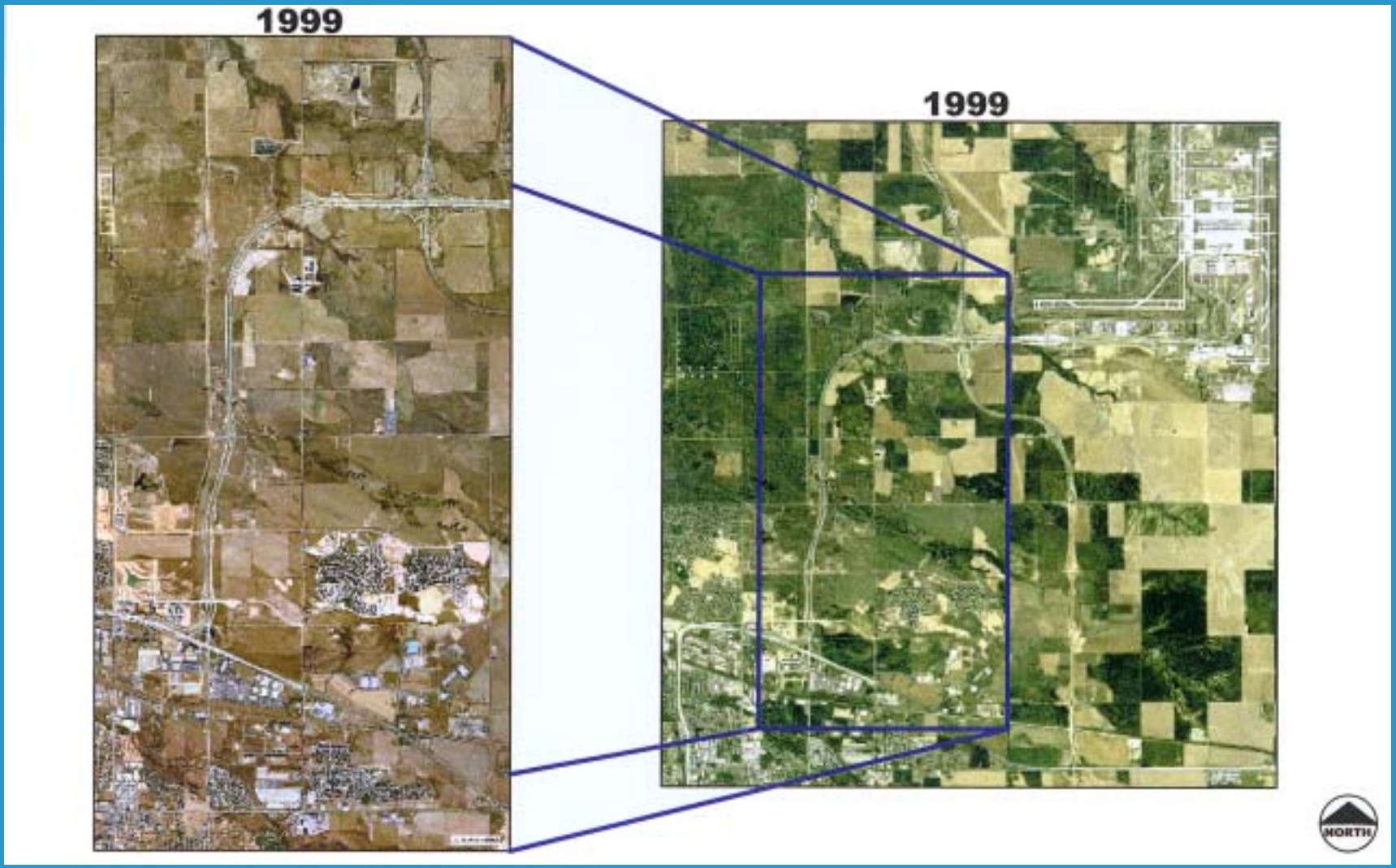
The City of Denver has also actively worked to attract businesses to the airport. The DEN Business Partnership is a public-private partnership that works to attract businesses to the new airport location. The partnership provides information to interested companies in the area of design and building, corporate relocation, Denver area business practices, real estate, and economic development activities.

Timing of Development

Before the airport opened, no substantial land-use development occurred in the Gateway area or anywhere else along the strip of land that is under the jurisdiction of the city (from DEN to the city). The advance planning of the city and business community has begun to bear fruit: a number of business parks have been announced following the opening of the airport. The sequencing of development parallels that observed at other airports. Approximately 2 million to 2.5 million square feet of space has been built around the airport in the last several years. According to Denver real estate consultants,

Denver International Airport (Opened 1995)

FIGURE 14-4



the development growth rate is high but demand-driven.

Placement

DEN is located northeast of the City of Denver. The direction of historic development has been to the south. As a result, the city government and business leaders have undertaken policies to draw some development toward the airport.

Redevelopment of Stapleton

Paired with the development of the area surrounding DEN is the redevelopment of the former airport, Stapleton. The city intends to convert the 7.5 square miles of runways, terminals, hangars, and open spaces into a network of urban villages, parks, and workplaces. The non-profit Stapleton Development Corporation is directing the project. In November 1998, Forest City Development, a Cleveland-based developer of mixed-use urban communities, was chosen to be Stapleton's master developer. As such, Forest City will develop 3,000 of Stapleton's 4,700 acres over 30 years. The remaining 1,700 acres will become parks, open space, and recreation sites. Forest City plans include a 700,000-square-foot retail center, a 300-acre industrial park, and a 200-acre urban center area with single-family homes, a school, and a community center. Upon completion, the project anticipates 10,500 single-family homes, condominiums, and apartments; 25,000 residents; 35,000 jobs; 1,700 acres of parks or open spaces; and 17 million square feet of commercial space.

Community interest in the development appears high, although there are some concerns regarding a surplus of land proposed for development. Competing projects to the redevelopment of Stapleton are the redevelopment of Lowry Air Force Base and construction near DEN, as well as renovated rail yards and warehouse districts.

The due diligence analysis of the project has extended beyond the original completion date of June 1999. One major hold-up is the appraisal process required by the FAA, which has not been completed. Another difficulty has been the need to negotiate with numerous stakeholders, including the City and County of Denver, the Stapleton Development Corporation, the FAA, and the airlines.

While the sale of land to Forest City Development slowly progresses, the Stapleton Development Corporation has been preparing the site for new development: rental car agency buildings have been razed, runway demolition is almost complete, and the terminal is being torn down. The removal of 1,150 acres of pavement has been described as "one of the largest concrete-removal projects on Earth." Some environmental mitigation is also needed.

Other developers with much smaller projects have been progressing. Catellus Development Corporation is building a 300-acre Stapleton Business Center, and another 155-acre parcel has been purchased by a grocery chain to serve as a distribution center.

14.2.3 Kansas City International Airport

Land for a new airport was purchased in 1953 in Platte County, which is north of Kansas City. Construction began at MCI in 1969 and was completed in 1972. MCI has 9,500 acres of land in a rural farming area. The airport is owned and operated by the City of Kansas City through its Department of Aviation. The population of the Kansas

City MSA is 1.7 million people. In 1998, MCI handled 10,954,527 passengers.

Type of Development

MCI's on-airport development policy has been to discourage development that is not directly related to airport operations or activities. As a result, most of the development on the airport is directly related to the airport and includes lodging, car rental, cargo, and aircraft maintenance. Parcels are available for on-airport development. Five thousand available acres are zoned for industrial use, with foreign trade zone access and easy access to the interstate. Another 1,000 acres are zoned for industrial use, with foreign trade zone access, easy access to the interstate, and direct access to the airfield. Three parcels, totaling 24 acres, are available in the cargo area.

Although several sizable free trade zones exist in the Kansas City metro area, only one 10-acre subzone is within the airport environs. FedEx, which has a regional hub at MCI, is one of the on-airport tenants, with approximately 112,000 square feet of space.

The airport submarket in MCI contains approximately 1.9 million acres of net rentable industrial and warehouse space. The volume of new office space being developed is modest, although accelerating. The centerpieces of this submarket are Airworld Center and Executive Hills North. Airworld Center is a 330-acre, master-planned industrial and office park. According to developer Hugh Zimmer, the development of the Airworld site stalled due to the initially speculative nature of construction at Executive Hills, the developer of which did almost anything necessary to get tenants.

Executive Hills North/Tiffany Square is a 3,700-acre development of mixed-use residential, office, and industrial space southeast of MCI, just beyond a concentration of hotels. It is a high-image, mixed-development area with predominant office building use. Executive Hills, which contains a hotel, golf course, and luxury housing, was built on a speculative basis.

There are nine hotels in the airport environs, four of which were built in 1974 immediately after construction of the airport. The developer of Executive Hills North/ Tiffany Square went bankrupt in 1989, a casualty of the Tax Reform Act of 1986, which sent the real estate industry into a tailspin. The development has since been renamed Tiffany Square.

The federal government has also contributed to the development of the airport area. In 1997-1998, it acquired a six-acre site for the Aviation Weather Center and National Weather Service Training Center. The one-story building, which contains more than 90,000 square feet of space, opened in 1998. The site is also served by water and sewer, which makes development easier.

Briarcliff West, which began in the early 1990s, is a mixed-use residential and office development. Residential development (200 homes) started first, followed by the construction of the first office buildings on a speculative basis. Development is growing due to the lack of buildings in the area north of Kansas City. Interest in the market, however, is still less than to the south (Overland Park).

Timing of Development

Industrial park development has proceeded slowly in the MCI environs. AW Zimmer and Company initiated the first mixed-use business center, Airworld, in 1974. Development at Airworld neared completion in 1998 with the construction of the final

two buildings. At the time, 40 acres remained undeveloped. Executive Hills North (Tiffany Square), the second development, began development in the early 1980s, almost ten years after Airworld. Interest in the area around the airport has increased over the past several years.

The northern suburbs of Kansas City have grown by almost 20 percent this decade. The growth mirrors the growth recorded during the same period in the southern suburbs. The "Northland" surge has been fueled by casinos and large data processing operations established near MCI by such companies as Citicorp Credit Services Inc. and the Electronic Data Systems Corp. Manufacturing facilities such as Harley-Davidson Motor Co. are other new occupants. Developments such as Briarcliff West have started to fill in the area between the city and the airport.

Placement

The airport, positioned north of the Missouri River in the State of Missouri, is located 17 miles northwest of the central business district. The river has traditionally been a strong psychological barrier to new growth to the north. The northland area, where the airport is located, has had an agricultural, blue-collar image. When the airport was built, only 10 percent of the population and less then 10 percent of the jobs were north of the river. In 1969, the major direction of new growth was, and continues to be, to the south and southwest of the central business district in Kansas. Limited efforts to counteract the traditional pattern of growth and pull developers north have been undertaken. The distance from the central business district is perceived to be great, although the airport has good interstate access.

Recent development near the airport is partially driven by the desire to take advantage of the location. It is also driven by newcomers to the Kansas City market who wish to be close to the airport and do not have any historical affinity to the southern suburbs. The developer of Airworld cites the following:

From 1975, when we opened Airworld Center, until 1980, about 75 percent of the deals that we made there were with companies from out of town, companies that did not have a presence in Kansas City, whereas at that same time in our Johnson County (south of the City) projects, 75 percent of the deals we made were with companies that did have a presence in Kansas City.

Factors Driving Catalytic Development

Four private non-profit agencies are engaged in economic development activities but have not experienced notable success. The Greater Kansas City Chamber of Commerce has promoted the Kansas City area as a whole or focused their attention on the prevailing direction of development, the southwest. There are few financial incentives offered by local jurisdictions to new businesses to locate to or develop the airport environs. Kansas City has placed little money or attention on the economic development potential of its airport.

The City of Kansas City is the sole provider of water and sewage service. The City extended trunk lines to the airport environs prior to its completion. No permanent development districts therein provide internal improvements. There are no known constraints to development. Because growth has been slow, utility installation has kept pace with development.

Platte County, in which the airport is located, has recently indicated that it is placing greater emphasis on providing the infrastructure needed to attract development. The county has been studying improvements to I-29 that would alleviate congestion. County representatives indicate that the county has lagged in the provision of infrastructure compared to their southern competitors in Johnson County, Kansas. Furthermore, they feel that development has accelerated in these areas because infrastructure predates the development.

14.2.4 Washington Dulles International Airport

IAD has been the beneficiary of, and force behind, the burgeoning growth in the area surrounding it, which is the fastest growing metropolitan area in the Commonwealth and one of the fastest growing in the entire U.S. The area has become one of the nation's leading high-technology centers for computer software, information technology, and telecommunications.

Built by the federal government, IAD opened in 1962. It was owned and operated by the federal government until 1986, when the operations of Ronald Reagan Washington National Airport and IAD were transferred to a public authority, the Metropolitan Washington Airports Authority. The airport consists of 11,000 acres and handled 15,619,407 passengers in 1998. With more than 180 weekly international and approximately 360 daily domestic flights, IAD reaches markets throughout the world.

Type of Development

The development around IAD is mixed-use: residential, office, retail, and light industrial. Potential tenants and economic development officials feel that the quantity and diversity of residential development is a positive factor, as companies are drawn by the availability of housing for workers. The tenants are drawn by the many high-technology companies located in the area and proximity to federal agencies and the government. Foreign companies are attracted by the availability of international flights at IAD.

It is difficult to estimate the quantity of development occurring in the IAD area. In Loudoun County alone, there are about 14 million square feet of existing commercial and industrial space, with approval for construction of an additional 170 million square feet, which is more than the District of Columbia and Arlington combined. Of the 14,000 acres zoned for business in Loudoun County in 1987, 9,000 were adjacent to the airport and its freeway corridors.

Timing of Development

Before the opening of IAD in the early 1960s, the area was farmland. Sterling Park, which was the first residential development to take advantage of the location, was developed in the 1960s. Many of the projects that have become the foundation of eastern Loudoun county's growth (e.g., Ashburn Village, Ashburn Farm, South Riding, etc.) were put together in the mid-1980s. Residential development, such as Reston in Fairfax County (between Loudoun and the Beltway), occurred about ten years before the current residential development in Loudoun. Generally speaking, the suburbs have grown out to meet the airport, although development/redevelopment in the close-in suburbs (e.g., Arlington County) and the District lags behind that of Fairfax and Loudoun.

Placement

Located approximately 26 miles west of Washington, D.C., the site chosen for the airport was farmland in Fairfax and Loudoun Counties, Virginia. For several years, many Washingtonians considered Dulles to be a "white elephant," isolated 12 miles off the Beltway. The suburbs of Washington, D.C. have grown out to encompass the airport. The airport, to some degree, has pulled development in its direction, although many D.C. suburbs have experienced significant development over the same time period.

Development Impacts

IAD is considered to have a major economic impact on the surrounding region. While the airport employs over 15,000 people, an additional 60,000 jobs are created by the impact that the airport brings to the region, as shown in **Table 14.4**.

The wages of the employment associated with and related to the airport contribute almost $2.0 billion to the local economy. The impact on business revenue is estimated to be $6.1 billion. IAD also has an important impact on state and local tax revenues by contributing $413 million.

Factors Driving Catalytic Development

Development in the IAD area is drawn by multiple factors, including infrastructure, airport access, and available land. Nevertheless, development in the IAD area languished for many years. Local, community-based groups have been instrumental in attracting businesses and air service to the IAD area. The county economic development authorities for Fairfax and Loudoun have also actively promoted the region both domestically and internationally.

Table 14.4

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

IAD Economic Impacts (1998)

Type of Impact	IAD
Employment	
Direct	15,481
Induced	8,115
Indirect	4,292
Visitor Industry	47,981
Total	75,869
Wages	
Direct	$548,000,000
Indirect	$444,000,000
Visitor Industry	$998,000,000
Total	$1,990,000,000
Business Revenue	
Direct	$4,125,000,000
Visitor Industry	$1,989,000,000
Total	$6,114,000,000
State and Local Tax Revenues	
Direct	$136,000,000
Visitor Industry	$277,000,000
Total	$413,000,000

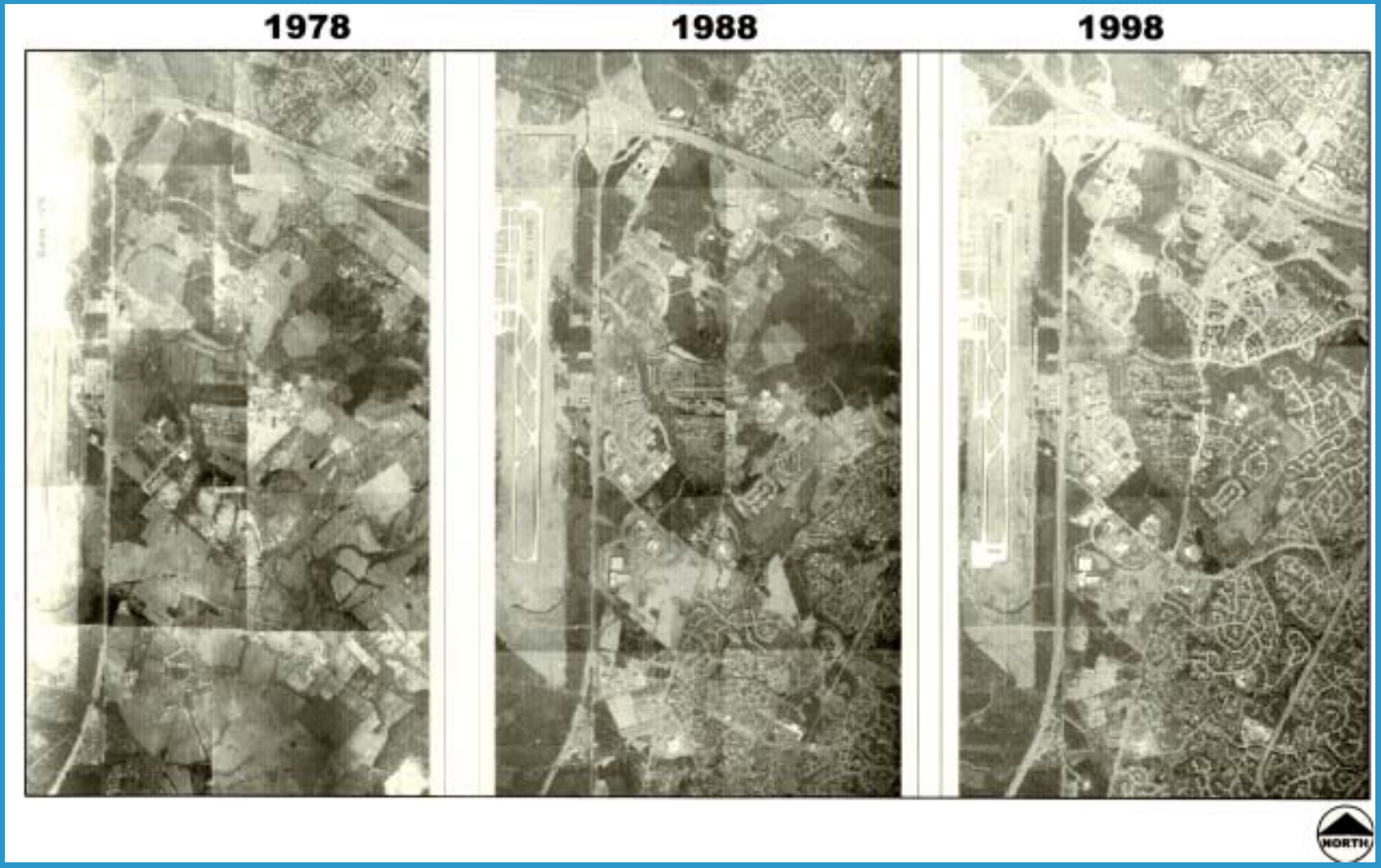
Source: Metropolitan Washington Airports Authority.

Infrastructure, including utilities and roads, has played an important role in the attractiveness of the area. In the beginning, the sewer line underneath IAD was more vital for developers than the runways and terminal. The line ran northward to the Potomac River and was big enough to service thousands of new houses in eastern Loudoun County. When IAD was built, it was connected to the Washington area by a 23-mile access road. Access roads, including the Dulles Greenway, the Dulles Toll Road, I-66, and an improved Route 28, pave the way for development in Fairfax and Loudoun Counties, as depicted in **Figure 14-5**. A special tax financed the expansion of Route 28 to six lanes.

Many of the companies building in the Dulles area are attracted by the ability to have a campus-style development. High-tech companies are attracted to campuses for

Washington Dulles International Airport

FIGURE 14-5



technical, financial, and lifestyle reasons. The facility is easier to control and costs less, particularly for companies such as MCI WorldCom and America OnLine that own their own campuses.

14.3 LESSONS FROM CASE STUDIES

Research into economic development around airports indicates that some characteristics of successful development can be predicted while others cannot. Furthermore, the research indicates that certain steps may be undertaken to influence the development outcomes.

14.3.1 Predictable Characteristics

The following characteristics have proven predictable with regard to initial development around new airports:

- If an airport is located in line with existing growth (e.g., radiating from the central business district), speculative development (e.g., multiple-tenant offices) occurs much later. The first series of developments is usually owner-occupied and owner-financed (e.g., a build-to-suit warehouse) if growth is not toward an airport.

- A correlation exists between the volume and range of airport activity and the magnitude and type of development. For example, international service may help drive a multi-national corporate presence or other high-end commercial uses.

- A specific sequencing of development also occurs: lodging, single-user (owner-financed) commercial buildings, small speculative buildings, large speculative buildings, and restaurants and retail.

- Based on the size of commercial-industrial parks at similar airports, the range of land developed around a new airport in eastern Virginia is estimated to be between 1,000 and 3,000 acres.

14.3.2 Non-Predictable Characteristics

The rate and volume of development are influenced by many determinants other than the existence of an airport. These determinants include such macro-economic factors as inflation, interest rates, demographic trends, regional economic strength as well as the relative health of target industries, the direction of development, suitability of infrastructure, and promotion of the airport.

The case studies indicate that it is difficult to accurately predict the rate of development. For example, in 1979, five years after the opening of DFW, less than 500,000 square feet of industrial space had been built. By 1987, more than 12 million square feet of space had been built. IAD was built in the early 1960s and most of the major mixed-use development was not initiated until the early 1980s. Development has taken off in the area surrounding MCI, which was built in the early 1970s, but only in the last ten years.

Likewise, many hotels were built in the vicinity of DFW when it opened in 1974. Few hotels, however, were built around Pittsburgh's new passenger terminal in 1988. While not a greenfield airport, this terminal was built in a different section of the airfield than the previous terminal. The absence of significant new catalytic growth at Pittsburgh may demonstrate that a new terminal and/or terminal location is insufficient to generate catalytic development, while an entirely new airport can generate significant catalytic development, given proper planning and marketing.

14.3.3 Factors Driving Catalytic Development

Despite the difficulty in predicting some development characteristics, airport sponsors nevertheless have the potential to influence the rate, volume, type, and location of on-airport and surrounding catalytic development. Land-use and strategic planning in the early stages of airport planning allow for the creation of desired catalytic outcomes when the airport is constructed. Infrastructure (e.g., road access and utilities) is an important factor in each of the case studies. Airport-environ development has also been strongly influenced by sustained, public and private marketing of the environs.

The airport sponsor and adjoining jurisdictions must work together to attract development near an airport site, particularly if it is not in the direction of development or is remote from current development; however, substantial financial incentives may not be required. These parties should anticipate the development to occur in a relatively established sequence (i.e., lodging, non-speculative commercial, speculative commercial, and retail/restaurant).

Land-use planning should be implemented by affected jurisdictions to attract initial development and ensure subsequent growth. Mixed-use (i.e., residential, commercial, retail) is desired by potential tenants at the airport site, as affordable housing enables commercial entities to attract and retain labor. Land-use planning would also enable the sponsor and/or municipalities to determine the quality and image they wish to attain, while protecting the airport from unwanted encroachment and future constraints or noise issues.

Such factors are important to the Commonwealth of Virginia as it continues its airport system planning. The proposed new airport search area, while located in the direction of development for Hampton Roads, is somewhat remote from current development. Promotional activities will need to be undertaken if the future sponsor and adjoining jurisdictions wish to nurture and control the development process. The planned road access improvements to Highway 460 will be beneficial in providing necessary access to tenants in the airport environs. Proper land-use planning at this stage will help enable development that generates the most benefits to the local community. Given the size of commercial-industrial parks at similar airports, the range of land developed around a new airport is estimated to be between 1,000 and 3,000 acres. Public and private organizations in the Denver area have performed some of the seminal research on the topic and are actively implementing their findings. Over the next few decades, it will be interesting to note if they are able to avoid some of the difficulties faced by other localities.

14.4 ECONOMIC IMPACT MODELING

With data entry assistance from the Hampton Roads Planning District Commission (HRPDC), the Impact Analysis for Planning (IMPLAN) model was used to determine the economic effects of developing a new airport. Economic impacts from the following four primary sources were modeled:

1. New construction.

2. Airport activity (passenger enplanements).

3. Redevelopment of existing airports.

4. Catalytic development.

For each airport, passenger catchment areas were used to model economic impacts, as described below. The following sections identify the key assumptions used for economic impact sources 2 through 4.

14.4.1 Counties Used in the Model

For the new airport, the traditional catchment area of a 50-mile radius was used. Counties with economic impacts are listed in **Table 14.5**.

Nine counties in northeastern North Carolina, which are located within the 50-mile radius, were not included in the economic impact model to limit the benefits to Virginia only.

The economic impact counties used for PHF were identified as the airport's catchment area in the May 1997 Master Plan, pages 3-9 and 3-12, as follows:

Northern Neck Planning District (PDC 17)

- Lancaster County
- Northumberland County

Middle Peninsula Planning District (PDC 18)

- Gloucester County
- Matthews County
- Middlesex County

Crater Planning District (PDC 19)

- Surry County

Table 14.5

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Economic Impact Counties for the New Airport

Charles City	Chesapeake	Chesterfield
Dinwiddie	Franklin City	Gloucester
Greensville	Hampton	Henrico
Isle of Wight	James City	Matthews
New Kent	Newport News	Norfolk
Poquoson	Portsmouth	Prince George
Southampton	Suffolk	Surry
Sussex	Virginia Beach	Williamsburg
York		

Note: Counties within 50 miles of new airport search region.

Hampton Roads Planning District (PDC 23)

- Isle of Wight County
- Hampton City
- Newport News City
- Portsmouth City
- Suffolk City
- James City County
- Williamsburg City
- York County
- Poquoson City

Plus (Linear Hub and Connecting Scenario)

- Chesapeake City
- Norfolk City
- Virginia Beach City

For ORF, the July 1995 Master Plan Update Supplemental Studies identified the following six cities that immediately surround the airport in its economic impact zone:

- Norfolk
- Hampton
- Chesapeake
- Portsmouth
- Newport News
- Virginia Beach

To provide more consistency with the counties used for Newport News, the following cities/counties were also treated as impacted by ORF:

- Surry County
- Isle of Wight County
- Suffolk City
- James City County
- Williamsburg City
- York County
- Poquoson City

For RIC, the traditional catchment area of a 50-mile radius was used. Counties with economic impacts, listed in **Table 14.6**, are the same as those identified as the Richmond-Petersburg Metropolitan Area in the Master Plan Update Draft Report, July 1996, page II-11, plus several others to fill the 50-mile radius airport catchment area.

Table 14.6

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Economic Impact Counties for Richmond International Airport

Amelia	Caroline	Charles City
Chesterfield	Colonial Heights City	Dinwiddie
Essex	Gloucester	Goochland
Hanover	Henrico	Hopewell City
James City	King and Queen	Lancaster
Middlesex	New Kent	Petersburg City
Powhatan	Prince George	Richmond City
Richmond County	Surry	Sussex
Williamsburg City		

Note: Counties within 50-mile radius of Richmond International Airport

A matrix was constructed to develop scenarios for each airport to be run through the IMPLAN model, as shown in **Table 14.7**.

Base and High refer to the study's forecasts in which no-hubbing and hubbing are assumed, respectively. Appropriate impact areas were used for the scenarios in each column. In every scenario, assumptions were based on the year 2030.

For the construction scenarios, dollar amounts were run through the IMPLAN model. For the enplanement, redevelopment, and catalytic development scenarios, jobs were estimated and run through the IMPLAN model.

14.4.2 Enplanement Assumptions

As shown in **Tables 14.8 and 14.9**, enplanements were based on the most recent study projections. For the three-airport and base (no-hubbing) scenarios, enplanements per job were assumed to be 120. For the high (hubbing) scenarios, enplanements per job were assumed to be 130. Enplanements per job are higher in a hubbing scenario because connecting passengers do not generate as much economic activity (and therefore jobs) as origination and destination passengers. Ratios were derived from data in *The Economic Impact of Aviation in the Commonwealth of Virginia*, December 1996. For the three-airport system, enplanements were the same in both the base and high scenarios; therefore, only the 120-enplanement-per-job ratio was used.

14.4.3 Redevelopment Assumptions

To account for redevelopment, the following assumptions were used in the IMPLAN model:

Approximately one-half of the land at each airport will be redeveloped: 818 acres out of 1,636 acres at PHF and 650 acres out of 1,300 acres at ORF. At PHF, the western portion of the airport, consisting of the existing paved areas, is assumed to be included in the redevelopment to avoid the wetland/water quality issue of the Harwoods Mill Reservoir. The number of jobs from redevelopment was estimated on a per-acre basis using *Trip Generation*, Institute of Transportation Engineers, 1997. The study showed the number of jobs each commercial land use

Table 14.7

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Scenario Matrix

Impact Basis	New Airport	Richmond	Newport News	Norfolk
Construction	1. Base 2. High	Not a variable in comparing airport systems.	12. Base/High	Not a variable in comparing airport systems.
Enplanements	3. Base 4. High	7. Base (RIC-PHF-ORF) 8. Base (RIC-PHF) 9. Base (RIC-new) 10. High (RIC-PHF) 11. High (RIC-new)	13. Base (RIC-PHF-ORF) 14. Base (RIC-PHF) 15. High (RIC-PHF	17. Base (RIC-PHF-ORF)
Redevelopment	Not redeveloped.	Not redeveloped.	16. PHF Redevelopment	ORF Redevelopment
Catalytic Development	5. Low 6. High	Not a variable in comparing airport systems.	Land not available around airport.	Land not available around airport.

Table 14.8

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

2030 Jobs Based on Enplanements: Base Scenario

Base Scenario	Three-Airport Status Quo	Two-Airport RIC+PHF	Two-Airport RIC+NEW
		ENPLANEMENTS	
Richmond	3,545,000	4,247,000	4,859,000
Norfolk	4,310,000	N/A	N/A
Newport News	1,041,000	4,053,000	N/A
New Airport	N/A	N/A	3,116,000
Total	**8,896,000**	**8,300,000**	**7,975,000**
		JOBS	
Richmond	29,542	35,392	40,492
Norfolk	35,917	N/A	N/A
Newport News	8,675	33,775	N/A
New Airport	N/A	N/A	25,967
Total	**74,133**	**69,167**	**66,458**

Source: IMG

Table 14.9

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

2030 Jobs Based on Enplanements: High Scenario

High Scenario	Three-Airport Status Quo	Two-Airport RIC+PHF	Two-Airport RIC+NEW
		ENPLANEMENTS	
Richmond	3,545,000	4,157,000	4,708,000
Norfolk	4,310,000	N/A	N/A
Newport News	1,041,000	6,455,000	N/A
New Airport	N/A	N/A	4,914,000
TOTAL	**8,896,000**	**10,612,000**	**9,622,000**
		JOBS	
Richmond	29,542	31,977	36,215
Norfolk	35,917	N/A	N/A
Newport News	8,675	49,654	N/A
New Airport	N/A	N/A	37,800
Total	**74,133**	**81,631**	**74,015**

Source: IMG

can support. The gross number of jobs per acre of redeveloped airport land was averaged from six categories, as shown in **Table 14.10**.

Table 14.10

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Jobs Per Acre

Industry Sector	**Jobs per acre**
Light Industrial	17
Heavy Industrial	8
Industrial park	19
Warehousing	15
Office park	56
Business park	38
Average:	**25.5**

Source: Institute of Transportation Engineers, 1997

14.4.4 Catalytic Development Assumptions

Around the new airport, based on the previously discussed case studies, the potential for catalytic development was assumed to range between 1,000 acres and 3,000 acres.

The highest density of development would likely occur within five miles of the new airport. The same number of jobs per acre (25.5) was assumed as in the redevelopment scenarios for the existing airports.

No assumption was made for further catalytic development around the airports at PHF and ORF, given the lack of available developable land.

14.4.5 Distribution of Jobs Among Industries

Once jobs were derived for each scenario, they were distributed among industries on the basis of observations of businesses at airports in Atlanta, Dallas, Denver, and Kansas City (Townsend, *Ready for Takeoff: The Business Impact of Three Recent Airport Developments in the U.S.*, 1989). Job distribution averages are shown in **Table 14.11**.

14.5 RESULTS

Each scenario yielded results in the following five categories:

- Jobs
- Labor income
- Total value added
- Output
- State tax

With the exception of state tax, direct, indirect, and induced impacts were totaled. Labor Income is the sum of employee compensation and proprietor income. Proprietor income consists of payments received by self-employed individuals as income. Value Added is the sale price of a product minus the cost of materials purchased to produce the product. Output is the value of production or sales coming from all of the industries in the impacted area. Tax is the total of Virginia state and local government tax receipts for corporate and personal, but not education, taxes.

Table 14.12 summarizes the outputs for each scenario. As shown in **Table 14.13**, scenarios were then aggregated to reflect combinations of economic impacts for individual airports. For example, if the two-airport system comprising RIC and PHF were selected, the economic impacts for PHF result from enplanements (Scenario 14: Base) and new construction (Scenario 12).

As shown in **Table 14.14**, scenarios were also aggregated to reflect combinations of economic impacts for airport systems. For example, the low end of the range of economic impacts for a two-airport system

Table 14.11

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Distribution of Jobs Among Industries

SIC Code	Industry Description	A Ave # Biz	B Job/Biz	A*B Ave Jobs	0.00%
7	Agricultural Services	1.7	8.3	13.8	0.08%
15	General Building Contractors	8.5	7.6	64.6	0.36%
16	Heavy Construction, Except Bldg	3.5	22.2	77.7	0.43%
17	Special Trade Contractors	9.0	10	90.0	0.50%
20	Food & Kindred Products	4.0	110.7	442.8	2.45%
26	Paper & Allied Products	3.7	295.5	1,083.5	6.00%
27	Printing & Publishing	11.0	30.7	337.7	1.87%
28	Chemicals & Allied Products	5.8	34	195.5	1.08%
30	Rubber & Misc. Plastics	4.3	38	161.5	0.89%
32	Stone, Clay, & Glass	2.0	10	20.0	0.11%
35	Industrial Machinery & Equip.	6.8	50.8	342.9	1.90%
36	Electronic & Other Equip.	7.5	50.5	378.8	2.10%
37	Transportation Equip.	4.0	262.2	1,048.8	5.81%
38	Instruments & Related Products	6.7	26.8	178.7	0.99%
42	Trucking & Warehousing	13.3	13.8	184.0	1.02%
45	Transportation by Air	38.5	50.4	1,940.4	10.75%
47	Transportation Services	35.8	8.9	318.2	1.76%
48	Communications	13.3	29.7	393.5	2.18%
49	Electric, Gas, & Sanitary	4.7	40	186.7	1.03%
50	Wholesale Trade – Non-durable	127.0	11.6	1,473.2	8.16%
51	Wholesale Trade - Durable	50.0	15.9	795.0	4.40%
52	Building Materials & Garden	3.0	20.3	60.9	0.34%
53	General Merchandise Stores	7.0	64.8	453.6	2.51%
54	Food Stores	4.0	20.3	81.2	0.45%
56	Apparel & Accessory Stores	6.3	9.9	61.9	0.34%
57	Furniture & Home Furnishing Stores	1.0	10.3	10.3	0.06%
59	Miscellaneous Retail	3.3	11.7	39.0	0.22%
60	Depository Institution	12.0	21.7	260.4	1.44%
62	Security and Commodity Brokers	6.0	9.8	58.8	0.33%
63	Insurance Carriers	6.0	14.7	88.2	0.49%
64	Insurance Agents, Brokers	5.8	4.2	24.2	0.13%
65	Real Estate	7.5	8.1	60.8	0.34%
70	Hotels & Motels	20.3	41.7	847.9	4.70%
58	Eating & Drinking Places	16.8	24.3	407.0	2.25%
72	Personal Services	24.0	4.0	96.0	0.53%
73	Business Services	9.7	24.8	239.7	1.33%
55	Automotive Dealers & Service Stations	79.3	50.1	3,970.4	21.99%
75	Auto Repair, Parking	22.3	7.2	160.8	0.89%
76	Miscellaneous Repair	5.8	6.7	38.5	0.21%
78/79	Motion Pictures, Amusement	7.0	40.5	283.5	1.57%
80	Health	18.3	24.7	452.8	2.51%
81	Legal	8.0	7.0	56.0	0.31%
82	Educational Services	4.0	37.3	149.2	0.83%
83	Social Services	2.7	17.9	47.7	0.26%
86	Membership Organizations	11.3	11.5	129.4	0.72%
87	Engineering, Management	16.3	15.3	249.9	1.38%
	TOTAL	**668.25**		**18,055.3**	**100.00%**

Table 14.12

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

2030: IMPLAN Outputs per Scenario

Scenario	Jobs	Lab Inc	TVA	Output	VA State Tax
1	18,089	$ 625,093,156	$ 780,007,851	$ 1,640,781,123	$ 41,691,972
2	19,701	$ 679,280,908	$ 847,760,748	$ 1,802,782,071	$ 45,913,310
3	46,808	$ 1,657,080,829	$ 2,600,108,874	$ 5,094,420,551	$ 20,986,495
4	68,139	$ 2,412,233,282	$ 3,785,313,216	$ 7,416,331,736	$ 305,491,692
5	45,964	$ 1,627,235,896	$ 2,553,621,264	$ 5,002,905,382	$ 206,090,323
6	137,899	$ 4,881,918,218	$ 7,660,670,414	$ 15,009,290,503	$ 618,225,050
7	53,095	$ 1,953,486,983	$ 3,109,630,035	$ 6,010,208,426	$ 251,846,464
8	63,610	$ 2,340,353,572	$ 3,725,635,331	$ 7,200,716,304	$ 301,757,254
9	72,779	$ 2,677,743,510	$ 4,262,807,087	$ 8,238,726,826	$ 345,271,478
10	57,471	$ 2,114,482,357	$ 3,366,295,732	$ 6,505,835,735	$ 272,666,059
11	65,086	$ 2,394,647,498	$ 3,812,061,599	$ 7,367,774,495	$ 308,764,482
12	10,954	$ 368,822,184	$ 457,718,867	$ 1,031,011,420	$ 27,386,629
13	15,236	$ 528,248,666	$ 836,940,468	$ 1,643,997,878	$ 68,438,480
14	59,299	$ 2,055,846,311	$ 3,257,357,326	$ 6,398,017,072	$ 266,378,040
15	87,182	$ 3,022,505,148	$ 4,788,830,791	$ 9,406,366,175	$ 391,613,327
16	36,633	$ 1,269,994,972	$ 2,012,224,873	$ 3,952,475,697	$ 164,547,781
17	63,034	$ 2,192,887,638	$ 3,474,270,446	$ 6,855,488,884	$ 282,701,042
18	29,085	$ 1,011,861,061	$ 1,603,110,605	$ 3,163,150,090	$ 130,442,456

Table 14.13

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

2030: Economic Impacts on Individual Airports

Scenario	Airport Scenario	Jobs	Labor Income($)	Total Value Added ($)	Output ($)	VA State Tax ($)
			Newport News			
13	Status Quo	15,236	528,248,666	836,940,468	1,643,997,878	68,438,480
12,14	PHF Base	70,253	2,424,668,495	3,715,076,193	7,429,028,492	293,764,669
12,15	PHF High	98,136	3,391,327,332	5,246,549,658	10,437,377,595	418,999,956
16	PHF Redevel	36,633	1,269,994,972	2,012,224,873	3,952,475,697	164,547,781
			Norfolk			
17	Status Quo	63,034	2,192,887,638	3,474,270,446	6,855,488,884	282,701,042
18	ORF Redevel	29,085	1,011,861,061	1,603,110,605	3,163,150,090	130,442,456
			New Airport			
1,3,5	Lowest	110,861	3,909,409,881	5,933,737,989	11,738,107,056	268,768,790
2,4,6	Highest	225,739	7,973,432,408	12,293,744,378	24,228,404,310	969,630,052

Table 14.14

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

2030: Economic Impacts on Individual Airports

Scenarios	Airport Scenario	Jobs	Lab Inc ($)	TVA ($)	Output ($)	VA State Tax ($)
Three-Airport System						
7,13,17	Status Quo	131,365	4,674,623,287	7,420,840,949	14,509,695,188	602,985,986
Two-Airport System: RIC + PHF						
8,12,14,18	Lowest	162,948	5,776,883,128	9,043,822,129	17,792,894,886	725,964,379
10,12,15,18	Highest	190,831	6,743,541,965	10,575,295,594	20,801,243,989	851,199,666
Two-Airport System: RIC + New Airport						
1,3,5,9,16,18	Lowest	249,358	8,869,009,424	13,811,880,554	27,092,459,669	909,030,505
2,4,6,11,16,18	Highest	356,543	12,649,935,939	19,721,141,455	38,711,804,592	1,573,384,771

Note: Scenarios are defined in Table 14.7
Source : IMG

comprising RIC and a new airport is the sum of the following scenarios:

- Base construction – New airport
- Base enplanements – New airport
- Low catalytic development – New airport
- Base enplanements – RIC
- Redevelopment – PHF
- Redevelopment – ORF

While Table 14.14 illustrates the total economic impacts for the study's airport systems, **Table 14.15** identifies the relative source of economic impacts, using jobs as an example. Except for the slight advantage the RIC and PHF system has in generating jobs from passenger activity, the RIC and NEW system demonstrates significant advantages derived from three of the four economic impact sources: construction, redevelopment, and catalytic development.

Table 14.15

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

2030 Jobs: Economic Impact Sources Comparison RIC + PHF versus RIC + NEW

Economic Impact Source	RIC + PHF	RIC + NEW	Difference
Construction	10,954	18,895	7,941
Enplanements	133,781	126,406	(7,375)
Redevelopment	29,085	65,718	36,633
Catalytic Development	-	91,932	91,932
TOTAL	**173,820**	**302,951**	**129,131**

Source: IMG

14.6 ECONOMIC IMPACT CONCLUSIONS

Using mid-points (arithmetic averages) between the range of economic outputs, the two-airport system comprising RIC and a new airport is economically superior to a two-airport system comprising RIC and PHF, providing nearly 75 percent more jobs, labor income, total value added, and economic output. Virginia state and local tax receipts also enjoy a 60 percent advantage, as shown in **Table 14.16**.

This comparison does not account for the following factors:

- Economic impacts of the sales value of existing airport land to be redeveloped.

- Economic impacts of the new airport on the nine counties in northeastern North Carolina.

A brief analysis was performed to estimate the sales value of existing airport land that would be redeveloped under the new airport system.

On the Peninsula, development is occurring in downtown Newport News, Oyster Point Industrial Park, Oakland Industrial Park, and in James City County. James City County has more land available than Newport News for development, at cheaper prices, and with more incentives.

In the South Hampton Roads area, most of the industrial land sites are concentrated along Highways I-664, I-64, and 460, stretching into south Suffolk. The City of Norfolk is actively developing land, including the area between the I-64 interchange and the airport's southern boundary:

- Twin Oaks, an office park selling at $150,000 per acre.

- A hotel on a 3-acre site bought land for $340,000 per acre.

- Norfolk Commerce Park, a 125-acre office and industrial park developed in the mid-1980s, valued now at $125,000 per acre.

A light industrial, 28-acre development near Oakwood Elementary School, valued at $115,000 per acre. Developers are also being drawn to downtown Newport News with incentives from the Commonwealth and city for urban enterprise and technology zones. For example, the Newport News Shipyard moved from the Patrick Henry Mall near the airport to a redesigned warehouse in downtown Newport News.

Using the values above, a rough and very conservative calculation for gross land sales from the redevelopment of the two existing airports is shown in **Table 14.17**.

Table 14.16

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

2030 Economic Impacts: Comparing Airport Systems

Airport System	Jobs	Labor Income ($)	Total Value Added ($)	Output ($)	VA State Tax ($)
Status Quo	131,365	4,674,623,287	7,420,840,949	14,509,695,188	602,985,986
RIC + PHF	173,820	6,147,276,939	9,629,889,062	18,949,629,153	774,036,425
RIC + NEW AIRPORT	302,951	10,759,472,682	16,766,511,005	32,902,132,131	1,241,207,638
RIC + NEW vs. Status Quo (%)	131%	130%	126%	127%	106%
RIC + NEW vs. RIC + PHF (%)	74%	75%	74%	74%	60%

Source: IMG

Table 14.17

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Conservative Gross Land Sales from Redevelopment

PHF acres		1,636
ORF acres		1,300
Total acres		2,936
Times	1/2 developable land	1,468
Times	$110,000 per acre	$161,480,000

Source: IMG

The estimate for gross land sales from redevelopment of half of ORF is $71,500,000, while PHF development is estimated at $89,980,000. These values are not accounted for in the economic impact analysis presented previously.

14.6.1 Conclusion

Based on the foregoing analysis, the two-airport system comprising RIC and a new airport yields superior economic impacts to the Eastern Region and the Commonwealth of Virginia. Therefore, it is recommended that this option be pursued in more detail. Further analysis of financial feasibility and institutional options should be undertaken in subsequent tasks.

14.7 VIRGINIA ECONOMIC DEVELOPMENT PARTNERSHIP

To better understand how public jurisdictions can encourage economic development, the Project team met with the Virginia Economic Development Partnership (VEDP). VEDP is charged with fostering economic growth by facilitating private investment in the state. The agency provided insight into economic trends that the Commonwealth and region face, information regarding what businesses are looking for in new locations, and advantages and disadvantages of the Hampton Roads area to attracting new businesses. VEDP indicated that a new airport located in the southside of Hampton Roads (i.e., the Counties of Southampton, Surry, or Isle of Wight, and the City of Suffolk) would have significant implications for the economy of the whole region, as well as the area around the airport.

In VEDP's experience, air service, particularly international, is essential to further economic development in the Commonwealth. Virginia, beyond the Northern Virginia (Dulles area), is not perceived to have direct access to an international airport. According to the VEDP, many companies seek out areas within a one-hour drive of an international airport. This excludes most of Virginia other than Dulles; however, the Dulles area is becoming increasingly congested and more expensive for businesses.

A new major airport would provide an alternative to Dulles and reduce further congestion in Northern Virginia. It would also improve air service and total travel times (factoring in fewer connections to final destinations) for the Hampton Roads area and, particularly, the Southside. As a result, the new airport could have an important equity effect of spreading the wealth to more Virginians and enhancing economic development in the Commonwealth.

14.7.1 Economy of Virginia

The economy of Virginia represents a blend of the "old" heavy industry and agricultural-based economy, and the "new" high-tech-based economy. Historically, heavy manufacturing, agricultural processing, and agri-

culture have dominated the economy of Virginia. Tobacco remained the most important export in 1999; however, semiconductors and electronics have surpassed coal, which traditionally was the second-leading export. Virginia has become the technology center of the East Coast; it has one of the largest concentrations of information technology, telecommunications, and Internet companies in the world. For example, more than 50 percent of Internet traffic worldwide passes through the state.

The VEDP has noticed trends in state economic development that mirror trends in the global economy, such as the shift toward high-tech and international business. Even traditionally local and domestic businesses are quickly becoming integrated in the global economy, according to the VEDP. Air cargo and logistics are key to this evolving economy, which demands more efficient and faster delivery of supplies and products. The VEDP anticipates that intermodal and e-commerce will increasingly be engines of economic growth for the Port of Virginia (the Port).

Air cargo has an important role, as it is the transportation mode that may best be able to respond to the time demands of e-commerce. Air cargo can be transported as belly freight on passenger flights or on dedicated air cargo carriers.

Hampton Roads is home to over 1.5 million Virginians. The 27th largest MSA in the U.S., Hampton Roads includes the Cities of Chesapeake, Portsmouth, and Suffolk. The Port is the second largest port on the East Coast and has one of best natural harbors in the world. The Port, military, and tourism have traditionally been the backbone of the Hampton Roads' economy.

The Port has grown faster than any other in the country—more than 300 percent since 1982, when several independent ports were unified under one state-sponsored authority. More growth is on the horizon for the Port, and it is significantly expanding its facilities. The Hampton Roads area also has the largest intermodal facility on the East Coast. It has direct-service trains to 30 cities per day, and more than 50 trucking companies operate in Hampton Roads. The region hopes to become a premier intermodal transportation hub and to attract technology- and manufacturing-related jobs.

The thrust of development in Hampton Roads is not on the Peninsula; it is migrating toward the Southside. Development is spreading south from Richmond/Petersburg and west toward Suffolk and Isle of Wight. Distribution companies are moving to the fringes of development (e.g., Franklin, Suffolk). The economy of these counties is more rural, and agriculture remains a major industry. Major agricultural products include peanuts, hogs, and cotton. The area also has timberlands that are regularly harvested. Agricultural and forest product-related plants dominate the industrial base. For example, International Paper owns several pulp and paper facilities located around Franklin in Southampton and Isle of Wight Counties. Smithfield Foods, a major processor of pork products, is located in the region at Smithfield, Isle of Wight County.

A new consolidated-service airport serving the Hampton Roads area could have an important equity effect by providing economic opportunities to a part of the Commonwealth that has traditionally not benefited from the current strong economy.

14.8 BUSINESS SITE SELECTION CRITERIA

Conversations with the VEDP suggest that logistics (including air service), market location, cost, and utilities are determining

factors in site selection. Travel times and market access are the most important factors. Rules-of-thumb in site selection include air access within one hour and direct interstate road access. Businesses are looking at total trip time (from home/office to their destination), not just proximity to an airport.

VEDP feels that these key factors drive site location decisions more than incentives. The Commonwealth of Virginia does not have significant incentives on the books, although the governor may provide discretionary funds that could "seal the deal." According to the VEDP, these discretionary funds often finance community assets or infrastructure that leverage the private investment.

14.8.1 Advantages to Hampton Roads

The Hampton Roads area is attractive to investors for a number of reasons, including the labor force and intermodal transportation facilities. The military provides a constant stream of attractive employees as its personnel leave the service. Due to the military presence, the population is young, with a median age of 30 years. Hampton Roads and the Southside, in particular, can generally boast low wage rates, operating costs, taxes, and energy costs.

The intermodal and port facilities are attractive to businesses concerned with logistics. For example, distribution facilities are particularly drawn to the area surrounding the Port. Large distribution centers for businesses, such as WalMart and QVC, have been attracted to the area.

14.8.2 Disadvantages of Hampton Roads

Ironically, while transportation is a major asset of the Hampton Roads area, it is also an important limiting factor for economic development. The interstate system, I-64, in Hampton Roads' urban areas (the Peninsula and Norfolk/ Chesapeake / Portsmouth / Virginia Beach) is extremely congested, and will continue to be congested with future improvements, particularly at the crossings.

The current level of air service also hinders efforts to attract businesses to the area, as current flight choices and typical layovers require a significant amount of total travel time to destination. VEDP is aware that Southeastern Virginia has been eliminated from several business site selection "competitions" due to lack of direct air service.

Therefore, if a new consolidated airport provided international air service for the Hampton Roads area, was located in/near the identified search region, and had direct access to a new interstate, the area would benefit from enhancing economic development opportunities.

14.9 REVISED FINANCIAL COMPARISONS

This section compares the financial costs of the new airport alternative with the PHF alternative. The purpose of this analysis is to compare the two alternatives using a common set of criteria. These costs supersede those presented in the previous submittal since they include updated capital costs. A more detailed financial analysis, including an examination of alternative financing methods, is developed in a later chapter.

The following assumptions were employed in preparing the comparisons:

- New airport/expanded PHF were assumed to open in 2020.

- New airport/expanded PHF were assumed to be operated by a public entity.

- Inflation was assumed to be 3 percent.

- The AIP, or similar federal funding program, was assumed to be active.

- No AIP entitlements from existing airports were assumed to be applied to the new airport.

- The current PFC program ($3 per enplanement) was assumed to continue.

- No PFC collections from the existing airports were assumed to be applied to the new airport.

- Proceeds from land sales at existing airports, made possible by their new roles, were assumed to be applied to the new airport/expanded PHF alternatives. For the PHF alternative, one-half of the land at ORF was assumed to be sold. For the new airport alternative, one-half of both PHF and ORF was assumed to be sold. The value of the sales was estimated to be $110,000 per acre.

All costs are presented in 1999 dollars. Estimates are provided for the 2020 Base Case, the 2030 Base Case, and the 2030 High Case.

Table 14.18 presents the estimated capital costs for each alternative, broken out by estimated funding source. In this scenario, it is assumed that 20 percent of capital costs will be financed by a combination of FAA entitlement and discretionary funds. Other estimated funding sources are PFCs and proceeds from the sale of existing airport lands. The remainder would need to be funded by General Airport Revenue Bonds (GARBs). **Table 14.19** presents the same information as Table 14.18 but assumes no AIP funding will be available. As shown, the lack of AIP funding significantly increases the funding to be obtained from GARBs.

Table 14.20 presents estimates of operating cost per enplaned passenger (OCPEP) and non-airline revenue per enplaned passenger (NARPEP). In both instances, a composite of local and national averages was obtained by averaging the experience of ORF, RIC, and large and medium hub airports.

Tables 14.21 and 14.22 present estimates of the cost per enplaned passenger (CPEP) for the PHF alternative and the new airport alternative, respectively. The estimates are presented for both the 20 percent AIP funding scenario and zero percent AIP funding scenario. The CPEP estimates are expressed in terms of total passenger costs and passenger costs incurred by the airlines.

Table 14.23 summarizes the airline CPEP estimates. As shown, the 2020 CPEP costs for the new airport alternative are high because of the major up-front costs associated with constructing a new airport. **Table 14.24** summarizes the total annual capital (debt service) and operating costs for each alternative.

Table 14.25 compares the 2030 airline CPEP estimates with existing large and medium hub airports in the United States. As shown, the new airport airline CPEP estimates are higher than all airports except for New York's John F. Kennedy International Airport. The expanded PHF alternative CPEP estimates are higher than all airports except the three New York area airports and DEN.

Table 14.18

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Debt Service With 20 Percent AIP Participation

Alternative	2020	2030	High Forecast 2030
Newport News/Williamsburg			
Annual Enplanements	2,283,000	4,053,000	6,455,000
Total Cost	174,826,000	443,904,000	443,904,000
AIP Eligible	87,225,225	117,436,425	117,436,425
AIP Funded	34,965,200	88,780,800	88,780,800
PFC Eligible	120,884,500	218,777,150	218,777,150
Available PFC Funds	-	35,329,000	48,722,000
PFC Funded	-	35,329,000	48,722,000
Funded from Sales of Airport Land	71,500,000	-	-
GARB Funded	68,360,800	319,794,200	306,401,200
Annual Debt Service	7,852,343	36,733,533	35,195,130
Cumulative Net Debt Service	7,852,343	42,576,413	41,038,011
New Airport			
Annual Enplanements	1,750,000	3,116,000	4,914,000
Total Cost	918,280,000	110,087,500	213,159,200
AIP Eligible	580,063,125	33,099,375	62,019,375
AIP Funded	183,656,000	22,017,500	42,631,840
PFC Eligible	788,267,500	54,282,500	111,042,500
Available PFC Funds	-	27,132,000	37,158,000
PFC Funded	-	27,132,000	37,158,000
Funded from Sales of Airport Land	161,480,000	-	-
GARB Funded	573,144,000	60,938,000	133,369,360
Annual Debt Service	65,834,852	6,999,714	15,319,627
Cumulative Net Debt Service	65,834,852	55,987,027	64,306,940

Sources: HNTB analysis.

Table 14.19

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Debt Service With No AIP Participation

Alternative	2020	2030	High Forecast 2030
Newport News/Williamsburg			
Annual Enplanements	2,283,000	4,053,000	6,455,000
Total Cost	174,826,000	443,904,000	443,904,000
AIP Eligible	87,225,225	117,436,425	117,436,425
AIP Funded	-	-	-
PFC Eligible	120,884,500	218,777,150	218,777,150
Available PFC Funds	-	35,329,000	48,722,000
PFC Funded	-	35,329,000	48,722,000
Funded from Sales of Airport Land	71,500,000	-	-
GARB Funded	103,326,000	408,575,000	395,182,000
Annual Debt Service	11,868,661	46,931,443	45,393,040
Cumulative Net Debt Service	11,868,661	55,762,841	54,224,439
New Airport			
Annual Enplanements	1,750,000	3,116,000	4,914,000
Total Cost	918,280,000	110,087,500	213,159,200
AIP Eligible	580,063,125	33,099,375	62,019,375
AIP Funded	-	-	-
PFC Eligible	788,267,500	54,282,500	111,042,500
Available PFC Funds	-	27,132,000	37,158,000
PFC Funded	-	27,132,000	37,158,000
Funded from Sales of Airport Land	161,480,000	-	-
GARB Funded	756,800,000	82,955,500	176,001,200
Annual Debt Service	86,930,712	9,528,780	20,216,583
Cumulative Net Debt Service	86,930,712	74,213,394	84,901,197

Sources: HNTB analysis.

Table 14.20

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Revised Operating Costs and Non-Airline Revenues Per Passenger

Source	Operating Cost Per Enplaned Passenger (OCPEP)	Non-Airline Revenue Per Enplaned Passenger (NARPEP)
Richmond International Airport	$10.15	$9.14
Norfolk International Airport	$8.87	$8.30
National Average for Medium Hub Airports	$8.65	$6.18
National Average for Small Hub Airports	$10.70	$8.20
Average	$9.59	$7.95

Sources: AAAE Survey of Airport Rates and Charges, Capital Region Airport Commission Biennial Report 1995-1996, Norfolk International Airport Master Plan Update, and HNTB analysis.

Table 14.21

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Estimate of Net Cost Per Enplaned Passenger
Newport News/Williamsburg

	2020	2030 Base	2030 High
	Assumes 20 Percent AIP Funding		
Capital Charge (a)	9,815,000	53,221,000	51,298,000
Operating Cost	21,903,000	38,884,000	61,929,000
Capital and Repair Cost	2,199,000	3,903,000	6,216,000
O&M Reserve	5,924,000	10,517,000	16,749,000
Less: Interest on O& M Reserve	(296,000)	(526,000)	(837,000)
Revenue Requirement	39,545,000	105,999,000	135,355,000
Less: Non-Airline Revenue	18,159,000	32,238,000	51,344,000
Less Interest Income	589,000	3,193,000	3,078,000
Net Revenue Requirement	20,797,000	70,568,000	80,933,000
Enplanements	2,283,000	4,053,000	6,455,000
Airline CPEP	**$9.11**	**$17.41**	**$12.54**
Total CPEP	**$17.06**	**$25.37**	**$20.49**
	Assumes No AIP Funding		
Capital Charge (a)	14,836,000	69,704,000	67,781,000
Operating Cost	21,903,000	38,884,000	61,929,000
Capital and Repair Cost	2,199,000	3,903,000	6,216,000
O&M Reserve	5,924,000	10,517,000	16,749,000
Less: Interest on O& M Reserve	(296,000)	(526,000)	(837,000)
Revenue Requirement	44,566,000	122,482,000	151,838,000
Less: Non-Airline Revenue	18,159,000	32,238,000	51,344,000
Less Interest Income	890,000	4,182,000	4,067,000
Net Revenue Requirement	25,517,000	86,062,000	96,427,000
Enplanements	2,283,000	4,053,000	6,455,000
Airline CPEP	**$11.18**	**$21.23**	**$14.94**
Total CPEP	**$19.13**	**$29.19**	**$22.89**

(a) Includes new debt service, existing debt service and assumes 25 percent coverage. All figures in 1999 dollars.

Source: HNTB analysis.

Table 14.22

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Estimate of Net Cost Per Enplaned Passenger
New Airport

	2020	2030 Base	2030 High
	Assumes 20 Percent AIP Funding		
Capital Charge (a)	82,294,000	69,984,000	80,384,000
Operating Cost	16,789,000	29,895,000	47,144,000
Capital and Repair Cost	1,685,000	3,001,000	4,732,000
O&M Reserve	4,541,000	8,085,000	12,751,000
Less: Interest on O& M Reserve	(227,000)	(404,000)	(638,000)
Revenue Requirement	105,082,000	110,561,000	144,373,000
Less: Non-Airline Revenue	13,920,000	24,785,000	39,087,000
Less Interest Income	4,938,000	4,199,000	4,823,000
Net Revenue Requirement	86,224,000	81,577,000	100,463,000
Enplanements	1,750,000	3,116,000	4,914,000
Airline CPEP	**$49.27**	**$26.18**	**$20.44**
Total CPEP	**$57.23**	**$34.13**	**$28.40**
	Assumes No AIP Funding		
Capital Charge (a)	108,663,000	92,767,000	106,126,000
Operating Cost	16,789,000	29,895,000	47,144,000
Capital and Repair Cost	1,685,000	3,001,000	4,732,000
O&M Reserve	4,541,000	8,085,000	12,751,000
Less: Interest on O& M Reserve	(227,000)	(404,000)	(638,000)
Revenue Requirement	131,451,000	133,344,000	170,115,000
Less: Non-Airline Revenue	13,920,000	24,785,000	39,087,000
Less Interest Income	6,520,000	5,566,000	6,368,000
Net Revenue Requirement	111,011,000	102,993,000	124,660,000
Enplanements	1,750,000	3,116,000	4,914,000
Airline CPEP	**$63.43**	**$33.05**	**$25.37**
Total CPEP	**$71.39**	**$41.01**	**$33.32**

(a) Includes new debt service, existing debt service and assumes 25 percent coverage. All figures in 1999 dollars.

Source: HNTB analysis.

Table 14.23

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Airline Cost Per Enplaned Passenger

Alternative	2020	2030	High Forecast 2030
Newport News/Williamsburg	$9.11	$17.41	$12.54
New Airport	$49.27	$26.18	$20.44

(a) Assumes 20 percent AIP funding.

Source: Tables 14fn.4 through 14fn.5.

Table 14.24

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Annual Operating and Capital Costs

Alternative	2020	2030	High Forecast 2030
Newport News/Williamsburg	$38,956,000	$102,806,000	$132,277,000
New Airport	$100,144,000	$106,362,000	$139,550,000

(a) Assumes 20 percent AIP funding.

Source: Tables 14fn.4 through 14fn.5.

Table 14.25

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Airline Cost Per Enplanement Compared With Other Large and Medium Hub Airports

Airport	1997Airline Costs	1997 Enplanements	Cost Per Enplaned Passenger
JFK	$435,900,000	15,500,000	$28.12
New Airport - 2030 Base			**$26.18**
New Airport - 2030 High			**$20.44**
EWR	$288,800,000	15,500,000	$18.63
Newport News - 2030 Base			**$17.41**
DEN	$292,140,513	17,529,799	$16.67
LGA	$167,500,000	10,800,000	$15.51
Newport News - 2030 High			**$12.54**
ANC	$21,551,573	2,136,783	$10.09
SJC	$44,403,245	5,086,401	$8.73
SNA	$32,756,946	3,819,306	$8.58
AUS	$24,462,985	2,949,169	$8.29
SDF	$14,591,664	1,804,599	$8.09
PBI	$23,490,566	2,917,014	$8.05
ORD	$262,581,167	34,778,738	$7.55
SAN	$53,762,000	7,160,373	$7.51
BUF	$10,943,680	1,576,268	$6.94
ABQ	$22,000,873	3,253,395	$6.76
OAK	$31,760,416	4,703,618	$6.75
HNL	$79,933,689	11,940,173	$6.69
BOS	$83,157,428	12,495,917	$6.65
BNA	$25,254,091	3,816,316	$6.62
PHX	$95,839,233	15,457,000	$6.20
CMH	$20,733,064	3,357,374	$6.18
RDU	$20,000,000	3,360,478	$5.95
TUL	$9,283,000	1,707,235	$5.44
LAX	$160,470,737	29,544,366	$5.43
SFO	$103,893,633	19,555,074	$5.31
ONT	$16,120,650	3,115,782	$5.17
MDW	$23,478,452	4,604,356	$5.10
IAH	$69,165,895	13,590,072	$5.09
TUC	$8,881,325	1,774,927	$5.00
LAS	$74,732,000	15,308,248	$4.88
REN	$17,329,712	3,562,174	$4.86
OMA	$8,649,252	1,782,213	$4.85
SAT	$16,520,736	3,484,141	$4.74
PVD	$9,316,480	2,036,648	$4.57
BDL	$11,326,824	2,709,069	$4.18
BWI	$29,229,307	6,998,899	$4.18
TPA	$27,873,597	6,703,113	$4.16
HOU	$16,802,385	4,160,669	$4.04
MKE	$10,079,456	2,804,596	$3.59
IND	$12,880,275	3,588,556	$3.59
FLL	$21,714,000	6,088,242	$3.57
STL	$47,364,983	13,572,732	$3.49
SLC	$34,886,371	10,465,996	$3.33
CVG	$31,278,000	10,131,976	$3.09
DFW	$76,852,779	28,317,677	$2.71
MEM	$12,687,625	4,828,150	$2.63
MSP	$39,435,000	15,056,000	$2.62
ELP	$3,459,799	1,633,458	$2.12
BUR	$4,075,551	2,350,362	$1.73
COS	$3,398,906	2,049,190	$1.66
DAL	$4,875,116	3,407,286	$1.43

Source: AAAE Survey of Rates and Charges: 1997-1998 and Table 14fn.6.

There are options for reducing the airline CPEPs. These could include the following:

- Allocating AIP entitlements and PFCs from the existing airports to the new airport.

- Privatizing the new airport, thereby potentially reducing construction and operating costs.

- Investigating innovative ways of increasing concession revenues.

- Capitalizing some of the interest expense to reduce up-front costs.

- Allowing the airlines to finance their own facilities.

- Selling more or all of the existing airport sites that would no longer have a commercial role.

Another factor that is outside the control of the Commonwealth of Virginia is PFC collection levels. If Congress were to increase the upper limit from $3 to $5 or $6, the airline CPEP would be significantly reduced.

Chapter Fifteen
SELECTION OF MOST ADVANTAGEOUS OPTION FOR AIRPORT SYSTEM

The primary goal of this task was to select the preferred airport system based on the results of the analyses presented in Chapter 14. Throughout the Phase II study process, various meetings were conducted with the TAC and the PAC, as well as several briefings to city government and community planning organizations in order to educate them on the possible outcome of this study. This section presents the DOAV recommendation provided to the PAC and the subsequent direction received from the PAC for completion of the study.

15.1 SUMMARY OF PRESENTATION AT PAC MEETING

After completion of Task 14, a PAC meeting was held. The primary focus of the presentation was on the economic impact of a new airport compared with the existing three-airport system, and the catalytic development potential associated with a new airport. As part of the presentation made to the PAC members, several case studies were discussed representing the success of such airports as Washington Dulles International Airport, Denver International Airport, and the new Alliance Airport in Texas. In addition, the discussion focused on the catalytic development that has occurred around these airports and the economic generators the case study airports have become.

15.2 DOAV RECOMMENDATION

Based on the results of the analyses, the DOAV recommendations presented to the PAC called for the completion of the study based on the two-airport systems, consisting of RIC and a new airport located in southeastern Virginia. As a basis for their recommendation, DOAV stressed the following points in reaching its decision.

The two-airport system of RIC and a new airport provides:

- A consolidated market, resulting in improved non-stop air service and a greater ability to attract international service.
- A reduction in total trip time resulting from improved air service.
- Economic impacts resulting in nearly 75 percent more jobs, increased economic activity, and tax revenues.
- A strategic plan for future consideration.

15.3 PAC DIRECTION

After careful consideration of the analysis results, the PAC directed the DOAV to complete the study based on its recommendation: a complete EVASS evaluation of the two-airport system of RIC and a new airport located in the search region. This preferred airport system is evaluated further in the remaining chapters in terms of its financial feasibility, as well as the institutional alternatives and potential sponsors for the development and operation of the new airport.

Chapter Sixteen
FINANCIAL FEASIBILITY ANALYSES

The purpose of this chapter is to analyze the capital costs associated with the preferred plan and to assess the financial feasibility of the plan with respect to the cost of operation to the airports' sponsors and to the airlines. The preferred plan consists of activity at Richmond International Airport (RIC) and a new airport in the search region identified in Chapter 14. Because it is presumed that RIC would continue to operate in its current role, financial feasibility analyses were limited to those for the new airport.

Financial feasibility is a critical element of the EVASS. Given the available funding sources, it is important that the project is affordable to the airport sponsor, to the airlines, and to the passengers and other users. The analyses presented herein contain projections of capital costs by year, operation and maintenance costs, revenues, and estimates of the preferred system's potential impact on airline cost per enplanement and airport cash flow. The financial analysis and the phasing of the development plan were developed together, and the analysis has been developed in increasing detail as the projects have been refined. The methodology, major assumptions, and preliminary results have been discussed with airport officials, and recommendations have been incorporated into this report.

This chapter begins with a description of the assumptions governing recommended capital costs and the phasing of these costs, followed by a discussion and estimate of potential funding sources, including Federal Aviation Administration (FAA) and Commonwealth funds. A cash flow projection identifying future costs and revenues is also included. In addition, alternative financial scenarios are included to explore the impact of changes in the key assumptions. The chapter concludes with a summary and assessment of the financial feasibility of the preferred airport system.

16.1 ASSUMPTIONS

Due to the preliminary nature of this study and the uncertainty involved with planning airport facilities 25 to 35 years into the future, it was essential to develop a comprehensive set of assumptions to govern the financial analyses. This section presents the assumptions that govern the Base Case financial analysis as well as the sensitivity analyses presented later.

All of the assumptions presented herein are (1) very likely to exist at the time of construction and/or operation of a new airport, or (2) conditions that must exist in order for a new airport to be considered. In the latter case, certain assumptions may not, in fact, be considered likely. In the event that any of the assumptions is considered unlikely, the feasibility of the new airport could be impacted from a perspective other than financial feasibility.

Following are the assumptions governing the Base Case:

- A new authority or other sponsor-entity will accept fiscal responsibility for the new airport, Newport News-Williamsburg International Airport (PHF), and Norfolk International Airport (ORF) prior to the opening of the new airport.

This financial analysis will not incorporate all of the details of PHF and ORF; rather, it will assume a certain deficit for each airport (GA airports are not likely to operate at or above break-even). These deficits, in effect, will be treated as an operating expense for the new airport, as these debts would have to be covered prior to debt service. The deficits would, however, be excluded from airline calculations, as it would be unlikely that the airlines at the new airport would pay for this expense**. It must be noted that this chapter does not *recommend* any particular ownership scenario; rather, it asserts that this assumption is required in order for financial analyses to make sense. If this assumption were not realized, the feasibility of the new airport would be greatly reduced (see Chapter 17).**

- All analyses were performed in real, CY 2000 dollars.

- The Base Case forecasts of aviation demand were used for this analysis.

- PHF will continue to function as an airport. ORF could be closed if financial analysis dictates; however, the Base Case of the financial model will show ORF remaining open.

- Construction will begin in 2020, and the airport would open in 2025.

- The AIP, as recently enacted in AIR-21, will continue through 2035. By 2025, the maximum PFC amount will have increased to $7 in real terms. However, the same stipulations regarding loss of entitlements for medium and large airports that implement a $7 PFC will remain.

- Commonwealth funding will be relatively strong. The maximum available participation under current entitlement policy will be realized. Discretionary spending in excess of the maximum entitlement level was assumed.

- Private funding was assumed for certain projects already typically funded that way. Other private funding (e.g., airline-financed terminals) will be addressed in the sensitivity analyses.

- Discretionary funding was assumed to be fairly strong, with levels similar to that obtained by Austin and NW Arkansas. Based on this participation level, total FAA participation is expected to be 20 percent of total project construction costs.

- Bond terms will be 25 years, with an interest rate of 6.5 percent, and financing costs equal to 4 percent of issue face amount.

- The construction budgets presented in Tables 14.1 and 14.2 were modified slightly based on additional data. The total capital cost amount of $918,280,000 in Table 14.1 is now estimated to be $926,582,500, which is an increase of 0.9 percent. These costs are also now defined as CY 2025 costs instead of CY 2020 costs. The total capital cost amount of $1,028,367,500 in Table 14.2 is now estimated to be $1,024,663,750, which is a decrease of 0.4 percent. This figure is now attributable to CY 2035 rather than CY 2030.

- In previous chapters, the underlying assumption regarding capital projects at PHF and ORF is that all Master Plan projects (1997 Master Plan and 1995

Master Plan) would be completed. At this stage of the analysis, certain assumptions can be changed. For this analysis, the Base Case assumed that development at PHF and ORF would be adjusted to meet realistic demand associated with the construction of a new airport. For both facilities, it was assumed that all Stage I, II, and III projects from the Master Plans (current and future updates) would be completed, less any that have already been constructed. Stage IV projects (beyond CY 2015) from the Master Plans would not be completed unless they are critical to the airport's function. This is consistent with the planning assumptions that went into these Master Plans, as Stage IV projects represented an "ultimate build-out," and are not part of the typical 20-year Capital Improvement Program (CIP).

- Activity levels at PHF and ORF will grow according to the three-airport case forecasts through 2024. In 2025 and beyond, activity growth will be according to the system study's Base Case forecasts for the RIC plus new airport forecasts. Given that existing activity levels have probably strayed from PHF and ORF forecasts, some smoothing (adjusting forecasts to grow smoothly between current levels and forecast levels) was done to ensure forecast levels are met by 2025.

- The Base Case financials will estimate required debt service for the new airport, and calculate the required revenue and cost per enplanement to satisfy the debt. Sensitivity analyses will change these assumptions to provide different perspectives.

- Sensitivity analyses were performed for six scenarios.

Assumptions that are added, modified, or eliminated to create alternative scenarios for sensitivity analyses are discussed in their respective sections.

16.2 CAPITAL PROGRAM

The critical assumptions determining the financial feasibility of the preferred airport system are project costs, project priority, funding sources, and the ability of the airport to leverage funding sources by issuing bonds. An important determinant of project feasibility is the year-by-year phasing of construction expenditures. In general, delaying a project provides more time to accumulate funding and enables the airport to exploit the greater bonding capacity in future years. However, project costs tend to increase with delays, and delaying expansion may constrain an airport from generating the revenues it needs to finance the expansion. Also, delays may adversely affect the safety and capacity of the facility. Phasing decisions can, therefore, either positively or negatively affect financial feasibility.

To the extent possible, the phasing of the projects contained herein has been determined by need and demand. Much of this is determined by the requirement of a minimum level of facilities to be in place upon the new airport's date of beneficial occupancy (DBO). In some cases, however, the phasing of projects was delayed in the model because of financial constraints. This is primarily due to the absence of revenues prior to the DBO.

Table 16.1 presents total projected capital improvements, including costs and projected construction years. New airport project construction costs, including airfield, terminal area, GA area, support facilities, air cargo and maintenance, and land

Table 16.1

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

New Airport Capital Improvement Program

	Cost in 1999 Dollars																					
Project Description	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**Total**
I. Airfield																						
Site Preparation [1]	23,100,000																					23,100,000
Utilities	8,394,750																					8,394,750
Runway/Taxiway		90,000,000	90,000,000	60,000,000	60,000,000																	300,000,000
NAVAIDS					8,000,000																	8,000,000
Ongoing Airfield						877,138	1,380,086	1,930,155	2,530,750	3,185,500	3,898,267	4,673,160	6,127,282	7,712,519	9,438,222	11,314,341	13,046,849	14,858,912	15,230,385	15,611,144	16,001,423	127,816,133
*Subtotal - Airfield Area	31,494,750	90,000,000	90,000,000	60,000,000	68,000,000	877,138	1,380,086	1,930,155	2,530,750	3,185,500	3,898,267	4,673,160	6,127,282	7,712,519	9,438,222	11,314,341	13,046,849	14,858,912	15,230,385	15,611,144	16,001,423	467,310,883
																						41.0%
II. Terminal Area																						
Site Preparation [1]	11,550,000																					11,550,000
Utilities	14,391,000																					14,391,000
Terminal Building			19,800,000	19,800,000	19,800,000									13,533,333	13,533,333	13,533,333						100,000,000
Apron Area				4,392,500	4,392,500										2,564,000	2,564,000						13,913,000
Ongoing Terminal						292,379	464,616	656,279	869,069	1,104,820	1,365,508	1,653,264	2,189,315	2,783,206	3,439,918	4,164,817	4,963,688	5,842,758	6,189,760	6,557,371	6,946,814	49,483,582
Subtotal Terminal Area	25,941,000	-	19,800,000	24,192,500	24,192,500	292,379	464,616	656,279	869,069	1,104,820	1,365,508	1,653,264	2,189,315	16,316,539	19,537,251	20,262,151	4,963,688	5,842,758	6,189,760	6,557,371	6,946,814	189,337,582
																						16.6%
III. General Aviation																						
Site Preparation [1]	3,850,000																					3,850,000
Utilities	1,199,250																					1,199,250
Airport Roadways		7,800,000	7,800,000	7,800,000	7,800,000																	31,200,000
Off-Airport Roadways			2,143,667	2,143,667	2,143,667																	6,431,000
Fuel Storage Facilities					4,000,000																	4,000,000
GA Facilities				5,150,000	5,150,000																	10,300,000
Ongoing GA						73,095	113,550	156,796	202,980	252,258	304,790	360,746	467,004	580,378	701,240	829,980	957,071	1,089,997	1,117,247	1,145,178	1,173,808	9,526,115
Subtotal General Aviation	5,049,250	7,800,000	9,943,667	15,093,667	19,093,667	73,095	113,550	156,796	202,980	252,258	304,790	360,746	467,004	580,378	701,240	829,980	957,071	1,089,997	1,117,247	1,145,178	1,173,808	66,506,365
																						5.8%
IV. Support Facilities/Functions																						
Construct ATCT			8,400,000	8,400,000	4,200,000																	21,000,000
ARFF/Maintenance/Support			8,000,000	8,000,000	4,000,000																	20,000,000
Terminal Parking - Grade					7,950,000											5,259,000						13,209,000
Terminal Parking - Structure			11,286,000	11,286,000	11,286,000									7,583,333	7,583,333	7,583,333						56,608,000
Ongoing Support						146,190	231,161	324,908	428,132	541,583	666,069	802,450	1,057,389	1,337,590	1,645,041	1,981,871	2,323,684	2,690,813	2,804,352	2,922,682	3,046,005	22,949,917
Subtotal Support Facilities	-	-	27,686,000	27,686,000	27,436,000	146,190	231,161	324,908	428,132	541,583	666,069	802,450	1,057,389	8,920,923	9,228,374	14,824,205	2,323,684	2,690,813	2,804,352	2,922,682	3,046,005	133,766,917
																						11.7%
V. Air Cargo/Aircraft Maintenance Facilities																						
Air Cargo Building					4,925,000										1,482,000	1,482,000						7,889,000
Air Cargo Apron					2,932,000										882,000	882,000						4,696,000
Ongoing Cargo						73,095	116,986	166,428	221,969	284,203	353,778	431,397	575,364	736,680	917,025	1,118,222	1,289,450	1,468,541	1,505,254	1,542,886	1,581,458	12,382,736
Subtotal Air Cargo Facility	-	-	-	-	7,857,000	73,095	116,986	166,428	221,969	284,203	353,778	431,397	575,364	736,680	3,281,025	3,482,222	1,289,450	1,468,541	1,505,254	1,542,886	1,581,458	24,967,736
																						2.2%
VI. Miscellaneous																						
Land Acquisition, Airport	9,350,000																					9,350,000
Land Acquisition, Non-Airport	17,850,000																					17,850,000
Re-finance ORF/PHF Debt						96,630,455																96,630,455
Wetlands Mitigation					26,560,000	26,560,000	26,560,000	26,560,000	26,560,000													132,800,000
Subtotal Miscellaneous	27,200,000	-	-	-	26,560,000	123,190,455	26,560,000	26,560,000	26,560,000	-	-	-	-	-	-	-	-	-	-	-	-	256,630,455
																						22.5%
Projects TOTAL	89,685,000	97,800,000	147,429,667	126,972,167	173,139,167	124,652,352	28,866,399	29,794,566	30,812,900	5,368,365	6,588,412	7,921,017	10,416,353	34,267,039	42,186,111	50,712,899	22,580,741	25,951,020	26,846,998	27,779,260	28,749,507	1,138,519,938

Source: HNTB analysis.

acquisition and noise mitigation, were calculated by the consulting team and the airport, and are presented previously. Other, ongoing improvements, not incorporated into the construction costs, are included in each category. The amount required to refinance ORF and PHF debt is also included.

As shown in Table 16.1, airfield items account for $467.3 million (41.0 percent of real costs) in 1999 dollars. Terminal area items account for $189.3 million (16.6 percent), and GA and flex area items account for $66.5 million (5.8 percent). Support facilities account for $133.8 million (11.7 percent), and air cargo and aircraft maintenance facilities account for $25.0 million (2.2 percent). Non-construction items, such as land acquisition and wetlands mitigation, account for an additional $256.6 million (22.5 percent) in project costs. The total combined costs are approximately $1.14 billion in current (1999) dollars. The majority of the project costs are scheduled over the first 5 years prior to DBO, with another major increment between 2033 and 2035.

Table 16.2 presents the total capital costs and their associated contingency costs, which are estimated at 10 percent of raw construction costs, and administration, engineering and testing costs, which are estimated at 15 percent. Table 16.2 also inflates the costs from Table 16.1 to current (2000) dollars. With these added costs, the total capital program is estimated at $1.43 billion in real (2000) dollars. These fully loaded costs were used for all subsequent analyses in this study.

16.3 FUNDING SOURCES

Several major sources of revenue can be used to fund the preferred airport system, including PFCs, FAA AIP funds, other FAA funds, Virginia entitlement and discretionary grants, revenue from airlines and other tenants, and the airport's CIP reserve balance. PFCs and airport revenue can be leveraged by issuing bonds.

16.3.1 Federal Funding

The principal anticipated source of federal funding is the AIP, which is funded by a trust fund to which revenues from the passenger ticket tax, cargo waybill tax, and GA fuel fees are contributed. As of this writing, Congress has passed legislation re-authorizing the AIP and has appropriated funding levels higher than previous years. It is assumed that, during the time frame of the preferred airport system, the AIP program (1) will continue in a form comparable to its current form, or (2) will be replaced by another similar program for funding improvements at small hub and non-hub airports.

The AIP program provides entitlement funds, which are based on passenger enplanements, and discretionary funds, which are based on the needs and priorities of the U.S. aviation system. The latest version of the enplanement formula for apportioning entitlement funds provides each primary airport $7.80 for each of the first 50,000 enplaned passengers, $5.20 for each of the next 50,000 passengers, $2.60 for each of the next 400,000 passengers, $0.65 for each of the next 500,000 passengers, and $0.50 for each passenger thereafter. In addition, airports with more than 100 million pounds of landed weight by all-cargo aircraft, or which are primarily air cargo airports, are eligible for cargo entitlements on the basis of their cargo activity. Entitlement funds may be carried over for up to three years.

Table 16.2

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Capital Costs Including Contingencies, A&E Fees and Cost Escalation to Year 2000 dollars

	Cost in Escalated Dollars																					
Project Description	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**Total**
I. Airfield																						
Site Preparation 1	29,453,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29,453,000
Utilities	10,703,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10,703,000
Runway/Taxiway	-	114,750,000	114,750,000	76,500,000	76,500,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	382,500,000
NAVAIDS	-	-	-	-	10,200,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10,200,000
Ongoing Airfield	-	-	-	-	-	1,118,000	1,760,000	2,461,000	3,227,000	4,062,000	4,970,000	5,958,000	7,812,000	9,833,000	12,034,000	14,426,000	16,635,000	18,945,000	19,419,000	19,904,000	20,402,000	162,966,000
Subtotal Airfield	40,156,000	114,750,000	114,750,000	76,500,000	86,700,000	1,118,000	1,760,000	2,461,000	3,227,000	4,062,000	4,970,000	5,958,000	7,812,000	9,833,000	12,034,000	14,426,000	16,635,000	18,945,000	19,419,000	19,904,000	20,402,000	595,822,000
II. Terminal Area																						
Site Preparation 1	14,726,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14,726,000
Utilities	18,349,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18,349,000
Terminal Building	-	-	25,245,000	25,245,000	25,245,000	-	-	-	-	-	-	-	-	17,255,000	17,255,000	17,255,000	-	-	-	-	-	127,500,000
Apron Area	-	-	-	5,600,000	5,600,000	-	-	-	-	-	-	-	-	-	3,269,000	3,269,000	-	-	-	-	-	17,738,000
Ongoing Terminal	-	-	-	-	-	373,000	592,000	837,000	1,108,000	1,409,000	1,741,000	2,108,000	2,791,000	3,549,000	4,386,000	5,310,000	6,329,000	7,450,000	7,892,000	8,361,000	8,857,000	63,093,000
Subtotal Terminal Area	33,075,000	-	25,245,000	30,845,000	30,845,000	373,000	592,000	837,000	1,108,000	1,409,000	1,741,000	2,108,000	2,791,000	20,804,000	24,910,000	25,834,000	6,329,000	7,450,000	7,892,000	8,361,000	8,857,000	241,406,000
III. General Aviation																						
Site Preparation 1	4,909,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,909,000
Utilities	1,529,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,529,000
Airport Roadways	-	9,945,000	9,945,000	9,945,000	9,945,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	39,780,000
Off-Airport Roadways	-	-	2,733,000	2,733,000	2,733,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8,199,000
Fuel Storage Facilities	-	-	-	-	5,100,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,100,000
GA Facilities	-	-	-	6,566,000	6,566,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13,132,000
Ongoing GA	-	-	-	-	-	93,000	145,000	200,000	259,000	322,000	389,000	460,000	595,000	740,000	894,000	1,058,000	1,220,000	1,390,000	1,424,000	1,460,000	1,497,000	12,146,000
Subtotal General Aviation	6,438,000	9,945,000	12,678,000	19,244,000	24,344,000	93,000	145,000	200,000	259,000	322,000	389,000	460,000	595,000	740,000	894,000	1,058,000	1,220,000	1,390,000	1,424,000	1,460,000	1,497,000	84,795,000
IV. Support Facilities																						
Construct ATCT	-	-	10,710,000	10,710,000	5,355,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26,775,000
ARFF/Maintenance/Support	-	-	10,200,000	10,200,000	5,100,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25,500,000
Terminal Parking - Grade	-	-	-	-	10,136,000	-	-	-	-	-	-	-	-	-	-	6,705,000	-	-	-	-	-	16,841,000
Terminal Parking - Structure	-	-	14,390,000	14,390,000	14,390,000	-	-	-	-	-	-	-	-	9,669,000	9,669,000	9,669,000	-	-	-	-	-	72,177,000
Ongoing Support	-	-	-	-	-	186,000	295,000	414,000	546,000	691,000	849,000	1,023,000	1,348,000	1,705,000	2,097,000	2,527,000	2,963,000	3,431,000	3,576,000	3,726,000	3,884,000	29,261,000
Subtotal Support Facilities	-	-	35,300,000	35,300,000	34,981,000	186,000	295,000	414,000	546,000	691,000	849,000	1,023,000	1,348,000	11,374,000	11,766,000	18,901,000	2,963,000	3,431,000	3,576,000	3,726,000	3,884,000	170,554,000
V. Air Cargo/Aircraft Maintenance Facilities																						
Air Cargo Building	-	-	-	-	6,279,000	-	-	-	-	-	-	-	-	-	1,890,000	1,890,000	-	-	-	-	-	10,059,000
Air Cargo Apron	-	-	-	-	3,738,000	-	-	-	-	-	-	-	-	-	1,125,000	1,125,000	-	-	-	-	-	5,988,000
Ongoing Cargo	-	-	-	-	-	93,000	149,000	212,000	283,000	362,000	451,000	550,000	734,000	939,000	1,169,000	1,426,000	1,644,000	1,872,000	1,919,000	1,967,000	2,016,000	15,786,000
Subtotal Air Cargo Facility	-	-	-	-	10,017,000	93,000	149,000	212,000	283,000	362,000	451,000	550,000	734,000	939,000	4,184,000	4,441,000	1,644,000	1,872,000	1,919,000	1,967,000	2,016,000	31,833,000
VI. Miscellaneous																						
Land Acquisition, Airport	11,921,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11,921,000
Land Acquisition, Non-Airport	22,759,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22,759,000
Re-finance ORF/PHF Debt						98,563,064																98,563,064
Wetlands Mitigation	-	-	-	-	33,864,000	33,864,000	33,864,000	33,864,000	33,864,000	-	-	-	-	-	-	-	-	-	-	-	-	169,320,000
Subtotal Miscellaneous	34,680,000	-	-	-	33,864,000	132,427,064	33,864,000	33,864,000	33,864,000	-	-	-	-	-	-	-	-	-	-	-	-	302,563,064
Grand Total	114,349,000	124,695,000	187,973,000	161,889,000	220,751,000	134,290,064	36,805,000	37,988,000	39,287,000	6,846,000	8,400,000	10,099,000	13,280,000	43,690,000	53,788,000	64,660,000	28,791,000	33,088,000	34,230,000	35,418,000	36,656,000	1,426,973,064
Cost Escalation Factor (X percent per year)	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	

Sources: Table 16.1 and HNTB analysis.

In general, airfield, public ground access, and public non-revenue-generating terminal improvements are eligible for AIP funding. The FAA will fund 90 percent of the cost of approved projects, with the remaining 10 percent funded by local or state sources. It should be noted, however, that the demand for AIP funding usually exceeds the available appropriation. Therefore, eligibility does not guarantee approval, especially for projects that require discretionary funding.

To account for this phenomenon, it was necessary to estimate the level of federal participation in the construction of the new airport. Participation will be dependent, in part, upon the total capital budget and the project eligibility. Based on comparisons to other new airports such as Denver International and Northwest Arkansas Regional, it was conservatively assumed that the *total* federal participation in this project would be 20 percent. Prior to the DBO, this figure would be achieved with discretionary money, while post-DBO funds would include entitlement funds.

Table 16.3 presents the estimated AIP and PFC revenue anticipated through 2040. The enplanement forecasts represent the Base Case forecast scenario presented in Chapter 14. AIP passenger entitlement funding is based on the specific formula discussed above. Cargo entitlement funds were assumed to be relatively low, representing some additional conservatism in this analysis. Table 16.3 Estimated Available Passenger Facility Charges and FAA Entitlement Funds

16.3.2 PFC Funding

Table 16.3 presents estimated available PFC revenue. PFCs, at the discretion of the airport and with the approval of the FAA, can be applied to all enplaned revenue passengers (not including frequent flyer passengers), provided the passenger is on one of the first two legs of his or her trip. The charge can be levied in $1 increments up to $7 per enplaned passenger.[11] PFCs may be collected for up to three years before being used, and this collection period can be extended an additional 2 years if the FAA approves a waiver. PFC revenues may be applied to paying debt service on bonds used to fund PFC-eligible projects. Generally, airports prefer to combine PFC bonds with standard revenue bonds to allay rating agency concerns about potential FAA termination of PFC-bonding authority. The projection of PFC revenue in Table 16.3 assumes authority for a $7 per passenger charge and a 4 percent airline administrative fee, attributable to 98 percent of enplaned passengers. It also assumes collections will begin in January 2025.

Airfield, public use roadways, and public non-concession terminal building planning, design, finance, and construction costs are eligible for PFC funding. Except for airline space, costs that are eligible for PFC funding are also typically eligible for AIP funding. Again, it should be noted that actual funding is contingent on availability, and PFC eligibility does not guarantee PFC funding.

16.3.3 State Funding

Capital improvement programs at Virginia airports are funded from the Commonwealth Airport Fund through an annual allocation of funds from the Commonwealth Transportation Board to the Virginia Aviation Board (VAB). The Code of Virginia specifies that the Commonwealth Airport Funds shall be allocated to airports on the basis of their classification. It stipulates that a portion of

[11] Currently, legislation has established the maximum PFC to be $4.50 per segment. This analysis assumes that, by 2025, this figure will have increased to $7 in real terms.

Table 16.3

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Estimated Available Passenger Facility Charges and FAA Entitlement Funds

Calendar Year	Enplanements (a)	Estimated PFC Collections (b)	Fiscal Year (c)	Estimated Passenger Entitlements (d)	Estimated Cargo Entitlements (e)
2020	-	-	2022	-	
2021	-	-	2023	-	
2022	-	-	2024	-	
2023	-	-	2025	-	
2024	-	-	2026	-	
2025	2,335,166	15,378,469	2027	2,682,583	100,000
2026	2,473,852	16,291,799	2028	2,751,926	104,000
2027	2,620,774	17,259,372	2029	2,825,387	108,160
2028	2,776,423	18,284,409	2030	2,903,211	112,486
2029	2,941,315	19,370,323	2031	2,985,657	116,986
2030	3,116,000	20,520,730	2032	3,073,000	121,665
2031	3,301,060	21,739,459	2033	3,165,530	126,532
2032	3,497,110	23,030,570	2034	3,263,555	131,593
2033	3,704,804	24,398,359	2035	3,367,402	136,857
2034	3,924,833	25,847,382	2036	3,477,417	142,331
2035	4,157,930	27,382,462	2037	3,593,965	148,024
2036	4,404,870	29,008,711	2038	3,717,435	153,945
2037	4,666,476	30,731,544	2039	3,848,238	160,103
2038	4,943,619	32,556,696	2040	3,986,809	166,507
2039	5,237,221	34,490,243	2041	4,133,611	173,168
2040	5,548,261	36,538,625	2042	4,289,130	180,094

(a) Table 14.2.
(b) Assumes collection of $7 per enplaned passenger, at 98 percent collection rate less 4 percent administration fee to airlines.
(c) Federal fiscal year ending September 30.
(d) Assumes existing passenger entitlement formula continues throughout the forecast period.
(e) Assumes minimal cargo entitlements would be available throughout the forecast period.

Sources: As noted and HNTB analysis.

the Commonwealth Airport Fund shall be allocated to air carrier airports as entitlement funds based on each airport's enplanements as a percentage of all air carrier enplanements during the previous calendar year. The Code of Virginia further specifies that no air carrier airport shall receive neither less than $50,000 nor more than $2 million per year in entitlement funds. The remaining portion shall be allocated at the discretion of the Board for air carrier, reliever, and GA airports. The Virginia Air Transportation System Plan defines airport classification. This program generally covers airport projects such as environmental assessments, master plan and airport layout studies, land acquisition, terminal buildings, new airports, and improvements to runways, taxiways, and aprons.

The Commonwealth may participate financially with an airport sponsor either as part of a federally funded or non-federally funded project. The Appropriations Act of the Code of Virginia specifies that legislative intent is for the Commonwealth to match federal funds to the maximum extent possible. Therefore, the Commonwealth participates at the rate of 80 percent of the non-federal share of the project cost. Federally funded projects are funded with 90 percent federal, 8 percent state, and 2 percent local shares. When an airport sponsor is not eligible for federal funding, or federal funds are not available, the VAB may provide state funding at varying percentages, but generally at a percentage rate of 80 percent of the total eligible project cost.

Due to the limited availability of public funds, and in an attempt to make funding available to as many sponsors as possible, the VAB has placed a limit on an airport sponsor's total annual allocations. No airport may receive an annual allocation totaling more than 25 percent of the current fiscal year's adjusted resources, as determined by the Commonwealth, prior to January 1 of the fiscal year in which the allocation is made. After January 1, this 25 percent limitation is removed for the remainder of the fiscal year.

In an effort to adequately represent the Commonwealth's support of this project (recall this is an assumption for these analyses, and not a fact) while maintaining a conservative approach, it was assumed that the Commonwealth would participate in the construction of the new airport at the maximum level.

Table 16.4 presents the total available funds in the Commonwealth Airport Fund from FY 1989 through FY 2001. Commonwealth law dictates that no more than 25 percent of this fund can be committed to any one airport in a fiscal year. Also presented is the growth in the United States CPI during the same period. The growth in the Fund over and above the growth in the CPI during the same period represents the real growth in the Fund for that period. It was assumed that the Fund would continue to grow at this real rate (2.2 percent) through 2040. With this assumption, Table 16.4 presents the projected levels of the Commonwealth Airport Fund and, based on a 25 percent maximum per airport, the projected funding available to the new airport.

16.3.4 Other Funding

Some facilities generate revenue for private operators and are therefore not eligible for federal funding assistance and have limited state-funding eligibility. If these facilities are capable of generating sufficient revenue to offset financing and operating costs, they can be candidates for private financing from a third-party developer. The most likely

Table 16.4

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Projection of Commonwealth Airport Fund

Year	Total Available VA Funds	Annual Growth	CPI (Index = 1982-84)	Annual Growth
1989	$ 10,047,075		122.7	
1990	$ 12,033,015	19.8%	129.0	5.1%
1991	$ 10,524,616	-12.5%	134.8	4.5%
1992	$ 10,553,656	0.3%	137.2	1.8%
1993	$ 11,578,051	9.7%	141.2	2.9%
1994	$ 12,330,831	6.5%	144.7	2.5%
1995	$ 12,108,500	-1.8%	148.8	2.8%
1996	$ 13,514,239	11.6%	153.0	2.8%
1997	$ 14,339,954	6.1%	156.9	2.5%
1998	$ 14,396,642	0.4%	159.1	1.4%
1999	$ 15,146,951	5.2%	162.2	1.9%
2000	$ 16,407,333	8.3%	166.6	2.7%
2001	$ 18,152,731	10.6%	170.6	2.4%
12-Year Rate		5.1%		2.8%
VA Real Growth		**2.2%**		

Year	Projected Commonwealth Airport Fund	New Airport Share	New Airport Funds
2020	$ 27,483,651	25%	$ 6,870,913
2021	$ 28,090,216	25%	$ 7,022,554
2022	$ 28,710,168	25%	$ 7,177,542
2023	$ 29,343,802	25%	$ 7,335,951
2024	$ 29,991,421	25%	$ 7,497,855
2025	$ 30,653,333	25%	$ 7,663,333
2026	$ 31,329,853	25%	$ 7,832,463
2027	$ 32,021,304	25%	$ 8,005,326
2028	$ 32,728,015	25%	$ 8,182,004
2029	$ 33,450,323	25%	$ 8,362,581
2030	$ 34,188,573	25%	$ 8,547,143
2031	$ 34,943,116	25%	$ 8,735,779
2032	$ 35,714,312	25%	$ 8,928,578
2033	$ 36,502,528	25%	$ 9,125,632
2034	$ 37,308,140	25%	$ 9,327,035
2035	$ 38,131,532	25%	$ 9,532,883
2036	$ 38,973,096	25%	$ 9,743,274
2037	$ 39,833,234	25%	$ 9,958,308
2038	$ 40,712,354	25%	$ 10,178,089
2039	$ 41,610,877	25%	$ 10,402,719
2040	$ 42,529,231	25%	$ 10,632,308

Sources: Commonwealth of Virginia
Federal Aviation Administration
HNTB Analysis

candidates for third-party development are fuel farms, rental car facilities, and, in some cases, cargo facilities, parking lots/garages, and terminals. In the Base Case, it was assumed that only the fuel facilities and certain GA facilities would be privately funded during the initial construction period. In the latter half of the planning period, it was assumed that some cargo facilities would be privately funded. Other assumptions of private funding were made for sensitivity analyses, which are discussed later.

16.3.5 Local Funding

Capital costs that remain if costs eligible for federal, state, and other private funding are excluded would need to be funded by the airport. Small projects can be funded from CIP reserves, but a bond issue(s) will be required to finance the bulk of the capital projects.

Principal determinants of bonding capacity are the interest rate and the debt service coverage ratio. This analysis assumes airport revenue bonds with an interest rate of 6.5 percent and a minimum debt service coverage ratio of 1.25. The assumed interest rate is conservative, since airport revenue bond interest rates currently range between 5.5 and 6.0 percent.

16.3.6 Summary of Funding Assumptions

Tables 16.5, 16.6, and 16.7 summarize the capital program by funding source eligibility and assumed funding source. The eligibility assumptions are based on the eligibility criteria for the alternative funding sources and are supplemented with information from the study team. The following assumptions were used in determining the funding source for each project:

- Projects eligible for federal funds were assumed to be funded as such. Total federal funding was estimated to be 20 percent for new construction projects. For ongoing projects, funding was estimated according to the AIP formula for the respective project types. Because this analysis is preliminary, specific project eligibility was not calculated; rather, most projects were assigned 20 percent participation, so that overall federal participation was 20 percent. Because a 20 percent participation rate often resulted in levels greater than available entitlements, some level of discretionary funding was implied.

- Projects eligible for AIP entitlement, PFC, or state entitlement funds were assumed to be financed from these sources to the extent that funds are available. Carry-over options are more limited for AIP entitlements than PFC funds and, in turn, more limited for PFC funds than state entitlements. Therefore, it was assumed that, in any given year, a project would draw from potential funding sources to the extent available in the following order: AIP entitlement, PFC, and state entitlement.

Commonwealth funding was capped at levels presented in Table 16.4. In certain years, this figure was exceeded because funds from other Common-wealth sources (e.g., Department of Transportation highway funds) were determined to be available.

As shown in Table 16.5, the preferred airport system projects, plus the ongoing capital projects, are assumed to be funded from the following sources:

- Federal AIP entitlement/discretionary funding - $422.3 million or 29.6 percent

- PFC funds - $145.1 million or 10.2 percent

Table 16.5

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Projects by Estimated Funding Source (Preliminary): Base Case
(Costs include Escalation for Inflation, Contingencies @ 10 Percent, and Administration, Engineering and Testing @ 15 Percent

			Estimated Eligibility (b)			Estimated Funding (c)				
Project	**Year (a)**	**Total Cost (a)**	**FAA**	**PFC**	**State**	**Composite FAA Funding**	**PFC**	**State**	**Other Private**	**Airport**
I. Airfield										
Site Preparation 1	2020	29,453,000	26,507,700	29,453,000	23,562,400	7,363,250	-	6,870,913	-	15,218,837
Utilities	2020	10,703,000	9,632,700	10,703,000	8,562,400	2,675,750	-	-	-	8,027,250
Runway/Taxiway	2021	114,750,000	103,275,000	114,750,000	91,800,000	33,893,130	-	7,022,554	-	73,834,316
Runway/Taxiway	2022	114,750,000	103,275,000	114,750,000	91,800,000	28,687,500	-	7,177,542	-	78,884,958
Runway/Taxiway	2023	76,500,000	68,850,000	76,500,000	61,200,000	18,360,000	-	7,335,951	-	50,804,049
Runway/Taxiway	2024	76,500,000	68,850,000	76,500,000	61,200,000	18,360,000	-	7,497,855	-	50,642,145
NAVAIDS	2024	10,200,000	10,200,000	10,200,000	8,160,000	2,040,000	-	-	-	8,160,000
Ongoing Airfield	2025	1,118,000	1,006,200	1,118,000	894,400	1,006,200	-	89,440	-	22,360
Ongoing Airfield	2026	1,760,000	1,584,000	1,760,000	1,408,000	1,584,000	-	140,800	-	35,200
Ongoing Airfield	2027	2,461,000	2,214,900	2,461,000	1,968,800	2,214,900	-	196,880	-	49,220
Ongoing Airfield	2028	3,227,000	2,904,300	3,227,000	2,581,600	2,904,300	64,540	258,160	-	-
Ongoing Airfield	2029	4,062,000	3,655,800	4,062,000	3,249,600	3,655,800	81,240	324,960	-	-
Ongoing Airfield	2030	4,970,000	4,473,000	4,970,000	3,976,000	4,473,000	99,400	397,600	-	-
Ongoing Airfield	2031	5,958,000	5,362,200	5,958,000	4,766,400	5,362,200	119,160	476,640	-	-
Ongoing Airfield	2032	7,812,000	7,030,800	7,812,000	6,249,600	7,030,800	156,240	624,960	-	-
Ongoing Airfield	2033	9,833,000	8,849,700	9,833,000	7,866,400	8,849,700	-	786,640	-	196,660
Ongoing Airfield	2034	12,034,000	10,830,600	12,034,000	9,627,200	10,830,600	-	962,720	-	240,680
Ongoing Airfield	2035	14,426,000	12,983,400	14,426,000	11,540,800	12,983,400	-	1,154,080	-	288,520
Ongoing Airfield	2036	16,635,000	14,971,500	16,635,000	13,308,000	14,971,500	332,700	1,330,800	-	-
Ongoing Airfield	2037	18,945,000	17,050,500	18,945,000	15,156,000	17,050,500	378,900	1,515,600	-	-
Ongoing Airfield	2038	19,419,000	17,477,100	19,419,000	15,535,200	17,477,100	388,380	1,553,520	-	-
Ongoing Airfield	2039	19,904,000	17,913,600	19,904,000	15,923,200	17,913,600	398,080	1,592,320	-	-
Ongoing Airfield	2040	20,402,000	18,361,800	20,402,000	16,321,600	18,361,800	408,040	1,632,160	-	-
Subtotal Airfield		595,822,000	537,259,800	595,822,000	476,657,600	258,049,030	2,426,680	48,942,095	-	286,404,195
II. Terminal Area										
Site Preparation 1	2020	14,726,000	7,363,000	14,726,000	11,780,800	2,945,200	-	-	-	11,780,800
Utilities	2020	18,349,000	9,174,500	18,349,000	9,174,500	3,669,800	-	-	-	14,679,200
Terminal Building	2022	25,245,000	12,622,500	20,196,000	12,622,500	5,049,000	-	-	-	20,196,000
Terminal Building	2023	25,245,000	12,622,500	20,196,000	12,622,500	5,049,000	-	-	-	20,196,000
Terminal Building	2024	25,245,000	12,622,500	20,196,000	12,622,500	5,049,000	-	-	-	20,196,000
Terminal Building	2033	17,255,000	8,627,500	13,804,000	8,627,500	1,725,500	7,190,508	8,338,992	-	-
Terminal Building	2034	17,255,000	8,627,500	13,804,000	8,627,500	1,725,500	7,165,185	8,364,315	-	-
Terminal Building	2035	17,255,000	8,627,500	13,804,000	8,627,500	1,725,500	7,150,697	8,378,803	-	-
Apron Area	2023	5,600,000	2,800,000	5,600,000	2,800,000	1,120,000	-	-	-	4,480,000
Apron Area	2024	5,600,000	2,800,000	5,600,000	2,800,000	1,120,000	-	-	-	4,480,000
Apron Area	2034	3,269,000	1,634,500	3,269,000	1,634,500	-	3,269,000	-	-	-
Apron Area	2035	3,269,000	1,634,500	3,269,000	1,634,500	-	3,269,000	-	-	-
Ongoing Terminal	2025	373,000	186,500	279,750	186,500	186,500	37,300	149,200	-	-
Ongoing Terminal	2026	592,000	296,000	444,000	296,000	296,000	59,200	236,800	-	-
Ongoing Terminal	2027	837,000	418,500	627,750	418,500	418,500	83,700	334,800	-	-
Ongoing Terminal	2028	1,108,000	554,000	831,000	554,000	554,000	110,800	443,200	-	-
Ongoing Terminal	2029	1,409,000	704,500	1,056,750	704,500	704,500	140,900	563,600	-	-
Ongoing Terminal	2030	1,741,000	870,500	1,305,750	870,500	870,500	174,100	696,400	-	-
Ongoing Terminal	2031	2,108,000	1,054,000	1,581,000	1,054,000	1,054,000	210,800	843,200	-	-
Ongoing Terminal	2032	2,791,000	1,395,500	2,093,250	1,395,500	1,395,500	279,100	1,116,400	-	-
Ongoing Terminal	2033	3,549,000	1,774,500	2,661,750	1,774,500	1,774,500	1,774,500	-	-	-
Ongoing Terminal	2034	4,386,000	2,193,000	3,289,500	2,193,000	2,193,000	2,193,000	-	-	-
Ongoing Terminal	2035	5,310,000	2,655,000	3,982,500	2,655,000	2,655,000	2,655,000	-	-	-
Ongoing Terminal	2036	6,329,000	3,164,500	4,746,750	3,164,500	3,164,500	632,900	2,531,600	-	-
Ongoing Terminal	2037	7,450,000	3,725,000	5,587,500	3,725,000	3,725,000	745,000	2,980,000	-	-
Ongoing Terminal	2038	7,892,000	3,946,000	5,919,000	3,946,000	3,946,000	789,200	3,156,800	-	-
Ongoing Terminal	2039	8,361,000	4,180,500	6,270,750	4,180,500	4,180,500	836,100	3,344,400	-	-
Ongoing Terminal	2040	8,857,000	4,428,500	6,642,750	4,428,500	4,428,500	885,700	3,542,800	-	-
Subtotal Terminal Area		241,406,000	120,703,000	200,132,750	125,120,800	60,725,000	39,651,690	45,021,310	-	96,008,000
III. General Aviation										
Site Preparation 1	2020	4,909,000	3,681,750	4,909,000	3,927,200	981,800	-	-	-	3,927,200
Utilities	2020	1,529,000	1,146,750	1,529,000	1,223,200	305,800	-	-	-	1,223,200
Airport Roadways	2021	9,945,000	7,458,750	9,945,000	450,000	1,989,000	-	-	-	7,956,000
Airport Roadways	2022	9,945,000	7,458,750	9,945,000	450,000	1,989,000	-	-	-	7,956,000
Airport Roadways	2023	9,945,000	7,458,750	9,945,000	450,000	1,989,000	-	-	-	7,956,000
Airport Roadways	2024	9,945,000	7,458,750	9,945,000	450,000	1,989,000	-	-	-	7,956,000
Off-Airport Roadways	2022	2,733,000	2,049,750	2,733,000	450,000	546,600	-	450,000	-	1,736,400
Off-Airport Roadways	2023	2,733,000	2,049,750	2,733,000	450,000	546,600	-	450,000	-	1,736,400
Off-Airport Roadways	2024	2,733,000	2,049,750	2,733,000	450,000	546,600	-	450,000	-	1,736,400
Fuel Storage Facilities	2024	5,100,000	3,825,000	-	125,000	1,020,000	-	-	4,000,000	80,000
GA Facilities	2023	6,566,000	4,924,500	3,283,000	3,283,000	1,313,200	-	-	1,313,200	3,939,600
GA Facilities	2024	6,566,000	4,924,500	3,283,000	3,283,000	1,313,200	-	-	1,313,200	3,939,600
Ongoing GA	2025	93,000	69,750	46,500	46,500	69,750	4,650	18,600	-	-
Ongoing GA	2026	145,000	108,750	72,500	72,500	108,750	7,250	29,000	-	-
Ongoing GA	2027	200,000	150,000	100,000	100,000	150,000	10,000	40,000	-	-
Ongoing GA	2028	259,000	194,250	129,500	129,500	194,250	12,950	51,800	-	-
Ongoing GA	2029	322,000	241,500	161,000	161,000	241,500	16,100	64,400	-	-
Ongoing GA	2030	389,000	291,750	194,500	194,500	291,750	19,450	77,800	-	-
Ongoing GA	2031	460,000	345,000	230,000	230,000	345,000	23,000	92,000	-	-
Ongoing GA	2032	595,000	446,250	297,500	297,500	446,250	29,750	119,000	-	-
Ongoing GA	2033	740,000	555,000	370,000	370,000	555,000	185,000	-	-	-
Ongoing GA	2034	894,000	670,500	447,000	447,000	670,500	223,500	-	-	-
Ongoing GA	2035	1,058,000	793,500	529,000	529,000	793,500	264,500	-	-	-
Ongoing GA	2036	1,220,000	915,000	610,000	610,000	915,000	-	61,000	244,000	-
Ongoing GA	2037	1,390,000	1,042,500	695,000	695,000	1,042,500	-	69,500	278,000	-
Ongoing GA	2038	1,424,000	1,068,000	712,000	712,000	1,068,000	-	71,200	284,800	-

Table 16.5

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Projects by Estimated Funding Source (Preliminary): Base Case
(Costs include Escalation for Inflation, Contingencies @ 10 Percent, and Administration, Engineering and Testing @ 15 Percent

			Estimated Eligibility (b)			Estimated Funding (c)				
Project	**Year (a)**	**Total Cost (a)**	**FAA**	**PFC**	**State**	**Composite FAA Funding**	**PFC**	**State**	**Other Private**	**Airport**
Ongoing GA	2039	1,460,000	1,095,000	730,000	730,000	1,095,000	-	73,000	292,000	-
Ongoing GA	2040	1,497,000	1,122,750	748,500	748,500	1,122,750	-	74,850	299,400	-
Subtotal General Aviation		84,795,000	63,596,250	67,056,000	21,064,400	23,639,300	796,150	2,192,150	8,024,600	50,142,800
IV. Support Facilities										
Construct ATCT	2022	10,710,000	9,639,000	10,710,000	-	2,142,000	-	-	-	8,568,000
Construct ATCT	2023	10,710,000	9,639,000	10,710,000	-	2,142,000	-	-	-	8,568,000
Construct ATCT	2024	5,355,000	4,819,500	5,355,000	-	1,071,000	-	-	-	4,284,000
ARFF/Maintenance/Support	2022	10,200,000	9,180,000	10,200,000	8,160,000	2,040,000	-	-	-	8,160,000
ARFF/Maintenance/Support	2023	10,200,000	9,180,000	10,200,000	8,160,000	2,040,000	-	-	-	8,160,000
ARFF/Maintenance/Support	2024	5,100,000	4,590,000	5,100,000	4,080,000	1,020,000	-	-	-	4,080,000
Terminal Parking - Grade	2024	10,136,000	-	-	-	2,027,200	-	-	-	8,108,800
Terminal Parking - Grade	2035	6,705,000	-	-	-	-	6,705,000	-	-	-
Terminal Parking - Structure	2022	14,390,000	-	-	-	2,878,000	-	-	-	11,512,000
Terminal Parking - Structure	2023	14,390,000	-	-	-	2,878,000	-	-	-	11,512,000
Terminal Parking - Structure	2024	14,390,000	-	-	-	2,878,000	-	-	-	11,512,000
Terminal Parking - Structure	2033	9,669,000	-	-	-	-	9,669,000	-	-	-
Terminal Parking - Structure	2034	9,669,000	-	-	-	-	9,669,000	-	-	-
Terminal Parking - Structure	2035	9,669,000	-	-	-	-	7,338,265	-	-	2,330,735
Ongoing Support	2025	186,000	139,500	148,800	93,000	139,500	9,300	37,200	-	-
Ongoing Support	2026	295,000	221,250	236,000	147,500	221,250	14,750	59,000	-	-
Ongoing Support	2027	414,000	310,500	331,200	207,000	310,500	20,700	82,800	-	-
Ongoing Support	2028	546,000	409,500	436,800	273,000	409,500	27,300	109,200	-	-
Ongoing Support	2029	691,000	518,250	552,800	345,500	518,250	34,550	138,200	-	-
Ongoing Support	2030	849,000	636,750	679,200	424,500	636,750	42,450	169,800	-	-
Ongoing Support	2031	1,023,000	767,250	818,400	511,500	767,250	51,150	204,600	-	-
Ongoing Support	2032	1,348,000	1,011,000	1,078,400	674,000	1,011,000	67,400	269,600	-	-
Ongoing Support	2033	1,705,000	1,278,750	1,364,000	852,500	1,278,750	426,250	-	-	-
Ongoing Support	2034	2,097,000	1,572,750	1,677,600	1,048,500	1,572,750	524,250	-	-	-
Ongoing Support	2035	2,527,000	1,895,250	2,021,600	1,263,500	1,895,250	-	-	-	631,750
Ongoing Support	2036	2,963,000	2,222,250	2,370,400	1,481,500	2,222,250	148,150	592,600	-	-
Ongoing Support	2037	3,431,000	2,573,250	2,744,800	1,715,500	2,573,250	171,550	686,200	-	-
Ongoing Support	2038	3,576,000	2,682,000	2,860,800	1,788,000	2,682,000	178,800	715,200	-	-
Ongoing Support	2039	3,726,000	2,794,500	2,980,800	1,863,000	2,794,500	186,300	745,200	-	-
Ongoing Support	2040	3,884,000	2,913,000	3,107,200	1,942,000	2,913,000	194,200	776,800	-	-
Subtotal Support Facilities		170,554,000	68,993,250	75,683,800	35,030,500	43,061,950	35,478,365	4,586,400	-	87,427,285
V. Air Cargo/Maintenance Facilities										
Air Cargo Building	2024	6,279,000	-	-	-	1,255,800	-	-	-	5,023,200
Air Cargo Building	2034	1,890,000	-	-	-	-	-	-	-	1,890,000
Air Cargo Building	2035	1,890,000	-	-	-	-	-	-	-	1,890,000
Air Cargo Apron	2024	3,738,000	3,364,200	3,738,000	2,990,400	747,600	-	-	-	2,990,400
Air Cargo Apron	2034	1,125,000	1,012,500	1,125,000	900,000	-	-	-	-	1,125,000
Air Cargo Apron	2035	1,125,000	1,012,500	1,125,000	900,000	-	-	-	-	1,125,000
Ongoing Cargo	2025	93,000	23,250	46,500	23,250	23,250	-	-	69,750	-
Ongoing Cargo	2026	149,000	37,250	74,500	37,250	37,250	-	-	111,750	-
Ongoing Cargo	2027	212,000	53,000	106,000	53,000	53,000	-	-	159,000	-
Ongoing Cargo	2028	283,000	70,750	141,500	70,750	70,750	-	-	212,250	-
Ongoing Cargo	2029	362,000	90,500	181,000	90,500	90,500	-	-	271,500	-
Ongoing Cargo	2030	451,000	112,750	225,500	112,750	112,750	-	-	338,250	-
Ongoing Cargo	2031	550,000	137,500	275,000	137,500	137,500	-	-	412,500	-
Ongoing Cargo	2032	734,000	183,500	367,000	183,500	183,500	-	-	550,500	-
Ongoing Cargo	2033	939,000	234,750	469,500	234,750	234,750	-	-	704,250	-
Ongoing Cargo	2034	1,169,000	292,250	584,500	292,250	292,250	-	-	876,750	-
Ongoing Cargo	2035	1,426,000	356,500	713,000	356,500	356,500	-	-	1,069,500	-
Ongoing Cargo	2036	1,644,000	411,000	822,000	411,000	411,000	-	-	1,233,000	-
Ongoing Cargo	2037	1,872,000	468,000	936,000	468,000	468,000	-	-	1,404,000	-
Ongoing Cargo	2038	1,919,000	479,750	959,500	479,750	479,750	-	-	1,439,250	-
Ongoing Cargo	2039	1,967,000	491,750	983,500	491,750	491,750	-	-	1,475,250	-
Ongoing Cargo	2040	2,016,000	504,000	1,008,000	504,000	504,000	-	-	1,512,000	-
Subtotal Air Cargo Facility		31,833,000	9,335,700	13,881,000	8,736,900	5,949,900	-	-	11,839,500	14,043,600
VI. Miscellaneous										
Land Acquisition, Airport	2020	11,921,000	10,728,900	11,921,000	9,536,800	2,384,200	-	-	-	9,536,800
Land Acquisition, Non-Airport	2020	22,759,000	20,483,100	22,759,000	18,207,200	4,551,800	-	-	-	18,207,200
Re-finance ORF/PHF Debt	2025	98,563,064	-	98,563,064	9,856,306	-	-	-	-	98,563,064
Wetlands Mitigation	2024	33,864,000	30,477,600	33,864,000	3,386,400	6,772,800	-	-	-	27,091,200
Wetlands Mitigation	2025	33,864,000	30,477,600	33,864,000	3,386,400	6,957,115	15,327,219	3,386,400	-	8,193,266
Wetlands Mitigation	2026	33,864,000	30,477,600	33,864,000	3,386,400	3,386,400	16,210,599	3,386,400	-	10,880,601
Wetlands Mitigation	2027	33,864,000	30,477,600	33,864,000	3,386,400	3,386,400	17,144,972	3,386,400	-	9,946,228
Wetlands Mitigation	2028	33,864,000	30,477,600	33,864,000	3,386,400	3,386,400	18,068,819	3,386,400	-	9,022,381
Subtotal Miscellaneous		302,563,064	183,600,000	302,563,064	54,532,306	30,825,115	66,751,608	13,545,600	-	191,440,742
Grand Total		1,426,973,064	983,488,000	1,255,138,614	721,142,506	422,250,295	145,104,493	114,287,554	19,864,100	725,466,622
						29.6%	10.2%	8.0%	1.4%	50.8%

(a) Table 16.2.
(b) Amount of project eligible for AIP, PFC, or State funding. Eligibility for funding does not guarantee funding.
(c) Estimated funding source(s) for each project.

Sources: As noted and HNTB analysis.

Table 16.6

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Capital Costs by Estimated Project Eligibility

	Cost in Escalated Dollars																					
Project Description	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**Total**
Total Capital Costs (a)																						
Airfield	40,156,000	114,750,000	114,750,000	76,500,000	86,700,000	1,118,000	1,760,000	2,461,000	3,227,000	4,062,000	4,970,000	5,958,000	7,812,000	9,833,000	12,034,000	14,426,000	16,635,000	18,945,000	19,419,000	19,904,000	20,402,000	595,822,000
Terminal Area	33,075,000	-	25,245,000	30,845,000	30,845,000	373,000	592,000	837,000	1,108,000	1,409,000	1,741,000	2,108,000	2,791,000	20,804,000	24,910,000	25,834,000	6,329,000	7,450,000	7,892,000	8,361,000	8,857,000	241,406,000
General Aviation	6,438,000	9,945,000	12,678,000	19,244,000	24,344,000	93,000	145,000	200,000	259,000	322,000	389,000	460,000	595,000	740,000	894,000	1,058,000	1,220,000	1,390,000	1,424,000	1,460,000	1,497,000	84,795,000
Support Facilities	-	-	35,300,000	35,300,000	34,981,000	186,000	295,000	414,000	546,000	691,000	849,000	1,023,000	1,348,000	11,374,000	11,766,000	18,901,000	2,963,000	3,431,000	3,576,000	3,726,000	3,884,000	170,554,000
Air Cargo/Maintenance Facilities	-	-	-	-	10,017,000	93,000	149,000	212,000	283,000	362,000	451,000	550,000	734,000	939,000	4,184,000	4,441,000	1,644,000	1,872,000	1,919,000	1,967,000	2,016,000	31,833,000
Miscellaneous	34,680,000	-	-	-	33,864,000	132,427,064	33,864,000	33,864,000	33,864,000	-	-	-	-	-	-	-	-	-	-	-	-	302,563,064
Total	114,349,000	124,695,000	187,973,000	161,889,000	220,751,000	134,290,064	36,805,000	37,988,000	39,287,000	6,846,000	8,400,000	10,099,000	13,280,000	43,690,000	53,788,000	64,660,000	28,791,000	33,088,000	34,230,000	35,418,000	36,656,000	1,426,973,064
Composite FAA Funding (b)																						
Airfield	36,140,400	103,275,000	103,275,000	68,850,000	79,050,000	1,006,200	1,584,000	2,214,900	2,904,300	3,655,800	4,473,000	5,362,200	7,030,800	8,849,700	10,830,600	12,983,400	14,971,500	17,050,500	17,477,100	17,913,600	18,361,800	537,259,800
Terminal Area	16,537,500	-	12,622,500	15,422,500	15,422,500	186,500	296,000	418,500	554,000	704,500	870,500	1,054,000	1,395,500	10,402,000	12,455,000	12,917,000	3,164,500	3,725,000	3,946,000	4,180,500	4,428,500	120,703,000
General Aviation	4,828,500	7,458,750	9,508,500	14,433,000	18,258,000	69,750	108,750	150,000	194,250	241,500	291,750	345,000	446,250	555,000	670,500	793,500	915,000	1,042,500	1,068,000	1,095,000	1,122,750	63,596,250
Support Facilities	-	-	18,819,000	18,819,000	9,409,500	139,500	221,250	310,500	409,500	518,250	636,750	767,250	1,011,000	1,278,750	1,572,750	1,895,250	2,222,250	2,573,250	2,682,000	2,794,500	2,913,000	68,993,250
Air Cargo/Maintenance Facilities	-	-	-	-	3,364,200	23,250	37,250	53,000	70,750	90,500	112,750	137,500	183,500	234,750	1,304,750	1,369,000	411,000	468,000	479,750	491,750	504,000	9,335,700
Miscellaneous	31,212,000	-	-	-	30,477,600	30,477,600	30,477,600	30,477,600	30,477,600	-	-	-	-	-	-	-	-	-	-	-	-	183,600,000
Total	88,718,400	110,733,750	144,225,000	117,524,500	155,981,800	31,902,800	32,724,850	33,624,500	34,610,400	5,210,550	6,384,750	7,665,950	10,067,050	21,320,200	26,833,600	29,958,150	21,684,250	24,859,250	25,652,850	26,475,350	27,330,050	983,488,000
PFC Eligible Capital Costs (c)																						
Airfield	40,156,000	114,750,000	114,750,000	76,500,000	86,700,000	1,118,000	1,760,000	2,461,000	3,227,000	4,062,000	4,970,000	5,958,000	7,812,000	9,833,000	12,034,000	14,426,000	16,635,000	18,945,000	19,419,000	19,904,000	20,402,000	595,822,000
Terminal Area	33,075,000	-	20,196,000	25,796,000	25,796,000	279,750	444,000	627,750	831,000	1,056,750	1,305,750	1,581,000	2,093,250	16,465,750	20,362,500	21,055,500	4,746,750	5,587,500	5,919,000	6,270,750	6,642,750	200,132,750
General Aviation	6,438,000	9,945,000	12,678,000	15,961,000	15,961,000	46,500	72,500	100,000	129,500	161,000	194,500	230,000	297,500	370,000	447,000	529,000	610,000	695,000	712,000	730,000	748,500	67,056,000
Support Facilities	-	-	20,910,000	20,910,000	10,455,000	148,800	236,000	331,200	436,800	552,800	679,200	818,400	1,078,400	1,364,000	1,677,600	2,021,600	2,370,400	2,744,800	2,860,800	2,980,800	3,107,200	75,683,800
Air Cargo/Maintenance Facilities	-	-	-	-	3,738,000	46,500	74,500	106,000	141,500	181,000	225,500	275,000	367,000	469,500	1,709,500	1,838,000	822,000	936,000	959,500	983,500	1,008,000	13,881,000
Miscellaneous	34,680,000	-	-	-	33,864,000	132,427,064	33,864,000	33,864,000	33,864,000	-	-	-	-	-	-	-	-	-	-	-	-	302,563,064
Total	114,349,000	124,695,000	168,534,000	139,167,000	176,514,000	134,066,614	36,451,000	37,489,950	38,629,800	6,013,550	7,374,950	8,862,400	11,648,150	28,502,250	36,230,600	39,870,100	25,184,150	28,908,300	29,870,300	30,869,050	31,908,450	1,255,138,614
State Eligible Capital Costs (d)																						
Airfield	32,124,800	91,800,000	91,800,000	61,200,000	69,360,000	894,400	1,408,000	1,968,800	2,581,600	3,249,600	3,976,000	4,766,400	6,249,600	7,866,400	9,627,200	11,540,800	13,308,000	15,156,000	15,535,200	15,923,200	16,321,600	476,657,600
Terminal Area	20,955,300	-	12,622,500	15,422,500	15,422,500	186,500	296,000	418,500	554,000	704,500	870,500	1,054,000	1,395,500	10,402,000	12,455,000	12,917,000	3,164,500	3,725,000	3,946,000	4,180,500	4,428,500	125,120,800
General Aviation	5,150,400	450,000	900,000	4,183,000	4,308,000	46,500	72,500	100,000	129,500	161,000	194,500	230,000	297,500	370,000	447,000	529,000	610,000	695,000	712,000	730,000	748,500	21,064,400
Support Facilities	-	-	8,160,000	8,160,000	4,080,000	93,000	147,500	207,000	273,000	345,500	424,500	511,500	674,000	852,500	1,048,500	1,263,500	1,481,500	1,715,500	1,788,000	1,863,000	1,942,000	35,030,500
Air Cargo/Maintenance Facilities	-	-	-	-	2,990,400	23,250	37,250	53,000	70,750	90,500	112,750	137,500	183,500	234,750	1,192,250	1,256,500	411,000	468,000	479,750	491,750	504,000	8,736,900
Miscellaneous	27,744,000	-	-	-	3,386,400	13,242,706	3,386,400	3,386,400	3,386,400	-	-	-	-	-	-	-	-	-	-	-	-	54,532,306
Total	58,230,500	92,250,000	113,482,500	88,965,500	96,160,900	1,243,650	1,961,250	2,747,300	3,608,850	4,551,100	5,578,250	6,699,400	8,800,100	19,725,650	24,769,950	27,506,800	18,975,000	21,759,500	22,460,950	23,188,450	23,944,600	721,142,506
Capital Costs Ineligible for Federal or State Grants (e)																						
Airfield	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Terminal Area	-	-	12,622,500	15,422,500	15,422,500	186,500	296,000	418,500	554,000	704,500	870,500	1,054,000	1,395,500	10,402,000	12,455,000	12,917,000	3,164,500	3,725,000	3,946,000	4,180,500	4,428,500	104,165,500
General Aviation	-	2,486,250	3,169,500	4,811,000	6,086,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16,552,750
Support Facilities	-	-	16,481,000	16,481,000	25,571,500	-	-	-	-	-	-	-	-	10,095,250	10,193,250	17,005,750	-	-	-	-	-	95,827,750
Air Cargo/Maintenance Facilities	-	-	-	-	6,652,800	69,750	111,750	159,000	212,250	271,500	338,250	412,500	550,500	704,250	2,879,250	3,072,000	1,233,000	1,404,000	1,439,250	1,475,250	1,512,000	22,497,300
Miscellaneous	-	-	-	-	3,386,400	101,949,464	3,386,400	3,386,400	3,386,400	-	-	-	-	-	-	-	-	-	-	-	-	115,495,064
Total	-	2,486,250	32,273,000	36,714,500	53,732,800	256,250	407,750	577,500	766,250	976,000	1,208,750	1,466,500	1,946,000	21,201,500	25,527,500	32,994,750	4,397,500	5,129,000	5,385,250	5,655,750	5,940,500	354,538,364

(a) Table 16.2
(b) Table 16.5. Many FAA eligible costs are alse eligible for PFC and State funding.
(c) Table 16.5. Many PFC eligible costs are also eligible for FAA AIP and State funding.
(d) Table 16.5. Many State eligible costs are also eligible for PFC and FAA AIP funding.
(e) Table 16.5.

Sources: As noted and HNTB analysis.

Table 16.7

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Capital Costs by Estimated Funding Source

	Cost in Escalated Dollars																					
Project Description	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**Total**
Total Capital Costs (a)																						
Airfield	40,156,000	114,750,000	114,750,000	76,500,000	86,700,000	1,118,000	1,760,000	2,461,000	3,227,000	4,062,000	4,970,000	5,958,000	7,812,000	9,833,000	12,034,000	14,426,000	16,635,000	18,945,000	19,419,000	19,904,000	20,402,000	595,822,000
Terminal Area	33,075,000	-	25,245,000	30,845,000	30,845,000	373,000	592,000	837,000	1,108,000	1,409,000	1,741,000	2,108,000	2,791,000	20,804,000	24,910,000	25,834,000	6,329,000	7,450,000	7,892,000	8,361,000	8,857,000	241,406,000
General Aviation	6,438,000	9,945,000	12,678,000	19,244,000	24,344,000	93,000	145,000	200,000	259,000	322,000	389,000	460,000	595,000	740,000	894,000	1,058,000	1,220,000	1,390,000	1,424,000	1,460,000	1,497,000	84,795,000
Support Facilities	-	-	35,300,000	35,300,000	34,981,000	186,000	295,000	414,000	546,000	691,000	849,000	1,023,000	1,348,000	11,374,000	11,766,000	18,901,000	2,963,000	3,431,000	3,576,000	3,726,000	3,884,000	170,554,000
Air Cargo/Aircraft Maintenance Facilities	-	-	-	-	10,017,000	93,000	149,000	212,000	283,000	362,000	451,000	550,000	734,000	939,000	4,184,000	4,441,000	1,644,000	1,872,000	1,919,000	1,967,000	2,016,000	31,833,000
Miscellaneous	34,680,000	-	-	-	33,864,000	132,427,064	33,864,000	33,864,000	33,864,000	-	-	-	-	-	-	-	-	-	-	-	-	302,563,064
Total	114,349,000	124,695,000	187,973,000	161,889,000	220,751,000	134,290,064	36,805,000	37,988,000	39,287,000	6,846,000	8,400,000	10,099,000	13,280,000	43,690,000	53,788,000	64,660,000	28,791,000	33,088,000	34,230,000	35,418,000	36,656,000	1,426,973,064
Composite FAA Funding (b)																						
Airfield	10,039,000	33,893,130	28,687,500	18,360,000	20,400,000	1,006,200	1,584,000	2,214,900	2,904,300	3,655,800	4,473,000	5,362,200	7,030,800	8,849,700	10,830,600	12,983,400	14,971,500	17,050,500	17,477,100	17,913,600	18,361,800	258,049,030
Terminal Area	6,615,000	-	5,049,000	6,169,000	6,169,000	186,500	296,000	418,500	554,000	704,500	870,500	1,054,000	1,395,500	3,500,000	3,918,500	4,380,500	3,164,500	3,725,000	3,946,000	4,180,500	4,428,500	60,725,000
General Aviation	1,287,600	1,989,000	2,535,600	3,848,800	4,868,800	69,750	108,750	150,000	194,250	241,500	291,750	345,000	446,250	555,000	670,500	793,500	915,000	1,042,500	1,068,000	1,095,000	1,122,750	23,639,300
Support Facilities	-	-	7,060,000	7,060,000	6,996,200	139,500	221,250	310,500	409,500	518,250	636,750	767,250	1,011,000	1,278,750	1,572,750	1,895,250	2,222,250	2,573,250	2,682,000	2,794,500	2,913,000	43,061,950
Air Cargo/Aircraft Maintenance Facilities	-	-	-	-	2,003,400	23,250	37,250	53,000	70,750	90,500	112,750	137,500	183,500	234,750	292,250	356,500	411,000	468,000	479,750	491,750	504,000	5,949,900
Miscellaneous	6,936,000	-	-	-	6,772,800	6,957,115	3,386,400	3,386,400	3,386,400	-	-	-	-	-	-	-	-	-	-	-	-	30,825,115
Total	24,877,600	35,882,130	43,332,100	35,437,800	47,210,200	8,382,315	5,633,650	6,533,300	7,519,200	5,210,550	6,384,750	7,665,950	10,067,050	14,418,200	17,284,600	20,409,150	21,684,250	24,859,250	25,652,850	26,475,350	27,330,050	422,250,295
PFC Funds (c)																						
Airfield	-	-	-	-	-	-	-	-	64,540	81,240	99,400	119,160	156,240	-	-	-	332,700	378,900	388,380	398,080	408,040	2,426,680
Terminal Area	-	-	-	-	-	37,300	59,200	83,700	110,800	140,900	174,100	210,800	279,100	8,965,008	12,627,185	13,074,697	632,900	745,000	789,200	836,100	885,700	39,651,690
General Aviation	-	-	-	-	-	4,650	7,250	10,000	12,950	16,100	19,450	23,000	29,750	185,000	223,500	264,500	-	-	-	-	-	796,150
Support Facilities	-	-	-	-	-	9,300	14,750	20,700	27,300	34,550	42,450	51,150	67,400	10,095,250	10,193,250	14,043,265	148,150	171,550	178,800	186,300	194,200	35,478,365
Air Cargo/Aircraft Maintenance Facilities	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Miscellaneous	-	-	-	-	-	15,327,219	16,210,599	17,144,972	18,068,819	-	-	-	-	-	-	-	-	-	-	-	-	66,751,608
Total	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	272,790	335,400	404,110	532,490	19,245,258	23,043,935	27,382,462	1,113,750	1,295,450	1,356,380	1,420,480	1,487,940	145,104,493
State Entitlements/Discretionary (d)																						
Airfield	6,870,913	7,022,554	7,177,542	7,335,951	7,497,855	89,440	140,800	196,880	258,160	324,960	397,600	476,640	624,960	786,640	962,720	1,154,080	1,330,800	1,515,600	1,553,520	1,592,320	1,632,160	48,942,095
Terminal Area	-	-	-	-	-	149,200	236,800	334,800	443,200	563,600	696,400	843,200	1,116,400	8,338,992	8,364,315	8,378,803	2,531,600	2,980,000	3,156,800	3,344,400	3,542,800	45,021,310
General Aviation	-	-	450,000	450,000	450,000	18,600	29,000	40,000	51,800	64,400	77,800	92,000	119,000	-	-	-	61,000	69,500	71,200	73,000	74,850	2,192,150
Support Facilities	-	-	-	-	-	37,200	59,000	82,800	109,200	138,200	169,800	204,600	269,600	-	-	-	592,600	686,200	715,200	745,200	776,800	4,586,400
Air Cargo/Aircraft Maintenance Facilities	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Miscellaneous	-	-	-	-	-	3,386,400	3,386,400	3,386,400	3,386,400	-	-	-	-	-	-	-	-	-	-	-	-	13,545,600
Total	6,870,913	7,022,554	7,627,542	7,785,951	7,947,855	3,680,840	3,852,000	4,040,880	4,248,760	1,091,160	1,341,600	1,616,440	2,129,960	9,125,632	9,327,035	9,532,883	4,516,000	5,251,300	5,496,720	5,754,920	6,026,610	114,287,554
Other Private (e)																						
Airfield	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Terminal Area	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
General Aviation	-	-	-	1,313,200	5,313,200	-	-	-	-	-	-	-	-	-	-	-	244,000	278,000	284,800	292,000	299,400	8,024,600
Support Facilities	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Air Cargo/Aircraft Maintenance Facilities	-	-	-	-	-	69,750	111,750	159,000	212,250	271,500	338,250	412,500	550,500	704,250	876,750	1,069,500	1,233,000	1,404,000	1,439,250	1,475,250	1,512,000	11,839,500
Miscellaneous	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	1,313,200	5,313,200	69,750	111,750	159,000	212,250	271,500	338,250	412,500	550,500	704,250	876,750	1,069,500	1,477,000	1,682,000	1,724,050	1,767,250	1,811,400	19,864,100
Airport																						
Airfield	23,246,087	73,834,316	78,884,958	50,804,049	58,802,145	22,360	35,200	49,220	-	-	-	-	-	196,660	240,680	288,520	-	-	-	-	-	286,404,195
Terminal Area	26,460,000	-	20,196,000	24,676,000	24,676,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	96,008,000
General Aviation	5,150,400	7,956,000	9,692,400	13,632,000	13,712,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50,142,800
Support Facilities	-	-	28,240,000	28,240,000	27,984,800	-	-	-	-	-	-	-	-	-	-	2,962,485	-	-	-	-	-	87,427,285
Air Cargo/Aircraft Maintenance Facilities	-	-	-	-	8,013,600	-	-	-	-	-	-	-	-	-	3,015,000	3,015,000	-	-	-	-	-	14,043,600
Miscellaneous	27,744,000	-	-	-	27,091,200	106,756,330	10,880,601	9,946,228	9,022,381	-	-	-	-	-	-	-	-	-	-	-	-	191,440,742
Total	82,600,487	81,790,316	137,013,358	117,352,049	160,279,745	106,778,690	10,915,801	9,995,448	9,022,381	-	-	-	-	196,660	3,255,680	6,266,005	-	-	-	-	-	725,466,622

Sources: Table 16.5 and HNTB analysis.

- State funding - $114.3 million or 8.0 percent
- Other - $19.9 million or 1.4 percent
- Airport - $725.5 million or 50.8 percent

16.4 CASH FLOW ANALYSIS

Table 16.8 presents the estimated airport cash flow analysis during the planning period. Additional detail for the cash flow analysis of the Base Case is provided in **Appendix I.** The analysis includes projections of project funding, revenue bond issues, airport revenues, operating and maintenance and capital costs, and net airport revenue.

16.4.1 Operating Revenue Projections

Operating, or non-airline, revenue is projected to grow from $27.1 million in the first year of operation to approximately $64.5 million in 2040. This represents consistent growth in accordance with the growth expected in passenger enplanements. The following assumptions were used to develop the estimates of operating revenue:

- Since it is not possible to accurately predict the amount of rentable terminal space or the exact aircraft fleets the airlines expect to use, it was determined that precise rates and charges modeling in the form of projected landing fees and terminal rents could not be accomplished. As presented previously in the preliminary financial analysis, airline cost per enplanement was used as the comparable measure.
- It was also determined that projecting specific non-airline revenue items would not be possible, as it cannot be determined how the construction and operation of the airport might benefit certain revenue sources, such as parking or retail concessions. As such, estimates were made only for non-airline revenues as a whole.
- Non-airline revenue was estimated to be approximately $11.62 (CY 2000 dollars) per enplanement for each year in the planning period. This figure is greater than the industry average for small hub airports because the airport is expected to provide services that would place it in the upper half of small hub airports with respect to revenue generation. Historically, airports with parking garages have experienced higher-than-average revenue production within their industry group. Similar results have been experienced with new or redeveloped concession programs. Because the new airport will have garage parking and because the terminal can be designed with modern concessions in mind, it was assumed that non-airline revenue per enplanement would exceed the small hub airport average.

16.4.2 Operating Cost Projections

Operating and maintenance (O&M) expenses are projected to increase from $17.5 million in 2025 to $41.6 million in 2040. Like non-airline revenues, O&M costs were not projected on a line-item basis; rather, they were projected according to an estimate of O&M expenses per enplanement. According to the AAAE Survey of Rates and Charges, small hubs recorded O&M expenses of approximately $10.87 per enplanement in FY 1997. Of those with similar passenger bases, the expense ratio was lower. In fact, newer airports with technological advantages and newer equipment have expense rates well below the average. The average for these airports was near $7.50, which was used in this study throughout the planning period.

Table 16.8

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Preliminary Cash Flow Analysis: BASE CASE

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Capital Costs and Grants (Calendar Year)																					
Total Costs	114,349,000	124,695,000	187,973,000	161,889,000	220,751,000	134,290,064	36,805,000	37,988,000	39,287,000	6,846,000	8,400,000	10,099,000	13,280,000	43,690,000	53,788,000	64,660,000	28,791,000	33,088,000	34,230,000	35,418,000	36,656,000
AIP Entitlements	-	-	-	-	-	-	-	2,782,583	2,855,926	2,933,547	3,015,698	3,102,643	3,194,665	3,292,062	3,395,148	3,504,259	3,619,748	3,741,989	3,871,380	4,008,341	4,153,317
AIP Discretionary	24,877,600	35,882,130	43,332,100	35,437,800	47,210,200	8,382,315	5,633,650	3,750,717	4,663,274	2,277,003	3,369,052	4,563,307	6,872,385	11,126,138	13,889,452	16,904,891	18,064,502	21,117,261	21,781,470	22,467,009	23,176,733
PFCs	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	272,790	335,400	404,110	532,490	14,084,050	18,946,000	19,460,950	1,113,750	1,295,450	1,356,380	1,420,480	1,487,940
State Entitlement	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
State Discretionary	6,870,913	7,022,554	7,627,542	7,785,951	7,947,855	1,243,650	1,361,250	2,111,666	2,935,465	377,783	585,855	815,812	1,281,782	8,227,081	8,375,119	8,524,432	3,447,657	4,119,508	4,297,711	4,484,701	4,680,953
Airport	82,600,487	81,790,316	82,600,487	117,352,049	160,279,745	106,778,690	10,915,801	9,995,448	9,022,381	-	-	-	-	196,660	3,255,680	6,266,005	-	-	-	-	-
Cash Flow (Fiscal Year)																					
Bond Issue	459,871,933	-	-	507,407,498	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Revenues																					
Available PFC Funds for Debt Service	-	-	-	-	-	-	-	-	-	19,097,533	20,185,330	21,335,349	22,498,080	10,314,309	6,901,382	7,921,512	27,894,961	29,436,094	31,200,316	33,069,763	35,050,685
Non-Airline Revenues	-	-	-	-	-	27,133,598	28,745,067	30,452,242	32,260,806	34,176,781	36,206,546	38,356,859	40,634,879	43,048,192	45,604,831	48,313,310	51,182,646	54,222,392	57,442,669	60,854,199	64,468,341
Required Airline Revenues	-	-	-	-	-	89,202,434	86,672,833	85,215,056	84,631,112	65,025,638	63,508,246	62,009,505	60,581,642	72,586,788	75,910,733	74,894,619	55,021,782	53,681,705	52,223,095	50,368,534	23,053,877
Total Revenues	-	-	-	-	-	116,336,032	115,417,900	115,667,298	116,891,917	118,299,951	119,900,122	121,701,713	123,714,601	125,949,289	128,416,946	131,129,441	134,099,389	137,340,191	140,866,080	144,292,496	122,572,903
Costs																					
Operating	-	-	-	-	-	17,513,745	18,553,889	19,655,808	20,823,169	22,059,861	23,370,000	24,757,948	26,228,327	27,786,032	29,436,249	31,184,473	33,036,525	34,998,569	37,077,140	39,279,158	41,611,954
ORF/PHF Expense	-	-	-	-	-	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
New Debt Service	-	-	-	-	-	79,299,000	77,744,118	76,219,724	74,725,219	73,260,019	71,823,548	70,415,243	69,034,552	67,680,933	66,353,856	65,052,800	63,777,255	62,526,721	61,300,706	59,672,412	30,907,940
Total Costs	-	-	-	-	-	99,212,745	98,698,007	98,275,531	97,948,389	97,719,880	97,593,548	97,573,191	97,662,879	97,866,965	98,190,105	98,637,273	99,213,780	99,925,290	100,777,847	101,351,570	74,919,895
Net Revenue	-	-	-	-	-	17,123,287	16,719,893	17,391,767	18,943,529	20,580,071	22,306,574	24,128,521	26,051,721	28,082,324	30,226,840	32,492,168	34,885,610	37,414,901	40,088,233	42,940,926	47,653,008
Airport Project Costs	82,600,487	81,790,316	137,013,358	117,352,049	160,279,745	106,778,690	10,915,801	9,995,448	9,022,381	-	-	-	-	196,660	3,255,680	6,266,005	-	-	-	-	-
CIP Reserve Balance	-	-	-	-	-	7,123,287	12,927,380	12,927,380	12,927,380	12,927,380	12,927,380	12,927,380	12,927,380	12,927,380	12,927,380	39,153,543	74,039,153	111,454,054	151,542,287	194,483,213	242,136,221
Debt Service Coverage	-	-	-	-	-	1.25	1.25	1.26	1.29	1.31	1.34	1.38	1.41	1.45	1.49	1.54	1.58	1.64	1.69	1.76	2.62
Airline Cost per Enplanement	$ -	$ -	$ -	$ -	$ -	$ 38.20	$ 35.04	$ 32.52	$ 30.48	$ 22.11	$ 20.38	$ 18.78	$ 17.32	$ 19.59	$ 19.34	$ 18.01	$ 12.49	$ 11.50	$ 10.56	$ 9.62	$ 4.16
10-year Average Cost per Enplanement						$ 25.38															

Sources: Table A.1 and HNTB analysis.

16.4.3 Bond Issues

Two bond issues are assumed for this analysis. The first bond issue, a $459.9 million issue projected for 2020, would provide the majority of the funds required for the first three years of airport construction. A 25-year repayment period and an interest rate of 6.5 percent are assumed. In addition, it is assumed that 4 percent of the bond would go toward financing costs such as insurance, and financial and legal counsel.

The second bond issue, a $507.4 million issue proposed for 2023, would provide the remainder of the required funds for airport construction, the refinancing of ORF and PHF debt, and a portion of the wetlands mitigation, which is expected to be performed between 2024 and 2028. The term and interest rate are assumed to be the same as for the first bond issue.

16.4.4 Airline Revenue Requirement

Based on the projections of operating revenue, O&M costs, and debt service, it was possible to determine the airline revenue required in each cash flow year to meet applicable O&M expenses, debt service, and a coverage factor of 25 percent. Because this is a feasibility analysis, this calculation was made in a residual manner; that is, airline revenues were limited to a maximum of 1.25 times the applicable O&M expenses and debt service. For this analysis, it was assumed that 75 percent of debt service and 70 percent of O&M expenses would be applicable to the airlines.[12]

Based on projected revenues and expenses, required airline revenue was projected to be $89.2 million in 2025, and decreasing gradually after that, in CY 2000 dollars. These revenues translate into an airline cost per enplanement of $38.20 in 2025, decreasing to $18.01 in 2035. The ten year average cost is estimated to be $25.38 per enplanement. The financial model projects additional decreases in airline cost per enplanement through 2040, primarily due to the lack of information regarding construction projects beyond 2035.

16.4.5 Base Case Summary

To determine the feasibility of the new airport, two issues must be addressed. First, can the airport be constructed and financed in such a way that the cash flows for the airport do not require other subsidies or operating loans? Second, does the airline revenue requirement fall into a range that is considered reasonable? The cash flows in Table 16.7 show that the first issue is adequately met. However, the airline cost per enplanement figures from the model of the Base Case show that the preferred airport system, under the assumptions provided in Section 16.1, is not feasible.

Table 14.25 shows that the cost per enplanement figures from other large and medium hub airports ranged from $28.12 (JFK) to $1.43 (Dallas Love) in 1997 dollars. Adjusting these figures for inflation changes the range from $29.84 (JFK) to $1.52 (Love). The cash flow analyses for the Base Case suggest that the airport would be more expensive than all of these airports. After removing the top four airports from the range, which represent the extremely expensive New York airports and Denver International, which is still recovering from a very expensive (over $5 billion) construction process, the top of the range decreases to $10.70. It is clear that, with the

[12] Because debt service interest contains an element of inflation, and because this analysis was conducted using real 2000 dollars, debt service payments were deflated at 2 percent per year beyond 2025.

given assumptions, the Base Case of the preferred airport system would not likely be feasible.

The analysis of the Base Case shows that the new airport would be forced to carry too much debt for the level of activity expected. It stands to reason that a smaller debt load would make this project more feasible for airlines and passengers alike. The key to determining the parameters under which the airport would be financially feasible is therefore identifying the level of debt that is supportable, or conversely, the level of activity required to support the full load of debt. These issues are addressed in the sensitivity analyses.

16.5 SENSITIVITY ANALYSES

The following sensitivity analyses were performed to assess the change in feasibility of the preferred airport system under different assumptions:

- Restrict Airline Cost per Enplanement – Because the Base Case does not appear to be feasible given the assumptions, a logical analysis was to restrict the construction budget and, therefore, the size of the bond issues, so that the resulting airline cost per enplanement would be "reasonable."

- High Forecast – Previous analyses in this study have presented a high forecast of aviation demand. Higher levels of demand would create more revenue for the airport. As such, it was concluded that an analysis of cash flows using the high forecast would be beneficial.

- Enhanced Private Funding – Private investment in airports is increasing, and there are now more types of airport projects—even entire airports—being privatized than ever before. This analysis assesses some of the changes in cash flows that might arise as a result of more private investment in certain airport facilities.

- No FAA Participation in Construction – The Base Case assumes a composite FAA participation rate of 20 percent of construction costs. Since much of this funding would be discretionary, a logical sensitivity analysis was to assume elimination of that funding. To ensure a more negative case that shows some of the worst-case scenarios, this sensitivity assumed no FAA participation for all construction projects previously identified in Chapter 14. FAA participation for "ongoing" projects was assumed to be at current rates.

- Close ORF – One of the key assumptions driving the Base Case is that a single entity will be responsible for the new airport, ORF, and PHF. It also presumes that steps would be taken to ensure airline service is focused at the new airport. With three airports in the local system, it was logical to structure sensitivity analyses that assess the impacts of closing ORF, PHF, or both. Based on the location of airports and the need to continue serving the local GA and corporate activity base, it was determined that the closure of PHF only was not probable enough to consider. Closure of ORF was considered, however, with respect to impacts on activity levels.

- Close ORF and PHF – Repeats the sensitivity analysis for closing ORF, but adds PHF closure as well. Additional impacts of activity diversion were included.

16.5.1 Restrict Airline Cost per Enplanement

To perform this sensitivity analysis, the following changes were made to the Base Case:

- Airline cost per enplanement ratios were revised in an attempt to restrict airline cost per enplanement to approximately $11, which was described earlier as the highest cost per enplanement level in the United States outside of the new Denver airport and the three primary New York airports.

- To accomplish this, the initial construction budget was cut as far as was practicable. These budget cuts reduced the debt load for the airport to the point where airline cost per enplanement was approximately equal to $10.90 in 2025, $10.75 in 2026, $14.20 in 2027, $13.60 in 2028, and a maximum $10.75 thereafter. The resulting ten year average cost was $10.06 per enplanement.

- Construction costs were reduced by eliminating certain elements from the initial capital program. These costs were reduced from the Base Case level of $926,582,500 to $605,732,500, as shown in **Table 16.9**. The incremental costs between 2025 and 2035 remained at $98,081,250.

- The cash flow model was run to reflect these changes. A major change in the model from the Base Case was the addition of a third bond issue in 2025. The first bond issue was a $234.0 million issue in 2020, the second was a $197.7 million issue in 2023, and the third was an $144.4 million issue in 2025. The sum of these bond issues ($576.1 million) is $391.2 million less than the sum of the bond issues for the Base Case ($967.3 million).

The resulting cash flow model is presented in **Table 16.10**. The reduced bond issue sizes and corresponding airline cost per enplanement figures are depicted. These cash flows depict a financially feasible airport. However, there is a more important factor than financial feasibility with respect to this scenario. The capital program presented in Table 16.9 reflects a much smaller airport than the one discussed in this study thus far. It has a smaller terminal, only one runway, and reduced cargo and GA facilities. One of the main goals of the new airport is to provide services capable of attracting service not otherwise supported by the two existing commercial service facilities. Therefore, even though the cash flow analysis shows financial feasibility, it does not represent an option to be pursued because the airport in this analysis no longer meets the goals and objectives of this study.

16.5.2 High Forecast

To perform this sensitivity analysis, the following changes were made to the Base Case:

- High forecast enplanements, as presented previously, were substituted for the Base Case forecasts, as shown in **Table 16.11**.

- The high forecast enplanements resulted in higher forecasts for PFC collections and entitlement funds, as shown in Table 16.11.

The timing of construction was analyzed to determine whether the faster growth in enplanements would require facility construction to be re-phased. It was determined that no such re-phasing would be required.

Table 16.9

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Facility Costs through 2020 for Two-Airport System(a)
Revised Budget: Restrict Airline Cost Sensitivity Analysis

Planning Factor	Units	Unit Costs	New Airport (Area 2) Req.	New Airport (Area 2) Cost Est.
Land Acquisition, Airport	acre(b)	$1,700	5,500	$9,350,000
Land Acquisition, Non-Airport (c)	acre(b)	$1,700	5,250	$8,925,000
Site Preparation	acre	$7,000	3,850	$26,950,000
Utilities (Install/relocate)(d)	various	n/a	lump	$19,188,000
Wetland Mitigation(e)	acre	$80,000	1,411	$112,880,000
Runway/Taxiway	lump sum	$150,000,000	1	$150,000,000
Airport Roadways	lane mile	$1,300,000	18	$23,400,000
Off-Airport Road & Railways(d)	lane mile	$1,300,000	5	$6,431,000
NAVAIDS	per ILS	$2,000,000	2	$4,000,000
Air Traffic Control Tower	lump sum	$21,000,000	1	$21,000,000
ARFF/Maintenance/Support(f)	various	n/a	lump	$20,000,000
Fuel Storage Facilities	lump sum	$4,000,000	1	$4,000,000
Terminal Building	sq. ft.	$200	237,600	$47,520,000
Terminal Parking - at grade	spaces	$1,500	7,500	$11,250,000
Terminal Parking - structure	spaces	$15,000	0	$0
Apron Area	sq. yd.	$150	43,925	$6,589,000
Air Cargo Building	sq. ft.	$70	52,768	$3,694,000
Air Cargo Apron	sq. yd.	$150	14,658	$2,199,000
General Aviation	n/a	n/a	lump	$7,210,000
A/E & Contingency	n/a	25%		$121,146,500
TOTAL				**$605,732,500**
Airline Share				**$533,276,250**
PFC Eligible				**$521,396,250**
AIP Eligible				**$382,137,188**

Note: All costs are in 1999 dollars rounded to nearest 1,000.
(a) Does not include cost for Richmond International Airport improvements.
(b) Cost estimate based on Task 11 input from PDCs.
(c) Remaining search area acreage.
(d) Assumes construction to center of search area (4-lane roads).
(e) Includes wetlands of entire search area, 2:1 mitigation ratio for wetland credits at an average $40,000 per acre.
(f) Includes ARFF facility, equipment, training facility, and maintenance/support facility & equipment.

Source: HNTB Team Analysis, 2000.

Table 16.10

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Preliminary Cash Flow Analysis: RESTRICTED AIRLINE COST ANALYSIS

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Capital Costs and Grants (Calendar Year)																					
Total Costs	82,126,000	63,342,000	105,161,000	115,489,000	114,326,000	135,316,064	30,458,000	31,426,000	18,098,000	4,874,000	6,152,000	8,629,000	11,349,000	41,251,000	50,794,000	61,059,000	24,603,000	28,275,000	29,250,000	30,266,000	31,324,000
AIP Entitlements	-	-	-	-	-	-	-	2,782,583	2,855,926	2,933,547	3,015,698	3,102,643	3,194,665	3,292,062	3,395,148	3,504,259	3,619,748	3,741,989	3,871,380	4,008,341	4,153,317
AIP Discretionary	17,884,200	34,421,000	23,900,950	25,392,800	23,630,200	7,957,566	4,157,450	2,111,867	1,407,924	776,003	1,660,552	3,447,507	5,408,735	9,279,638	11,625,802	14,186,291	14,910,252	17,501,111	18,049,220	18,616,009	19,201,033
PFCs	-	-	-	-	-	15,378,469	16,291,799	17,259,372	11,660,920	194,190	245,650	345,270	455,070	13,792,400	18,586,150	19,026,150	951,700	1,106,980	1,159,030	1,213,780	1,271,530
State Entitlement	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
State Discretionary	6,870,913	7,022,554	7,627,542	7,785,951	7,947,855	531,900	516,350	1,124,466	1,355,095	63,383	226,855	580,452	972,102	8,227,081	8,375,119	8,524,432	2,790,607	3,355,528	3,497,961	3,647,301	3,804,413
Airport	57,370,887	21,898,446	57,370,887	81,084,649	78,747,945	108,945,790	6,801,641	5,872,618	-	-	-	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
Cash Flow (Fiscal Year)																					
Bond Issue	233,985,232	-	-	197,708,273	-	144,406,288	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Revenues																					
Proceeds from Sale of Land	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Available PFC Funds for Debt Service	-	-	-	-	-	-	-	-	6,623,489	19,176,133	20,275,080	21,394,189	22,575,500	10,605,959	7,261,232	8,356,312	28,057,011	29,624,564	31,397,666	33,276,463	35,267,095
Non-Airline Revenues	-	-	-	-	-	24,420,238	25,870,561	27,407,018	29,034,725	30,759,103	32,585,891	34,521,173	36,571,391	38,743,372	41,044,348	43,481,979	46,064,381	48,800,153	51,698,402	54,768,779	58,021,507
Required Airline Revenues	-	-	-	-	-	25,453,309	26,593,907	37,214,996	37,759,347	31,619,134	23,681,262	23,351,521	22,497,555	34,859,372	38,664,260	38,100,371	19,005,243	18,121,208	17,113,361	16,085,589	15,036,044
Total Revenues	-	-	-	-	-	49,873,547	52,464,468	64,622,013	73,417,561	81,554,370	76,542,232	79,266,883	81,644,446	84,208,703	86,969,840	89,938,662	93,126,636	96,545,925	100,209,429	104,130,832	108,324,645
Costs																					
Operating	-	-	-	-	-	14,886,683	15,770,806	16,707,436	17,699,694	18,750,882	19,864,500	21,044,256	22,294,078	23,618,127	25,020,812	26,506,802	28,081,046	29,748,784	31,515,569	33,387,285	35,370,161
ORF/PHF Expense	-	-	-	-	-	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
New Debt Service	-	-	-	-	-	28,060,078	27,509,880	38,349,403	44,505,426	43,632,771	32,054,604	32,015,713	31,431,680	30,861,485	30,304,985	29,762,050	29,232,558	28,716,398	28,213,470	27,723,684	27,246,961
Total Costs	-	-	-	-	-	45,346,761	45,680,686	57,456,840	64,605,120	64,783,653	54,319,104	55,459,969	56,125,758	56,879,612	57,725,797	58,668,852	59,713,604	60,865,182	62,129,039	63,510,968	65,017,122
Net Revenue	-	-	-	-	-	4,526,787	6,783,782	7,165,174	8,812,441	16,770,717	22,223,128	23,806,914	25,518,688	27,329,091	29,244,043	31,269,810	33,413,033	35,680,743	38,080,390	40,619,864	43,307,523
Airport Project Costs	57,370,887	21,898,446	73,632,508	81,084,649	78,747,945	108,945,790	6,801,641	5,872,618	-	-	-	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
CIP Reserve Balance	-	-	-	-	-	4,526,787	11,310,569	12,603,124	21,415,565	38,186,282	60,409,410	65,909,410	71,509,410	71,509,410	97,532,793	123,262,998	123,262,998	158,943,741	197,024,131	237,643,994	280,951,517
Debt Service Coverage	-	-	-	-	-	1.25	1.33	1.25	1.25	1.44	1.77	1.82	1.89	1.96	2.04	2.13	2.23	2.33	2.43	2.55	2.68
Airline Cost per Enplanement	$ -	$ -	$ -	$ -	$ -	$ 10.90	$ 10.75	$ 14.20	$ 13.60	$ 10.75	$ 7.60	$ 7.07	$ 6.43	$ 9.41	$ 9.85	$ 9.16	$ 4.31	$ 3.88	$ 3.46	$ 3.07	$ 2.71
10-year Average Cost per Enplanement						$ 10.06															

Sources: Table A.2 and HNTB analysis.

Table 16.11

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Estimated Available Passenger Facility Charges and FAA Entitlement Funds
High Forecast Sensitivity Analysis

Calendar Year	Enplanements (a)	Estimated PFC Collections (b)	Fiscal Year (c)	Estimated Passenger Entitlements (d)	Estimated Cargo Entitlements (e)
2020			2022		
2021			2023		
2022			2024		
2023			2025		
2024			2026		
2025	2,932,490	19,312,209	2027	2,981,245	125,000
2026	3,251,444	21,412,711	2028	3,140,722	130,000
2027	3,605,089	23,741,676	2029	3,317,545	135,200
2028	3,997,199	26,323,951	2030	3,513,599	140,608
2029	4,431,956	29,187,090	2031	3,730,978	146,232
2030	4,914,000	32,361,638	2032	3,972,000	152,082
2031	5,448,474	35,881,469	2033	4,239,237	158,165
2032	6,041,080	39,784,135	2034	4,535,540	164,491
2033	6,698,141	44,111,277	2035	4,864,070	171,071
2034	7,426,668	48,909,063	2036	5,228,334	177,914
2035	8,234,433	54,228,682	2037	5,632,217	185,031
2036	9,130,055	60,126,893	2038	6,080,028	192,432
2037	10,123,091	66,666,626	2039	6,576,545	200,129
2038	11,224,134	73,917,656	2040	7,127,067	208,134
2039	12,444,932	81,957,347	2041	7,737,466	216,460
2040	13,798,512	90,871,481	2042	8,414,256	225,118

(a) Table 14.2.
(b) Assumes collection of $7 per enplaned passenger, at 98 percent collection rate less 4 percent administration fee to airlines.
(c) Federal fiscal year ending September 30.
(d) Assumes existing passenger entitlement formula continues throughout the forecast period.
(e) Assumes minimal cargo entitlements would be available throughout the forecast period.

Sources: As noted and HNTB analysis.

- The cash flow model was run to reflect these changes. Because the construction requirements are the same as for the Base Case, two bond issues were required. These two issues were of approximately the same amount as in the Base Case; the first bond issue was a $459.9 million issue in 2020, and the second was a $502.4 million issue in 2023.

The resulting cash flow model for the High Forecast Case is presented in **Table 16.12**. Because virtually all elements of the model are the same as in the Base Case, the differences realized from running the high forecast model can be traced to the improved revenue realized from high enplanement levels. This improved revenue caused airline costs to decline approximately $10 per enplanement from the Base Case, to $25.76 in 2025 and $8.61 in 2035. The ten year average cost per enplanement was estimated to be $15.38. These figures suggest that higher-than-expected passenger levels at the airport would make it more financially feasible, but that the high forecast for this study does not meet the criterion. Still, this analysis shows the impact of higher passenger levels. Other sensitivity analyses that reflect feasible situations might, in fact, be stronger cases if they were assumed in conjunction with higher forecasts.

16.5.3 Enhanced Private Funding Case

As described earlier, there are a variety of ways private funding can be incorporated into an airport construction project. This subsection, in addition to describing the cash flow results of the sensitivity analysis, presents a discussion of airport development projects that may be privately funded. Major airport components are defined and divided into four main development areas: airside, terminal, landside, and ancillary facilities. The four development areas are subsequently broken down and discussed with reference to example cases.

- Airside - Components of the airside include runways, taxiways, navigational aids, air traffic control tower, airfield lighting, apron area, aircraft fueling, fuel farm, aircraft maintenance, hangar, de-icing, and snow removal.

- Terminal - Terminal areas include public areas within the terminal building, airline and office tenant facilities, and food/beverage and retail concessions. Landside – Landside areas include facilities related to ground access, such as roads, automotive parking, rental cars, taxi, limousine, and rapid transit (bus or rail).

- Ancillary Facilities – Ancillary facilities include air cargo facilities, hotel, catering, ARFF, utilities, communications and computer systems, and advertising/ signage.

The feasibility of private financing and management of these four areas, as well as for subcomponents within the areas, varies widely. Private sector participation is most often found in the terminal, landside, and ancillary aspects of an airport. More rarely, private investment in airside facilities has occurred, usually internationally in airports that find a private concession agreement to be the fastest and most efficient means of attracting capital into their airport. The scale of private participation also demonstrates a wide range, from contract management of specific facilities to long-term Build-Operate-Transfer (BOT) contracts for major airport expansions.

- It is important to understand that no airport facility is a viable candidate for

Table 16.12

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Preliminary Cash Flow Analysis: HIGH FORECAST ANALYSIS

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Capital Costs and Grants (Calendar Year)																					
Total Costs	114,349,000	124,695,000	187,973,000	161,889,000	220,751,000	134,290,064	36,805,000	37,988,000	39,287,000	6,846,000	8,400,000	10,099,000	13,280,000	43,690,000	53,788,000	64,660,000	28,791,000	33,088,000	34,230,000	35,418,000	36,656,000
AIP Entitlements	-	-	-	-	-	-	-	3,106,245	3,270,722	3,452,745	3,654,207	3,877,210	4,124,082	4,397,402	4,700,031	5,035,142	5,406,248	5,817,247	6,272,459	6,776,674	7,335,201
AIP Discretionary	24,877,600	35,882,130	43,332,100	35,437,800	47,210,200	8,382,315	5,633,650	3,427,055	4,248,478	1,757,805	2,730,543	3,788,740	5,942,968	10,020,798	12,584,569	15,374,008	16,278,002	19,042,003	19,380,391	19,698,676	19,994,849
PFCs	-	-	-	-	-	19,312,209	21,412,711	23,741,676	26,323,951	272,790	335,400	404,110	532,490	14,084,050	18,946,000	19,460,950	1,113,750	1,295,450	1,356,380	1,420,480	1,487,940
State Entitlement	-	-	-	-	-	-	600,000	665,259	737,617	817,844	906,797	1,005,425	1,114,781	1,236,031	1,370,468	1,519,528	1,684,800	1,868,048	2,071,227	2,296,505	2,546,286
State Discretionary	6,870,913	7,022,554	7,627,542	7,785,951	7,947,855	1,243,650	1,361,250	2,082,041	2,871,233	273,316	434,803	611,015	1,015,179	7,889,601	7,956,567	8,013,355	2,831,200	3,383,252	3,425,493	3,458,415	3,480,324
Airport	82,600,487	81,790,316	82,600,487	117,352,049	160,279,745	102,844,951	5,794,889	3,513,144	982,839	-	-	-	-	196,660	3,255,680	3,303,520	-	-	-	-	-
Cash Flow (Fiscal Year)																					
Bond Issue	459,871,933	-	-	502,391,854	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Revenues																					
Proceeds from Sale of Land	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Available PFC Funds for Debt Service	-	-	-	-	-	-	-	-	-	28,914,300	32,026,238	35,477,359	39,251,645	30,027,227	29,963,063	34,767,732	59,013,143	65,371,176	72,561,276	80,536,867	89,383,541
Non-Airline Revenues	-	-	-	-	-	34,074,245	37,780,348	41,889,547	46,445,685	51,497,374	57,098,513	63,308,862	70,194,683	77,829,444	86,294,603	95,680,480	106,087,217	117,625,848	130,419,484	144,604,626	160,332,623
Required Airline Revenues	-	-	-	-	-	75,554,749	72,535,939	69,524,618	76,176,929	62,678,603	60,757,687	60,203,767	58,329,602	69,821,960	72,558,420	70,870,966	50,232,714	48,021,754	45,574,088	42,997,816	39,336,120
Total Revenues	-	-	-	-	-	109,628,994	110,316,287	111,414,165	122,622,615	143,090,277	149,882,438	158,989,987	167,775,930	177,678,630	188,816,086	201,319,178	215,333,075	231,018,778	248,554,848	268,139,310	289,052,283
Costs																					
Operating	-	-	-	-	-	21,993,678	24,385,832	27,038,169	29,978,990	33,239,670	36,855,000	40,863,553	45,308,099	50,236,057	55,700,008	61,758,248	68,475,416	75,923,180	84,181,003	93,336,994	103,488,840
ORF/PHF Expense	-	-	-	-	-	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
New Debt Service	-	-	-	-	-	70,356,453	68,976,914	67,624,426	74,337,746	72,880,143	71,451,120	71,548,414	70,256,617	68,996,210	67,766,909	66,568,453	65,400,604	64,263,151	63,155,906	62,078,707	60,029,304
Total Costs	-	-	-	-	-	94,750,131	95,762,746	97,062,595	106,716,736	108,519,813	110,706,120	114,811,967	117,964,715	121,632,267	125,866,917	130,726,701	136,276,020	142,586,331	149,736,909	157,815,701	165,918,144
Net Revenue	-	-	-	-	-	14,878,863	14,553,541	14,351,570	15,905,879	34,570,464	39,176,318	44,178,020	49,811,215	56,046,363	62,949,169	70,592,478	79,057,055	88,432,447	98,817,939	110,323,609	123,134,140
Airport Project Costs	82,600,487	81,790,316	137,013,358	117,352,049	160,279,745	102,844,951	5,794,889	3,513,144	982,839	-	-	-	-	196,660	3,255,680	3,303,520	-	-	-	-	-
CIP Reserve Balance	-	-	-	-	-	14,878,863	23,637,516	34,475,941	34,475,941	34,475,941	34,475,941	34,475,941	84,287,156	140,136,859	199,830,348	267,119,306	346,176,360	434,608,807	533,426,746	643,750,355	766,884,495
Debt Service Coverage	-	-	-	-	-	1.25	1.25	1.25	1.25	1.51	1.58	1.65	1.74	1.85	1.96	2.10	2.25	2.41	2.60	2.82	3.09
Airline Cost per Enplanement	$ -	$ -	$ -	$ -	$ -	$ 25.76	$ 22.31	$ 19.29	$ 19.06	$ 14.14	$ 12.36	$ 11.05	$ 9.66	$ 10.42	$ 9.77	$ 8.61	$ 5.50	$ 4.74	$ 4.06	$ 3.46	$ 2.85
10-year Average Cost per Enplanement						$ 15.38															

Sources: Table A.3 and HNTB analysis.

- private investment unless the airport as a whole is financially viable. More specifically, this section on private development opportunities must address the following three questions: In which airport components or subcomponents can the private sector add the most value, i.e., the greatest comparative advantage (compared with government financing, development, and operation), in reducing the cost of the airport, increasing non-airline revenues, and/or managing the financial risks associated with the component?

- Which component or bundle of components would provide the most attractive investment packages for private investors or an investor-operator?

- Is initial financial feasibility and long-term development best fostered by fully private finance, operation, and development or by some mixture of public and private finance, operation, and development?

The following subsections address these questions in greater detail, and identify opportunities to engage the private sector using demonstrated examples of private investment in public-use infrastructure.

Airside

Private participation in the airside for runways, landing systems, and air traffic control systems is relatively rare. It usually occurs in instances in which the airport has difficulty raising large amounts of capital for its own account or in which technical and management expertise is otherwise more difficult to obtain (e.g., developing countries). Private participation in air traffic control in U.S. airports, for example, is limited to operating contracts at Class 1 GA airports. However, specialty services and facilities are commonly financed with private capital and operated by private firms, even in the United States. Support area investment such as aircraft fueling and maintenance and snow removal is quite common.

Airside Infrastructure

A recent example of airside infrastructure development is the private financing of a runway at the Eldorado Airport in Bogota, Colombia. The project is structured as a build-transfer-maintain concession. The runway is being built by Compañía de Desarollo Aeropuerto Eldorado S.A. (CODAD), which is a special purpose company owned by Dragados y Construccíones, Ogden Corp. and Concreto Ingenieros Civiles. CODAD will construct a second runway under a fixed-price contract, then transfer ownership to Aerocivil, the Colombian aeronautical authority. Aerocivil, which will maintain both of the airport's runways and collect landing fees, provided a revenue guarantee for the 20-year term of the concession. More commonly, however, the public partner finances and develops this portion of the airport and seeks private participation for airside support, landside, terminal, and ancillary facilities.

Airside Support Services

The structure of participation for airside support areas runs the gamut from service contracts (e.g., for snow removal) to concessions and leases for airline fuel and fueling services, and maintenance and hangar facilities. For example, Ogden Corp. has a concession to provide ground support and maintenance services at the new Macau Airport. At the Chek Lap Kok (new Hong Kong) Airport, the Hong Kong Airport Authority signed concessions worth $218

million with AFCO for the construction and operation of aviation fuel services and $179 million with Hong Kong Aircraft Engineering Co. for an aircraft maintenance facility.

Terminal

Numerous opportunities exist for private sector involvement in the terminal area. An examination of U.S. airport terminals reveals several models of engagement by the private sector. In its most basic structure, private companies provide services and concessions. As the private sector assumes more control and risk, private investment takes the form of construction and/or operation of the terminal building.

Service Provision

In most publicly developed terminals, the private sector plays an important role as concessionaire (retail sales) and provides services such as cleaning, groundskeeping, and security. The public sector airport operators control the contracting and oversight of these functions. For example, at Atlanta Hartsfield, where six companies operate the majority of retail, food, and beverage concessions, the Airport Authority ensures that the concessions are operated according to the airport concession master plan. The Authority controls the hours of operation, products sold, materials to be used in the shops and restaurants, and the locations of the concessions. The Authority offered to finance the build-outs of potential retail tenants at below-market rates by using bond money or airport sources of financing. The public partner suggested that this strategy best allowed it to provide regional, as well as national and international, brands.

At other airports, such as Reagan Washington National, the public partner retains a firm, such as Innovations Airports, to arrange contracts with concessionaires on its behalf.

Master Concessionaire

Further along the continuum toward private development is the master concessionaire structure. In this model, the public operator cedes control of the development and management of the food and beverage, retail, and service concessions to a private real estate manager. BAA's development of concessions at Pittsburgh International provides a classic example of this strategy. BAA performs all functions pertaining to the development of concession strategy, selection of concessionaires, build-out of concession space, and management of concessionaires. Other features of the BAA Pittsburgh strategy include branded retailers, street pricing, and competing outlets. BAA has boosted average spending per passenger from approximately $2 to $6. It pays the airport $0.40 per passenger up to a base rent of $4 million. Revenues above $4 million are split 80 percent to the public partner and 20 percent to BAA. This strategy is pursued at the Philadelphia airport.

Terminal Development and Financing

Private development of a new facility or expansion of an existing one represents the ultimate level of private investment in the terminal area. Airlines and airport management companies have organized and controlled most of the investor consortia, although investment banks, construction companies, and real estate developers have become members of a successful team. Examples of airline participation in terminals include the construction in the early 1970s of Terminal B at Logan (Boston) by South Terminal Corporation, which is a venture of Northwest, American,

and US Airways, and the recent development of Terminal One at JFK by Terminal One Group Association (TOGA), a limited partnership between Air France, Japan Airlines, Lufthansa, and Korean Airlines (KAL). Many of the other passenger terminals at JFK are operated by the occupying airlines, which also contribute financially to the expansion of the facilities. The Terminal Four project at JFK represents a recent example of airport management company involvement in terminal development. Schiphol, the operator of the Amsterdam Airport, teamed with LCOR, a New York real estate development company, and Lehman Brothers, an investment bank, on this project.

The private parties lease the facility, assume the risk for the construction and/or operation of the facility, guarantee the debt repayment, and contribute a small quantity of equity. The public partner retains ownership of the physical asset and provides favorable debt-financing terms through access to the tax-exempt market. It may or may not provide some infrastructure-related improvements. The projects are generally highly leveraged. The allocation of generated revenues between public and private partners varies from case to case.

Airline-Led Development. At Terminal B (Logan), the airline-owned company, South Terminal Corporation, agreed to lease and operate the terminal for the term of the debt repayment (25 years) and to repay the financing costs associated with the construction of the terminal and required off-site infrastructure improvements (boilers, piping, and road access). The project was financed in the tax-exempt market. During the term of the concession, South Terminal Corporation made leasehold improvements to the facility. The private partner receives profit sharing (50 percent) of parking revenues from the garage attached to the terminal and all concession revenues.

A more recent example of airline-led development is Terminal One at JFK. Four airlines—Air France, Japan Airlines, Lufthansa, and KAL—have equal shares in TOGA LLP. TOGA negotiated a site lease for the former Eastern Airlines Terminal site, which it then razed. TOGA contributed equity of $12 million to the project, which funded work that could not be financed using tax-exempt debt (e.g., off-site improvements, rolling stock). The public partner, the Port Authority of New York and New Jersey (Port Authority), provided $4 million in access improvements. The remainder of the project ($435 million) was financed through tax-exempt debt. The public partner receives ground rental revenue, 50 percent of retail concession payments, and 80 percent of food concession payments.

Airport Management Company Development. The Terminal Four project is an example of airport management company development of a terminal facility. JFK International Arrivals Terminal LLC, composed of Schiphol, LCOR, and Lehman Brothers, contributed $15 million in equity, and the Port Authority contributed $80 million. The Port Authority also provided an in-kind contribution of planning and engineering research that had been undertaken prior to the signing date. The remainder of the project ($934 million) was financed in the tax-exempt market using non-recourse bonds issued by the Port Authority. The Port Authority required that the private partner provide a full completion and management guarantee. It did not provide cash flow, fee, or passenger guarantees. The private partner receives a management fee up-front as part of O&M costs, and retains 40 percent of net revenue after O&M expenses and debt service. The

Port Authority earns 60 percent of net revenue after O&M expenses and debt service and is guaranteed $12 million per year in base rent, with its share of terminal concession income, rent, and other revenues capped at $60 million per year.

Another example is TBI's acquisition of the domestic terminal at Orlando Sanford International Airport (OSI) on August 30, 1999. TBI US, an American subsidiary of TBI plc, a large owner and operator of airports worldwide, signed a 30-year management contract to operate, manage, and develop the domestic airline terminal at OSI. TBI will pay $10 million against the $25 million cost of the planned terminal expansion project. To cover construction costs, $7.5 million will be paid initially, while the remaining $2.5 million will be spread evenly over the first five years of the agreement in the form of $500,000 annual payments to the Airport Authority for airfield capital requirements.

Landside

Landside transportation facilities provide opportunities for private investment and revenue generation at airports. Generally, public partners develop the road access portion of the landside. Rapid transit is often also publicly developed and tied into existing local rapid transit networks. Automotive parking, rental car, and taxi/limousine concessions provide the best opportunities for private landside development.

Automotive Parking

Automotive parking revenues alone can account for as much as 15 percent to 20 percent of gross revenues of the entire airport. An estimated 60 percent of scheduled service airports outsource parking in some way. In view of the returns available, real estate developers, as well as other airport-related investors, have invested in parking facilities at airports.

At T.F. Green in Providence, Rhode Island, a privately developed garage built in 1986 has proven so successful that the developer suggested expanding the garage to four to five times its present size. An integral part of the Terminal B project at Logan was the construction of a parking facility adjacent to the terminal. South Terminal Corporation's 50 percent share of the profit from this garage is $4 million. In 1992, Chicago O'Hare hired a private parking operator. At that time, gross parking revenues equaled approximately $42 million. Presently, O'Hare gross parking revenues equal $87 million, $12 million of which is a result of rate increases. Austin, Columbus, Sacramento, and Dallas also outsource parking at their airports.

Rental Car Concessions

Rental car concessions contribute $1 billion a year to airport revenues and provide another lucrative opportunity for private investment. A concession fee of ten percent of gross revenues for car rental companies has long been standard at airports, although companies are trying to negotiate more flexible concession rates. Companies may also pay square footage charges for the terminal or ground space that they use.

Integration of companies such as Dollar Rent-a-Car, Budget Rent-a-Car, Avis, and Hertz as equal partners in the planning and financing of their facilities will not only provide a source of private development funds for the public agency but will enhance the passenger's travel experience at the airport by integrating the car rental facility into the design of the airport from the project's inception. Such planning speeds

car pick-up, facilitates the return of the automobile, and enhances the passenger's perception of the airport. Financing, however, is an issue for the industry as it has thin profit margins, and car rental companies would like to see more of their revenues dedicated to landside development. Some airports, such as Reagan Washington National, mandate a customer facility charge that is added to per-day rental charges and is used to pay debt service on revenue or special facility bonds used to develop the landside facilities in response to car rental company concerns.

Ancillary Facilities

A diverse group of functions including air cargo, hotel, catering, ARFF, utilities, communications and computer systems, and advertising/signage may be classified as ancillary facilities. The private sector may be integrated in the development of many of these facilities, most notably air cargo, hotel, utilities, and catering. GA is also included in this sector.

Air Cargo

Many airports, such as Washington Dulles, JFK, and Hong Kong's Chek Lap Kok, have successfully attracted private companies to develop their air cargo infrastructures. In 1996, JFK privately financed the redevelopment of 440,000 square feet of cargo facilities, including a 200,000-square-foot structure by KAL. The KAL project is a highly leveraged, 25-year concession. The $100 million cost of the project is financed through tax-exempt debt supported by the KAL lease. The airline was not required to provide equity specifically for this project, as it had deposits with the Port Authority for other pre-existing leases.

The Washington Dulles Air Cargo facility is a $25 million project that required a limited equity investment ($2 million) by the private partners. The scope of the project included the construction of a cargo handling facility and a 315,000-square-foot air cargo aircraft apron and ground support equipment storage area. This project was also financed in the tax-exempt market.

Two consortia privately develop all cargo development at Chek Lap Kok: Hong Kong Air Cargo (Swire Pacific and related companies) and Asia Air Freight Co. (Federal Express, Singapore Terminal Management Co., etc.). The consortia have agreed to invest $1 billion and $100 million, respectively.

Hotels

Airport hotels provide important "billboards" for companies in the hospitality industry, and an opportunity for public partners to engage the private sector. Companies are often interested in developing a facility commensurate with their market segments and that enhances their brand value. For example, Hilton recently demolished the O'Hare Hilton and rebuilt the facility that had fallen into disrepair. Airport hotels also provide a significant source of concession revenues. Hotel companies will typically pay for hotel development, make ground lease payments, and share a percentage of revenues.

Utilities

Airport utilities (electricity, natural gas, wastewater, water, HVAC, and communications) provide an opportunity to attract private investment. Some airports have piggy-backed the development and expansion of utilities to the development of other privately financed facilities, such as

passenger terminals. For example, the airline owners of South Terminal Corporation financed and paid for significant additions to the airport infrastructure as a part of the deal to develop Terminal B at Boston Logan.

The Terminal One project at JFK also provides for private finance of off-site infrastructure improvements. JFK has also privately developed a co-generation facility. In addition to these more traditional examples of privately developed utilities, the deregulation of the telecommunications industry and the emerging deregulation of the local monopolies for electricity provide opportunities to competitively purchase these utilities, invest in generating assets, and develop the needed infrastructure. Private developers and operators of water and wastewater plants may also be enticed to develop these facilities. Even airport lighting may be privately financed or managed.

General Aviation

Throughout the U.S., fixed base operations and GA airport management have increasingly been handed over to private operators. AMPORTS, a U.S. subsidiary to Associated British Ports plc, successfully manages five GA airports and three FBOs in the northeastern United States. Fort Worth Alliance Airport, the world's first industrial airport, is managed by Hillwood's Alliance Air Services as a joint venture between the City of Fort Worth, the FAA, and Hillwood. Hillwood's Alliance Aviation Services operates the full-service FBO at the airport, which offers fuel, maintenance, catering, cargo handling, hangar use, U.S. Customs services, pilots lounge, ARFF service, FAA control tower, and more.

Catering

Chek Lap Kok has integrated the catering franchises in the development of their facilities. For the first ten years of the airport, there will be no more than four franchises providing catering services. Three companies—Cathay Pacific Catering Services HK Ltd., LSG Lufthansa Service HK Ltd., and Gate Gourmet HK Ltd.—have agreed to design, construct, and operate their on-site catering and support facilities. Cathay Pacific Catering Services HK Ltd. is investing $205 million, LSG Lufthansa Service HK Ltd. is investing $56.8 million, and Gate Gourmet HK Ltd. is investing $41.7 million.

Conclusion

Private investment in the airside infrastructure has historically been limited. However, projects such as the Eldorado runway demonstrate that airside infrastructure projects can be independently structured and financed with some flexibility and creativity. Private firms have shown willingness to participate in the development of airside support areas (e.g., snow removal, airline/GA fueling, and maintenance and hangar facilities).

For developing terminal areas, the private sector can play a significant role which spans the whole continuum of public-private partnerships: service contracts (provision of security, cleaning, retail sales, etc.), management contracts and leases (either for discrete areas such as food, beverage, or retail concessions or for the entire terminal complex), and concessions for the financing and development of new facilities. Cultivating the interest of airlines and airport management companies may also provide a fruitful strategy to privately develop the terminal area.

Planning of most landside facilities has been limited, with the exception of access roads and automotive parking. However, the private sector has demonstrated an interest in the development of landside facilities, such as automotive parking and car rental. The integration of the private sector in locating and designing these facilities can both enhance the airport experience for airport users and maximize revenues.

Ancillary facilities provide many opportunities for private development of airport facilities. Companies have demonstrated an interest in financing air cargo, hotel, utilities, and catering facilities both domestically and internationally. Trends in industries, such as telecommunications, may provide other opportunities. GA, treated here as an ancillary facility, is another opportunity for private financing, development, construction, management, and operation.

The following development projects are presented in order of their likelihood for private funding and participation:

- Fuel farm
- Leasehold improvements for terminal tenants and rental cars
- Hotel development
- Utilities
- Aircraft maintenance
- Parking
- General Aviation
- Rental cars
- Terminal buildings

The most likely and successful private development projects have involved the fuel farm and leasehold improvements for terminal tenants and rental cars. Hotel development inside airport property should be considered next in the scheme of private development. Utilities, aircraft maintenance facilities, air cargo, and parking follow as the next likely and common areas to be developed privately. The private management and financing of GA airports is becoming more commonplace, and follows the aforementioned ancillary facilities as next likely to be privately developed and operated. Finally, private development of rental car and terminal buildings could be considered, although there are only a few examples of these projects currently in the U.S. (e.g., Orlando Sanford International Airport).

Sensitivity Analysis

To perform this sensitivity analysis, the following changes were made to the Base Case:

- The estimated funding sources were adjusted to reflect greater participation by the private sector. As it is technically possible to model many different privatization scenarios, it was necessary to estimate a reasonable level of investment to provide a good perspective to the impacts of private funding. The development projects assumed to attract private funding were utilities, the terminal building, terminal auto parking, and air cargo buildings, as shown in **Table 16.13**.

- Adjustments were made to the forecast O&M expenses and non-airline revenues to reflect the portion of these line items that would be borne by the private sector. The corresponding reduction in both created a net gain in net revenue for the airport.

Table 16.13

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Projects by Estimated Funding Source (Preliminary): Enhanced Private Funding Case
(Costs include Escalation for Inflation, Contingencies @ 10 Percent, and Administration, Engineering and Testing @ 15 Percent)

			Estimated Eligibility (b)			Estimated Funding (c)				
Project	Year (a)	Total Cost (a)	FAA	PFC	State	Composite FAA Funding	PFC	State	Other Private	Airport
I. Airfield										
Site Preparation 1	2020	27,980,000	25,182,000	27,980,000	22,384,000	6,995,000	-	6,870,913	-	14,114,087
Utilities	2020	10,168,000	9,151,200	10,168,000	8,134,400	2,542,000	-	-	7,626,000	-
Runway/Taxiway	2021	109,013,000	98,111,700	109,013,000	87,210,400	32,197,350	-	7,022,554	-	69,793,096
Runway/Taxiway	2022	109,013,000	98,111,700	109,013,000	87,210,400	27,253,250	-	7,177,542	-	74,582,208
Runway/Taxiway	2023	72,675,000	65,407,500	72,675,000	58,140,000	17,442,000	-	7,335,951	-	47,897,049
Runway/Taxiway	2024	72,675,000	65,407,500	72,675,000	58,140,000	17,442,000	-	7,497,855	-	47,735,145
NAVAIDS	2024	9,690,000	9,690,000	9,690,000	7,752,000	1,938,000	-	-	-	7,752,000
Ongoing Airfield	2025	478,000	430,200	478,000	382,400	430,200	-	38,240	-	9,560
Ongoing Airfield	2026	1,002,000	901,800	1,002,000	801,600	901,800	-	80,160	-	20,040
Ongoing Airfield	2027	1,577,000	1,419,300	1,577,000	1,261,600	1,419,300	-	126,160	-	31,540
Ongoing Airfield	2028	2,206,000	1,985,400	2,206,000	1,764,800	1,985,400	44,120	176,480	-	-
Ongoing Airfield	2029	2,892,000	2,602,800	2,892,000	2,313,600	2,602,800	57,840	231,360	-	-
Ongoing Airfield	2030	3,640,000	3,276,000	3,640,000	2,912,000	3,276,000	72,800	291,200	-	-
Ongoing Airfield	2031	5,091,000	4,581,900	5,091,000	4,072,800	4,581,900	101,820	407,280	-	-
Ongoing Airfield	2032	6,676,000	6,008,400	6,676,000	5,340,800	6,008,400	133,520	534,080	-	-
Ongoing Airfield	2033	8,403,000	7,562,700	8,403,000	6,722,400	7,562,700	-	672,240	-	168,060
Ongoing Airfield	2034	10,283,000	9,254,700	10,283,000	8,226,400	9,254,700	-	822,640	-	205,660
Ongoing Airfield	2035	12,327,000	11,094,300	12,327,000	9,861,600	11,094,300	-	986,160	-	246,540
Ongoing Airfield	2036	14,215,000	12,793,500	14,215,000	11,372,000	12,793,500	284,300	1,137,200	-	-
Ongoing Airfield	2037	16,189,000	14,570,100	16,189,000	12,951,200	14,570,100	323,780	1,295,120	-	-
Ongoing Airfield	2038	16,594,000	14,934,600	16,594,000	13,275,200	14,934,600	331,880	1,327,520	-	-
Ongoing Airfield	2039	17,009,000	15,308,100	17,009,000	13,607,200	15,308,100	340,180	1,360,720	-	-
Ongoing Airfield	2040	17,434,000	15,690,600	17,434,000	13,947,200	15,690,600	348,680	1,394,720	-	-
Subtotal Airfield		547,230,000	493,476,000	547,230,000	437,784,000	228,224,000	2,038,920	46,786,095	7,626,000	262,554,986
II. Terminal Area										
Site Preparation 1	2020	13,990,000	6,995,000	13,990,000	11,192,000	2,798,000	-	-	-	11,192,000
Utilities	2020	17,431,000	8,715,500	17,431,000	8,715,500	3,486,200	-	-	8,715,500	5,229,300
Terminal Building	2022	23,983,000	11,991,500	19,186,400	11,991,500	4,796,600	-	-	19,186,400	-
Terminal Building	2023	23,983,000	11,991,500	19,186,400	11,991,500	4,796,600	-	-	19,186,400	-
Terminal Building	2024	23,983,000	11,991,500	19,186,400	11,991,500	4,796,600	-	-	19,186,400	-
Terminal Building	2033	16,392,000	8,196,000	13,113,600	8,196,000	1,639,200	6,299,408	8,453,392	-	-
Terminal Building	2034	16,392,000	8,196,000	13,113,600	8,196,000	1,639,200	6,248,405	8,504,395	-	-
Terminal Building	2035	16,392,000	8,196,000	13,113,600	8,196,000	1,639,200	6,206,077	8,546,723	-	-
Apron Area	2023	5,320,000	2,660,000	5,320,000	2,660,000	1,064,000	-	-	-	4,256,000
Apron Area	2024	5,320,000	2,660,000	5,320,000	2,660,000	1,064,000	-	-	-	4,256,000
Apron Area	2034	3,106,000	1,553,000	3,106,000	1,553,000	-	3,106,000	-	-	-
Apron Area	2035	3,106,000	1,553,000	3,106,000	1,553,000	-	3,106,000	-	-	-
Ongoing Terminal	2025	159,000	79,500	119,250	79,500	79,500	15,900	63,600	-	-
Ongoing Terminal	2026	337,000	168,500	252,750	168,500	168,500	33,700	134,800	-	-
Ongoing Terminal	2027	536,000	268,000	402,000	268,000	268,000	53,600	214,400	-	-
Ongoing Terminal	2028	757,000	378,500	567,750	378,500	378,500	75,700	302,800	-	-
Ongoing Terminal	2029	1,003,000	501,500	752,250	501,500	501,500	100,300	401,200	-	-
Ongoing Terminal	2030	1,275,000	637,500	956,250	637,500	637,500	127,500	510,000	-	-
Ongoing Terminal	2031	1,801,000	900,500	1,350,750	900,500	900,500	180,100	720,400	-	-
Ongoing Terminal	2032	2,385,000	1,192,500	1,788,750	1,192,500	1,192,500	238,500	954,000	-	-
Ongoing Terminal	2033	3,032,000	1,516,000	2,274,000	1,516,000	1,516,000	1,516,000	-	-	-
Ongoing Terminal	2034	3,748,000	1,874,000	2,811,000	1,874,000	1,874,000	1,874,000	-	-	-
Ongoing Terminal	2035	4,538,000	2,269,000	3,403,500	2,269,000	2,269,000	2,269,000	-	-	-
Ongoing Terminal	2036	5,408,000	2,704,000	4,056,000	2,704,000	2,704,000	540,800	2,163,200	-	-
Ongoing Terminal	2037	6,366,000	3,183,000	4,774,500	3,183,000	3,183,000	636,600	2,546,400	-	-
Ongoing Terminal	2038	6,744,000	3,372,000	5,058,000	3,372,000	3,372,000	674,400	2,697,600	-	-
Ongoing Terminal	2039	7,144,000	3,572,000	5,358,000	3,572,000	3,572,000	714,400	2,857,600	-	-
Ongoing Terminal	2040	7,569,000	3,784,500	5,676,750	3,784,500	3,784,500	756,900	3,027,600	-	-
Subtotal Terminal Area		222,200,000	111,100,000	184,774,500	115,297,000	27,799,100	24,981,790	25,568,110	66,274,700	24,933,300
III. General Aviation and Flex Area										
Site Preparation 1	2020	4,663,000	3,497,250	4,663,000	3,730,400	932,600	-	-	-	3,730,400
Utilities	2020	1,453,000	1,089,750	1,453,000	1,162,400	290,600	-	-	1,162,400	-
Airport Roadways	2021	9,448,000	7,086,000	9,448,000	450,000	1,889,600	-	-	-	7,558,400
Airport Roadways	2022	9,448,000	7,086,000	9,448,000	450,000	1,889,600	-	-	-	7,558,400
Airport Roadways	2023	9,448,000	7,086,000	9,448,000	450,000	1,889,600	-	-	-	7,558,400
Airport Roadways	2024	9,448,000	7,086,000	9,448,000	450,000	1,889,600	-	-	-	7,558,400
Off-Airport Roadways	2022	2,597,000	1,947,750	2,597,000	450,000	519,400	-	450,000	-	1,627,600
Off-Airport Roadways	2023	2,597,000	1,947,750	2,597,000	450,000	519,400	-	450,000	-	1,627,600
Off-Airport Roadways	2024	2,597,000	1,947,750	2,597,000	450,000	519,400	-	450,000	-	1,627,600
Fuel Storage Facilities	2024	4,845,000	3,633,750	-	125,000	969,000	-	-	3,876,000	-
GA Facilities	2023	6,238,000	4,678,500	3,119,000	3,119,000	1,247,600	-	-	1,247,600	3,742,800
GA Facilities	2024	6,238,000	4,678,500	3,119,000	3,119,000	1,247,600	-	-	1,247,600	3,742,800
Ongoing GA	2025	40,000	30,000	20,000	20,000	30,000	2,000	8,000	-	-
Ongoing GA	2026	82,000	61,500	41,000	41,000	61,500	4,100	16,400	-	-
Ongoing GA	2027	128,000	96,000	64,000	64,000	96,000	6,400	25,600	-	-
Ongoing GA	2028	177,000	132,750	88,500	88,500	132,750	8,850	35,400	-	-
Ongoing GA	2029	229,000	171,750	114,500	114,500	171,750	11,450	45,800	-	-
Ongoing GA	2030	285,000	213,750	142,500	142,500	213,750	14,250	57,000	-	-
Ongoing GA	2031	393,000	294,750	196,500	196,500	294,750	19,650	78,600	-	-
Ongoing GA	2032	509,000	381,750	254,500	254,500	381,750	25,450	101,800	-	-
Ongoing GA	2033	632,000	474,000	316,000	316,000	474,000	158,000	-	-	-
Ongoing GA	2034	764,000	573,000	382,000	382,000	573,000	191,000	-	-	-
Ongoing GA	2035	904,000	678,000	452,000	452,000	678,000	226,000	-	-	-
Ongoing GA	2036	1,043,000	782,250	521,500	521,500	782,250	10,430	41,720	208,600	-
Ongoing GA	2037	1,188,000	891,000	594,000	594,000	891,000	11,880	47,520	237,600	-
Ongoing GA	2038	1,217,000	912,750	608,500	608,500	912,750	12,170	48,680	243,400	-
Ongoing GA	2039	1,248,000	936,000	624,000	624,000	936,000	12,480	49,920	249,600	-
Ongoing GA	2040	1,279,000	959,250	639,500	639,500	959,250	12,790	51,160	255,800	-
Subtotal General Aviation		79,138,000	59,353,500	62,996,000	19,464,800	21,392,500	726,900	1,957,600	8,728,600	46,332,400

Table 16.13

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Projects by Estimated Funding Source (Preliminary): Enhanced Private Funding Case
(Costs include Escalation for Inflation, Contingencies @ 10 Percent, and Administration, Engineering and Testing @ 15 Percent)

			Estimated Eligibility (b)			Estimated Funding (c)				
Project	Year (a)	Total Cost (a)	FAA	PFC	State	Composite FAA Funding	PFC	State	Other Private	Airport
IV. Support Facilities										
Construct ATCT	2022	10,175,000	9,157,500	10,175,000	-	2,035,000	-	-	-	8,140,000
Construct ATCT	2023	10,175,000	9,157,500	10,175,000	-	2,035,000	-	-	-	8,140,000
Construct ATCT	2024	5,087,000	4,578,300	5,087,000	-	1,017,400	-	-	-	4,069,600
ARFF/Maintenance/Support	2022	9,690,000	8,721,000	9,690,000	7,752,000	1,938,000	-	-	-	7,752,000
ARFF/Maintenance/Support	2023	9,690,000	8,721,000	9,690,000	7,752,000	1,938,000	-	-	-	7,752,000
ARFF/Maintenance/Support	2024	4,845,000	4,360,500	4,845,000	3,876,000	969,000	-	-	-	3,876,000
Terminal Parking - Grade	2024	9,629,000	-	-	-	1,925,800	-	-	7,703,200	-
Terminal Parking - Grade	2035	6,370,000	-	-	-	-	4,548,732	-	1,821,268	-
Terminal Parking - Structure	2022	13,670,000	-	-	-	2,734,000	-	-	10,936,000	-
Terminal Parking - Structure	2023	13,670,000	-	-	-	2,734,000	-	-	10,936,000	-
Terminal Parking - Structure	2024	13,670,000	-	-	-	2,734,000	-	-	10,936,000	-
Terminal Parking - Structure	2033	9,185,000	-	-	-	-	6,148,439	-	3,036,561	-
Terminal Parking - Structure	2034	9,185,000	-	-	-	-	426,994	-	8,758,006	-
Terminal Parking - Structure	2035	9,185,000	-	-	-	-	-	-	9,185,000	-
Ongoing Support	2025	80,000	60,000	64,000	40,000	60,000	4,000	16,000	-	-
Ongoing Support	2026	168,000	126,000	134,400	84,000	126,000	8,400	33,600	-	-
Ongoing Support	2027	265,000	198,750	212,000	132,500	198,750	13,250	53,000	-	-
Ongoing Support	2028	373,000	279,750	298,400	186,500	279,750	18,650	74,600	-	-
Ongoing Support	2029	492,000	369,000	393,600	246,000	369,000	24,600	98,400	-	-
Ongoing Support	2030	622,000	466,500	497,600	311,000	466,500	31,100	124,400	-	-
Ongoing Support	2031	874,000	655,500	699,200	437,000	655,500	43,700	174,800	-	-
Ongoing Support	2032	1,152,000	864,000	921,600	576,000	864,000	57,600	230,400	-	-
Ongoing Support	2033	1,457,000	1,092,750	1,165,600	728,500	1,092,750	364,250	-	-	-
Ongoing Support	2034	1,792,000	1,344,000	1,433,600	896,000	1,344,000	448,000	-	-	-
Ongoing Support	2035	2,159,000	1,619,250	1,727,200	1,079,500	1,619,250	539,750	-	-	-
Ongoing Support	2036	2,532,000	1,899,000	2,025,600	1,266,000	1,899,000	126,600	506,400	-	-
Ongoing Support	2037	2,932,000	2,199,000	2,345,600	1,466,000	2,199,000	146,600	586,400	-	-
Ongoing Support	2038	3,055,000	2,291,250	2,444,000	1,527,500	2,291,250	152,750	611,000	-	-
Ongoing Support	2039	3,184,000	2,388,000	2,547,200	1,592,000	2,388,000	159,200	636,800	-	-
Ongoing Support	2040	3,319,000	2,489,250	2,655,200	1,659,500	2,489,250	165,950	663,800	-	-
Subtotal Support Facilities		158,682,000	63,037,800	69,226,800	31,608,000	38,402,200	13,428,565	3,809,600	63,312,035	39,729,600
V. Air Cargo/Maintenance Facilities										
Air Cargo Building	2024	5,965,000	-	-	-	1,193,000	-	-	4,772,000	-
Air Cargo Building	2034	1,795,000	-	-	-	-	-	-	1,795,000	-
Air Cargo Building	2035	1,795,000	-	-	-	-	-	-	1,795,000	-
Air Cargo Apron	2024	3,551,000	3,195,900	3,551,000	2,840,800	710,200	-	-	-	2,840,800
Air Cargo Apron	2034	1,068,000	961,200	1,068,000	854,400	-	-	-	-	1,068,000
Air Cargo Apron	2035	1,068,000	961,200	1,068,000	854,400	-	-	-	-	1,068,000
Ongoing Cargo	2025	40,000	10,000	20,000	10,000	10,000	-	-	30,000	-
Ongoing Cargo	2026	85,000	21,250	42,500	21,250	21,250	-	-	63,750	-
Ongoing Cargo	2027	136,000	34,000	68,000	34,000	34,000	-	-	102,000	-
Ongoing Cargo	2028	193,000	48,250	96,500	48,250	48,250	-	-	144,750	-
Ongoing Cargo	2029	258,000	64,500	129,000	64,500	64,500	-	-	193,500	-
Ongoing Cargo	2030	330,000	82,500	165,000	82,500	82,500	-	-	247,500	-
Ongoing Cargo	2031	470,000	117,500	235,000	117,500	117,500	-	-	352,500	-
Ongoing Cargo	2032	627,000	156,750	313,500	156,750	156,750	-	-	470,250	-
Ongoing Cargo	2033	803,000	200,750	401,500	200,750	200,750	-	-	602,250	-
Ongoing Cargo	2034	999,000	249,750	499,500	249,750	249,750	-	-	749,250	-
Ongoing Cargo	2035	1,218,000	304,500	609,000	304,500	304,500	-	-	913,500	-
Ongoing Cargo	2036	1,405,000	351,250	702,500	351,250	351,250	-	-	1,053,750	-
Ongoing Cargo	2037	1,600,000	400,000	800,000	400,000	400,000	-	-	1,200,000	-
Ongoing Cargo	2038	1,640,000	410,000	820,000	410,000	410,000	-	-	1,230,000	-
Ongoing Cargo	2039	1,681,000	420,250	840,500	420,250	420,250	-	-	1,260,750	-
Ongoing Cargo	2040	1,723,000	430,750	861,500	430,750	430,750	-	-	1,292,250	-
Subtotal Air Cargo Facility		28,450,000	8,420,300	12,291,000	7,851,600	5,205,200	-	-	18,268,000	4,976,800
VI. Miscellaneous										
Land Acquisition, Airport	2020	11,325,000	10,192,500	11,325,000	9,060,000	2,265,000	-	-	-	9,060,000
Land Acquisition, Non-Airport	2020	21,621,000	19,458,900	21,621,000	17,296,800	4,324,200	-	-	-	17,296,800
Re-finance ORF/PHF Debt	2025	98,563,064	-	98,563,064	9,856,306	-	-	-	-	98,563,064
Wetlands Mitigation	2024	32,171,000	28,953,900	32,171,000	3,217,100	6,434,200	-	-	-	25,736,800
Wetlands Mitigation	2025	32,171,000	28,953,900	32,171,000	3,217,100	6,609,300	15,356,569	3,217,100	-	6,988,031
Wetlands Mitigation	2026	32,171,000	28,953,900	32,171,000	3,217,100	3,217,100	16,245,599	3,217,100	-	9,491,201
Wetlands Mitigation	2027	32,171,000	28,953,900	32,171,000	3,217,100	3,217,100	17,186,122	3,217,100	-	8,550,678
Wetlands Mitigation	2028	32,171,000	28,953,900	32,171,000	3,217,100	3,217,100	18,137,089	3,217,100	-	7,599,711
Subtotal Miscellaneous		292,364,064	174,420,900	292,364,064	52,298,606	29,284,000	66,925,378	12,868,400	-	183,286,286
Grand Total		1,328,064,064	909,808,500	1,168,882,364	664,304,006	350,307,000	108,101,553	90,989,804	164,209,335	561,813,372

(a) Table 16.2.
(b) Amount of project eligible for AIP, PFC, or State funding. Eligiblity for funding does not guarantee funding.
(c) Estimated funding source(s) for each project.

Sources: As noted and HNTB analysis.

- The cash flow model was run to reflect these changes. The airport funding portion of the projects is less than in the Base Case, but two bond issues were still required. These two issues were of smaller amounts than in the Base Case: the first bond issue was a $362.8 million issue in 2020, and the second was a $350.1 million issue in 2023.

The resulting cash flow model for the Enhanced Private Funding Case is presented in **Table 16.14**. Because of the smaller airport capital requirements as compared to the Base Case, the results from the Enhanced Private Funding Case produced airline costs approximately $13.00 per enplanement lower than the Base Case, to $24.92 in 2025 and $11.99 in 2035. The ten year average cost per enplanement is estimated at $16.52. These figures suggest that increased private investment at the airport could reduce required airport debt to the point where the airport could be financially feasible, but that private equity would be required in somewhat greater amounts than was assumed in this analysis. Still, this analysis shows the impact of private investment. Other sensitivity analyses that reflect feasible situations might, in fact, be stronger cases if they were assumed in conjunction with increased private investment.

16.5.4 No FAA Funding of Airport Construction

To perform this sensitivity analysis, the following changes were made to the Base Case:

- The FAA participation rate for the airport construction (all projects except "ongoing" projects) was reduced from 20 percent to zero percent. This greatly increased the airport's capital requirement, particularly in the early years of the planning period, as shown in **Table 16.15**.

- For ongoing capital projects beyond the development projects presented previously, FAA participation was assumed to be consistent with current policy.

- The cash flow model was run to reflect these changes. A major change in the model from the Base Case was the addition of a third bond issue in 2025. The first bond issue was a $618.7 million issue in 2020, the second was a $444.9 million issue in 2023, and the third was a $178.1 million issue in 2025.

The resulting cash flow model is presented in **Table 16.16**. The increased bond issue sizes and corresponding airline cost per enplanement figures are depicted. These cash flows depict a much less feasible situation than the Base Case or other sensitivity cases presented thus far. It is also important to note that the cash flow model suggests that adequate coverage of the new debt service (1.25 or more) cannot be expected under this scenario. Given the assumptions, the No FAA Funding Case of the preferred airport system would not likely be feasible.

16.5.5 Close ORF Upon New Airport Opening

This sensitivity analysis was designed to measure the impact of closing ORF upon the opening of the new airport. Such a closure would not generate any additional capital with which to construct the airport, but would cause a reallocation of operational activity between PHF and the new airport.

Table 16.14

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Preliminary Cash Flow Analysis: ENHANCED PRIVATE FUNDING ANALYSIS

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Capital Costs and Grants (Calendar Year)																					
Total Costs	108,631,000	118,461,000	178,576,000	153,796,000	209,714,000	131,531,064	33,845,000	34,813,000	35,877,000	4,874,000	6,152,000	8,629,000	11,349,000	39,904,000	49,132,000	59,062,000	24,603,000	28,275,000	29,250,000	30,266,000	31,324,000
AIP Entitlements	-	-	-	-	-	-	-	2,782,583	2,855,926	2,933,547	3,015,698	3,102,643	3,194,665	3,292,062	3,395,148	3,504,259	3,619,748	3,741,989	3,871,380	4,008,341	4,153,317
AIP Discretionary	23,633,600	34,086,950	41,165,850	33,666,200	44,849,800	7,219,000	4,496,150	2,450,567	3,185,824	776,003	1,660,552	3,447,507	5,408,735	9,193,338	11,539,502	14,099,991	14,910,252	17,501,111	18,049,220	18,616,009	19,201,033
PFCs	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	194,190	245,650	345,270	455,070	13,188,300	12,294,399	16,895,559	962,130	1,118,860	1,171,200	1,226,260	1,284,320
State Entitlement	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
State Discretionary	6,870,913	7,022,554	7,627,542	7,785,951	7,947,855	531,900	516,350	1,124,466	1,793,165	63,383	226,855	580,452	972,102	8,227,081	8,375,119	8,524,432	2,780,177	3,343,648	3,485,791	3,634,821	3,791,623
Airport	60,622,587	77,351,496	60,622,587	80,973,849	109,195,145	105,560,655	9,511,241	8,582,218	7,599,711	-	-	-	-	168,060	1,273,660	1,314,540	-	-	-	-	-
Cash Flow (Fiscal Year)																					
Bond Issue	362,787,768	-	-	350,091,437	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Revenues																					
Proceeds from Sale of Land	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Available PFC Funds for Debt Service	-	-	-	-	-	-	-	-	-	19,176,133	20,275,080	21,394,189	22,575,500	11,210,059	13,552,983	10,486,903	28,046,581	29,612,684	31,385,496	33,263,983	35,254,305
Non-Airline Revenues	-	-	-	-	-	18,993,519	20,121,547	21,316,569	22,582,564	23,923,746	25,344,582	26,849,801	28,444,415	30,133,734	31,923,382	33,819,317	35,827,852	37,955,674	40,209,868	42,597,939	45,127,838
Required Airline Revenues	-	-	-	-	-	58,185,462	56,493,694	54,648,956	59,804,583	41,478,791	39,983,454	39,501,649	38,088,794	49,284,042	46,834,428	49,859,629	32,327,356	30,859,589	29,258,873	15,122,326	5,250,348
Total Revenues	-	-	-	-	-	77,178,981	76,615,241	75,965,525	82,387,147	84,578,670	85,603,115	87,745,639	89,108,709	90,627,835	92,310,793	94,165,849	96,201,790	98,427,947	100,854,237	90,984,249	85,632,491
Costs																					
Operating	-	-	-	-	-	11,383,934	12,060,028	12,776,275	13,535,060	14,338,910	15,190,500	16,092,666	17,048,413	18,060,921	19,133,562	20,269,908	21,473,741	22,749,070	24,100,141	25,531,453	27,047,770
ORF/PHF Expense	-	-	-	-	-	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
New Debt Service	-	-	-	-	-	52,497,822	51,468,453	50,459,268	55,072,043	53,992,199	52,933,529	52,939,703	51,979,098	51,041,553	50,126,845	49,234,770	48,365,140	47,517,785	46,692,554	32,548,579	23,009,294
Total Costs	-	-	-	-	-	66,281,756	65,928,481	65,635,542	71,007,104	70,731,109	70,524,029	71,432,370	71,427,511	71,502,474	71,660,407	71,904,678	72,238,881	72,666,856	73,192,696	60,480,032	52,457,065
Net Revenue	-	-	-	-	-	10,897,225	10,686,761	10,329,983	11,380,043	13,847,561	15,079,086	16,313,270	17,681,198	19,125,361	20,650,385	22,261,172	23,962,908	25,761,092	27,661,541	30,504,217	33,175,426
Airport Project Costs	60,622,587	77,351,496	99,660,208	80,973,849	109,195,145	105,560,655	9,511,241	8,582,218	7,599,711	-	-	-	-	168,060	1,273,660	1,314,540	-	-	-	-	-
CIP Reserve Balance	-	-	-	-	-	10,897,225	10,897,225	12,644,989	12,644,989	10,492,550	10,492,550	10,492,550	10,492,550	10,492,550	10,492,550	10,492,550	10,492,550	36,253,642	63,915,183	94,419,401	127,594,827
Debt Service Coverage	-	-	-	-	-	1.25	1.25	1.25	1.25	1.30	1.33	1.35	1.39	1.42	1.46	1.50	1.55	1.59	1.64	2.01	2.55
Airline Cost per Enplanement	$ -	$ -	$ -	$ -	$ -	$ 24.92	$ 22.84	$ 20.85	$ 21.54	$ 14.10	$ 12.83	$ 11.97	$ 10.89	$ 13.30	$ 11.93	$ 11.99	$ 7.34	$ 6.61	$ 5.92	$ 2.89	$ 0.95
10-year Average Cost per Enplanement						$ 16.52															

Sources: Table A.4 and HNTB analysis.

Table 16.15

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Projects by Estimated Funding Source (Preliminary): No FAA Funding Analysis
(Costs include Escalation for Inflation, Contingencies @ 10 Percent, and Administration, Engineering and Testing @ 15 Percent)

			Estimated Eligibility (b)			Estimated Funding (c)				
Project	Year (a)	Total Cost (a)	FAA	PFC	State	Composite FAA Funding	PFC	State	Other Private	Airport
I. Airfield										
Site Preparation 1	2020	29,453,000	26,507,700	29,453,000	23,562,400	-	-	6,870,913	-	22,582,087
Utilities	2020	10,703,000	9,632,700	10,703,000	8,562,400	-	-	-	-	10,703,000
Runway/Taxiway	2021	114,750,000	103,275,000	114,750,000	91,800,000	-	-	7,022,554	-	107,727,446
Runway/Taxiway	2022	114,750,000	103,275,000	114,750,000	91,800,000	-	-	7,177,542	-	107,572,458
Runway/Taxiway	2023	76,500,000	68,850,000	76,500,000	61,200,000	-	-	7,335,951	-	69,164,049
Runway/Taxiway	2024	76,500,000	68,850,000	76,500,000	61,200,000	-	-	7,497,855	-	69,002,145
NAVAIDS	2024	10,200,000	10,200,000	10,200,000	8,160,000	-	-	-	-	10,200,000
Ongoing Airfield	2025	478,000	430,200	478,000	382,400	-	-	382,400	-	95,600
Ongoing Airfield	2026	1,002,000	901,800	1,002,000	801,600	-	-	801,600	-	200,400
Ongoing Airfield	2027	1,577,000	1,419,300	1,577,000	1,261,600	1,419,300	-	126,160	-	31,540
Ongoing Airfield	2028	2,206,000	1,985,400	2,206,000	1,764,800	1,985,400	44,120	176,480	-	-
Ongoing Airfield	2029	2,892,000	2,602,800	2,892,000	2,313,600	2,602,800	57,840	231,360	-	-
Ongoing Airfield	2030	3,640,000	3,276,000	3,640,000	2,912,000	3,276,000	72,800	291,200	-	-
Ongoing Airfield	2031	5,091,000	4,581,900	5,091,000	4,072,800	4,581,900	101,820	407,280	-	-
Ongoing Airfield	2032	6,676,000	6,008,400	6,676,000	5,340,800	6,008,400	133,520	534,080	-	-
Ongoing Airfield	2033	8,403,000	7,562,700	8,403,000	6,722,400	7,562,700	-	672,240	-	168,060
Ongoing Airfield	2034	10,283,000	9,254,700	10,283,000	8,226,400	9,254,700	-	822,640	-	205,660
Ongoing Airfield	2035	12,327,000	11,094,300	12,327,000	9,861,600	11,094,300	-	986,160	-	246,540
Ongoing Airfield	2036	14,215,000	12,793,500	14,215,000	11,372,000	12,793,500	284,300	1,137,200	-	-
Ongoing Airfield	2037	16,189,000	14,570,100	16,189,000	12,951,200	14,570,100	323,780	1,295,120	-	-
Ongoing Airfield	2038	16,594,000	14,934,600	16,594,000	13,275,200	14,934,600	331,880	1,327,520	-	-
Ongoing Airfield	2039	17,009,000	15,308,100	17,009,000	13,607,200	15,308,100	340,180	1,360,720	-	-
Ongoing Airfield	2040	17,434,000	15,690,600	17,434,000	13,947,200	15,690,600	348,680	1,394,720	-	-
Subtotal Airfield		568,872,000	513,004,800	568,872,000	455,097,600	121,082,400	2,038,920	47,851,695	-	397,898,985
II. Terminal Area										
Site Preparation 1	2020	14,726,000	7,363,000	14,726,000	11,780,800	-	-	-	-	14,726,000
Utilities	2020	18,349,000	9,174,500	18,349,000	9,174,500	-	-	-	-	18,349,000
Terminal Building	2022	25,245,000	12,622,500	20,196,000	12,622,500	-	-	-	-	25,245,000
Terminal Building	2023	25,245,000	12,622,500	20,196,000	12,622,500	-	-	-	-	25,245,000
Terminal Building	2024	25,245,000	12,622,500	20,196,000	12,622,500	-	-	-	-	25,245,000
Terminal Building	2033	17,255,000	8,627,500	13,804,000	8,627,500	1,725,500	7,076,108	8,453,392	-	-
Terminal Building	2034	17,255,000	8,627,500	13,804,000	8,627,500	1,725,500	7,025,105	8,504,395	-	-
Terminal Building	2035	17,255,000	8,627,500	13,804,000	8,627,500	1,725,500	6,982,777	8,546,723	-	-
Apron Area	2023	5,600,000	2,800,000	5,600,000	2,800,000	-	-	-	-	5,600,000
Apron Area	2024	5,600,000	2,800,000	5,600,000	2,800,000	-	-	-	-	5,600,000
Apron Area	2034	3,269,000	1,634,500	3,269,000	1,634,500	-	3,269,000	-	-	-
Apron Area	2035	3,269,000	1,634,500	3,269,000	1,634,500	-	3,269,000	-	-	-
Ongoing Terminal	2025	159,000	79,500	119,250	79,500	-	79,500	79,500	-	-
Ongoing Terminal	2026	337,000	168,500	252,750	168,500	-	168,500	168,500	-	-
Ongoing Terminal	2027	536,000	268,000	402,000	268,000	268,000	53,600	214,400	-	-
Ongoing Terminal	2028	757,000	378,500	567,750	378,500	378,500	75,700	302,800	-	-
Ongoing Terminal	2029	1,003,000	501,500	752,250	501,500	501,500	100,300	401,200	-	-
Ongoing Terminal	2030	1,275,000	637,500	956,250	637,500	637,500	127,500	510,000	-	-
Ongoing Terminal	2031	1,801,000	900,500	1,350,750	900,500	900,500	180,100	720,400	-	-
Ongoing Terminal	2032	2,385,000	1,192,500	1,788,750	1,192,500	1,192,500	238,500	954,000	-	-
Ongoing Terminal	2033	3,032,000	1,516,000	2,274,000	1,516,000	1,516,000	1,516,000	-	-	-
Ongoing Terminal	2034	3,748,000	1,874,000	2,811,000	1,874,000	1,874,000	1,874,000	-	-	-
Ongoing Terminal	2035	4,538,000	2,269,000	3,403,500	2,269,000	2,269,000	2,269,000	-	-	-
Ongoing Terminal	2036	5,408,000	2,704,000	4,056,000	2,704,000	2,704,000	540,800	2,163,200	-	-
Ongoing Terminal	2037	6,366,000	3,183,000	4,774,500	3,183,000	3,183,000	636,600	2,546,400	-	-
Ongoing Terminal	2038	6,744,000	3,372,000	5,058,000	3,372,000	3,372,000	674,400	2,697,600	-	-
Ongoing Terminal	2039	7,144,000	3,572,000	5,358,000	3,572,000	3,572,000	714,400	2,857,600	-	-
Ongoing Terminal	2040	7,569,000	3,784,500	5,676,750	3,784,500	3,784,500	756,900	3,027,600	-	-
Subtotal Terminal Area		231,115,000	115,557,500	192,414,500	119,975,300	5,176,500	27,701,490	25,584,010	-	120,010,000
III. General Aviation and Flex Area										
Site Preparation 1	2020	4,909,000	3,681,750	4,909,000	3,927,200	-	-	-	-	4,909,000
Utilities	2020	1,529,000	1,146,750	1,529,000	1,223,200	-	-	-	-	1,529,000
Airport Roadways	2021	9,945,000	7,458,750	9,945,000	450,000	-	-	-	-	9,945,000
Airport Roadways	2022	9,945,000	7,458,750	9,945,000	450,000	-	-	-	-	9,945,000
Airport Roadways	2023	9,945,000	7,458,750	9,945,000	450,000	-	-	-	-	9,945,000
Airport Roadways	2024	9,945,000	7,458,750	9,945,000	450,000	-	-	-	-	9,945,000
Off-Airport Roadways	2022	2,733,000	2,049,750	2,733,000	450,000	-	-	450,000	-	2,283,000
Off-Airport Roadways	2023	2,733,000	2,049,750	2,733,000	450,000	-	-	450,000	-	2,283,000
Off-Airport Roadways	2024	2,733,000	2,049,750	2,733,000	450,000	-	-	450,000	-	2,283,000
Fuel Storage Facilities	2024	5,100,000	3,825,000	-	125,000	-	-	-	4,000,000	1,100,000
GA Facilities	2023	6,566,000	4,924,500	3,283,000	3,283,000	-	-	-	1,313,200	5,252,800
GA Facilities	2024	6,566,000	4,924,500	3,283,000	3,283,000	-	-	-	1,313,200	5,252,800
Ongoing GA	2025	40,000	30,000	20,000	20,000	-	20,000	20,000	-	-
Ongoing GA	2026	82,000	61,500	41,000	41,000	-	41,000	41,000	-	-
Ongoing GA	2027	128,000	96,000	64,000	64,000	96,000	6,400	25,600	-	-
Ongoing GA	2028	177,000	132,750	88,500	88,500	132,750	8,850	35,400	-	-
Ongoing GA	2029	229,000	171,750	114,500	114,500	171,750	11,450	45,800	-	-
Ongoing GA	2030	285,000	213,750	142,500	142,500	213,750	14,250	57,000	-	-
Ongoing GA	2031	393,000	294,750	196,500	196,500	294,750	19,650	78,600	-	-
Ongoing GA	2032	509,000	381,750	254,500	254,500	381,750	25,450	101,800	-	-
Ongoing GA	2033	632,000	474,000	316,000	316,000	474,000	158,000	-	-	-
Ongoing GA	2034	764,000	573,000	382,000	382,000	573,000	191,000	-	-	-
Ongoing GA	2035	904,000	678,000	452,000	452,000	678,000	226,000	-	-	-
Ongoing GA	2036	1,043,000	782,250	521,500	521,500	782,250	10,430	41,720	208,600	-
Ongoing GA	2037	1,188,000	891,000	594,000	594,000	891,000	11,880	47,520	237,600	-
Ongoing GA	2038	1,217,000	912,750	608,500	608,500	912,750	12,170	48,680	243,400	-
Ongoing GA	2039	1,248,000	936,000	624,000	624,000	936,000	12,480	49,920	249,600	-
Ongoing GA	2040	1,279,000	959,250	639,500	639,500	959,250	12,790	51,160	255,800	-
Subtotal General Aviation		82,767,000	62,075,250	66,042,000	20,050,400	7,497,000	781,800	1,994,200	7,821,400	64,672,600

Table 16.15

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Projects by Estimated Funding Source (Preliminary): No FAA Funding Analysis
(Costs include Escalation for Inflation, Contingencies @ 10 Percent, and Administration, Engineering and Testing @ 15 Percent)

			Estimated Eligibility (b)			Estimated Funding (c)				
Project	Year (a)	Total Cost (a)	FAA	PFC	State	Composite FAA Funding	PFC	State	Other Private	Airport
IV. Support Facilities										
Construct ATCT	2022	10,710,000	9,639,000	10,710,000	-	-	-	-	-	10,710,000
Construct ATCT	2023	10,710,000	9,639,000	10,710,000	-	-	-	-	-	10,710,000
Construct ATCT	2024	5,355,000	4,819,500	5,355,000	-	-	-	-	-	5,355,000
ARFF/Maintenance/Support	2022	10,200,000	9,180,000	10,200,000	8,160,000	-	-	-	-	10,200,000
ARFF/Maintenance/Support	2023	10,200,000	9,180,000	10,200,000	8,160,000	-	-	-	-	10,200,000
ARFF/Maintenance/Support	2024	5,100,000	4,590,000	5,100,000	4,080,000	-	-	-	-	5,100,000
Terminal Parking - Grade	2024	10,136,000	-	-	-	-	-	-	-	10,136,000
Terminal Parking - Grade	2035	6,705,000	-	-	-	-	6,705,000	-	-	-
Terminal Parking - Structure	2022	14,390,000	-	-	-	-	-	-	-	14,390,000
Terminal Parking - Structure	2023	14,390,000	-	-	-	-	-	-	-	14,390,000
Terminal Parking - Structure	2024	14,390,000	-	-	-	-	-	-	-	14,390,000
Terminal Parking - Structure	2033	9,669,000	-	-	-	-	9,669,000	-	-	-
Terminal Parking - Structure	2034	9,669,000	-	-	-	-	9,669,000	-	-	-
Terminal Parking - Structure	2035	9,669,000	-	-	-	-	7,930,685	-	-	1,738,315
Ongoing Support	2025	80,000	60,000	64,000	40,000	-	40,000	40,000	-	-
Ongoing Support	2026	168,000	126,000	134,400	84,000	-	84,000	84,000	-	-
Ongoing Support	2027	265,000	198,750	212,000	132,500	198,750	13,250	53,000	-	-
Ongoing Support	2028	373,000	279,750	298,400	186,500	279,750	18,650	74,600	-	-
Ongoing Support	2029	492,000	369,000	393,600	246,000	369,000	24,600	98,400	-	-
Ongoing Support	2030	622,000	466,500	497,600	311,000	466,500	31,100	124,400	-	-
Ongoing Support	2031	874,000	655,500	699,200	437,000	655,500	43,700	174,800	-	-
Ongoing Support	2032	1,152,000	864,000	921,600	576,000	864,000	57,600	230,400	-	-
Ongoing Support	2033	1,457,000	1,092,750	1,165,600	728,500	1,092,750	364,250	-	-	-
Ongoing Support	2034	1,792,000	1,344,000	1,433,600	896,000	1,344,000	448,000	-	-	-
Ongoing Support	2035	2,159,000	1,619,250	1,727,200	1,079,500	1,619,250	-	-	-	539,750
Ongoing Support	2036	2,532,000	1,899,000	2,025,600	1,266,000	1,899,000	126,600	506,400	-	-
Ongoing Support	2037	2,932,000	2,199,000	2,345,600	1,466,000	2,199,000	146,600	586,400	-	-
Ongoing Support	2038	3,055,000	2,291,250	2,444,000	1,527,500	2,291,250	152,750	611,000	-	-
Ongoing Support	2039	3,184,000	2,388,000	2,547,200	1,592,000	2,388,000	159,200	636,800	-	-
Ongoing Support	2040	3,319,000	2,489,250	2,655,200	1,659,500	2,489,250	165,950	663,800	-	-
Subtotal Support Facilities		165,749,000	65,389,500	71,839,800	32,628,000	18,156,000	35,849,935	3,884,000	-	107,859,065
V. Air Cargo/Maintenance Facilities										
Air Cargo Building	2024	6,279,000	-	-	-	-	-	-	-	6,279,000
Air Cargo Building	2034	1,890,000	-	-	-	-	-	-	-	1,890,000
Air Cargo Building	2035	1,890,000	-	-	-	-	-	-	-	1,890,000
Air Cargo Apron	2024	3,738,000	3,364,200	3,738,000	2,990,400	-	-	-	-	3,738,000
Air Cargo Apron	2034	1,125,000	1,012,500	1,125,000	900,000	-	-	-	-	1,125,000
Air Cargo Apron	2035	1,125,000	1,012,500	1,125,000	900,000	-	-	-	-	1,125,000
Ongoing Cargo	2025	40,000	10,000	20,000	10,000	-	2,000	8,000	30,000	-
Ongoing Cargo	2026	85,000	21,250	42,500	21,250	-	4,250	17,000	63,750	-
Ongoing Cargo	2027	136,000	34,000	68,000	34,000	34,000	-	-	102,000	-
Ongoing Cargo	2028	193,000	48,250	96,500	48,250	48,250	-	-	144,750	-
Ongoing Cargo	2029	258,000	64,500	129,000	64,500	64,500	-	-	193,500	-
Ongoing Cargo	2030	330,000	82,500	165,000	82,500	82,500	-	-	247,500	-
Ongoing Cargo	2031	470,000	117,500	235,000	117,500	117,500	-	-	352,500	-
Ongoing Cargo	2032	627,000	156,750	313,500	156,750	156,750	-	-	470,250	-
Ongoing Cargo	2033	803,000	200,750	401,500	200,750	200,750	-	-	602,250	-
Ongoing Cargo	2034	999,000	249,750	499,500	249,750	249,750	-	-	749,250	-
Ongoing Cargo	2035	1,218,000	304,500	609,000	304,500	304,500	-	-	913,500	-
Ongoing Cargo	2036	1,405,000	351,250	702,500	351,250	351,250	-	-	1,053,750	-
Ongoing Cargo	2037	1,600,000	400,000	800,000	400,000	400,000	-	-	1,200,000	-
Ongoing Cargo	2038	1,640,000	410,000	820,000	410,000	410,000	-	-	1,230,000	-
Ongoing Cargo	2039	1,681,000	420,250	840,500	420,250	420,250	-	-	1,260,750	-
Ongoing Cargo	2040	1,723,000	430,750	861,500	430,750	430,750	-	-	1,292,250	-
Subtotal Air Cargo Facility		29,255,000	8,691,200	12,592,000	8,092,400	3,270,750	6,250	25,000	9,906,000	16,047,000
VI. Miscellaneous										
Land Acquisition, Airport	2020	11,921,000	10,728,900	11,921,000	9,536,800	-	-	-	-	11,921,000
Land Acquisition, Non-Airport	2020	22,759,000	20,483,100	22,759,000	18,207,200	-	-	-	-	22,759,000
Re-finance ORF/PHF Debt	2025	98,563,064	-	98,563,064	9,856,306	-	-	-	-	98,563,064
Wetlands Mitigation	2024	33,864,000	30,477,600	33,864,000	3,386,400	-	-	-	-	33,864,000
Wetlands Mitigation	2025	33,864,000	30,477,600	33,864,000	3,386,400	-	15,236,969	3,386,400	-	15,240,631
Wetlands Mitigation	2026	33,864,000	30,477,600	33,864,000	3,386,400	-	15,994,049	3,386,400	-	14,483,551
Wetlands Mitigation	2027	33,864,000	30,477,600	33,864,000	3,386,400	-	17,186,122	3,386,400	-	13,291,478
Wetlands Mitigation	2028	33,864,000	30,477,600	33,864,000	3,386,400	-	18,137,089	3,386,400	-	12,340,511
Subtotal Miscellaneous		302,563,064	183,600,000	302,563,064	54,532,306	-	66,554,228	13,545,600	-	222,463,237
Grand Total		1,380,321,064	948,318,250	1,214,323,364	690,376,006	155,182,650	132,932,623	92,884,504	17,727,400	928,950,887

(a) Table 16.2.
(b) Amount of project eligible for AIP, PFC, or State funding. Eligiblity for funding does not guarantee fundin
(c) Estimated funding source(s) for each project

Sources: As noted and HNTB analysis.

Table 16.16

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Preliminary Cash Flow Analysis: NO FAA FUNDING OF INITIAL CONSTRUCTION PROJECTS

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Capital Costs and Grants (Calendar Year)																					
Total Costs	114,349,000	124,695,000	187,973,000	161,889,000	220,751,000	133,224,064	35,538,000	36,506,000	37,570,000	4,874,000	6,152,000	8,629,000	11,349,000	41,251,000	50,794,000	61,059,000	24,603,000	28,275,000	29,250,000	30,266,000	31,324,000
AIP Entitlements	-	-	-	-	-	-	-	2,782,583	2,855,926	2,933,547	3,015,698	3,102,643	3,194,665	3,292,062	3,395,148	3,504,259	3,619,748	3,741,989	3,871,380	4,008,341	4,153,317
AIP Discretionary	-	-	-	-	-	-	-	-	-	-	1,638,746	3,447,507	5,408,735	9,279,638	11,625,802	14,186,291	14,910,252	17,501,111	18,049,220	18,616,009	19,201,033
PFCs	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	194,190	245,650	345,270	455,070	13,792,400	18,586,150	19,026,150	962,130	1,118,860	1,171,200	1,226,260	1,284,320
State Entitlement	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
State Discretionary	6,870,913	7,022,554	7,627,542	7,785,951	7,947,855	531,900	516,350	1,124,466	1,793,165	63,383	226,855	580,452	972,102	8,227,081	8,375,119	8,524,432	2,780,177	3,343,648	3,485,791	3,634,821	3,791,623
Airport	107,478,087	117,672,446	107,478,087	152,789,849	207,489,945	113,899,295	14,683,951	13,323,018	12,340,511	-	-	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
Cash Flow (Fiscal Year)																					
Bond Issue	618,702,827	-	-	444,921,305	-	178,127,944	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Revenues																					
Proceeds from Sale of Land	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Available PFC Funds for Debt Service	-	-	-	-	-	-	-	-	-	19,176,133	20,275,080	21,394,189	22,575,500	10,605,959	7,261,232	8,356,312	28,046,581	29,612,684	31,385,496	33,263,983	35,254,305
Non-Airline Revenues	-	-	-	-	-	27,133,598	28,745,067	30,452,242	32,260,806	34,176,781	36,206,546	38,356,859	40,634,879	43,048,192	45,604,831	48,313,310	51,182,646	54,222,392	57,442,669	60,854,199	64,468,341
Required Airline Revenues	-	-	-	-	-	86,924,051	86,188,144	98,683,059	104,509,702	84,435,852	82,525,177	81,926,674	80,180,796	91,683,182	94,661,360	93,303,769	73,458,713	71,849,498	70,149,481	68,464,223	66,792,411
Total Revenues	-	-	-	-	-	114,057,650	114,933,211	129,135,301	136,770,508	137,788,765	139,006,802	141,677,721	143,391,175	145,337,332	147,527,423	149,973,391	152,687,940	155,684,574	158,977,645	162,582,406	166,515,057
Costs																					
Operating	-	-	-	-	-	17,513,745	18,553,889	19,655,808	20,823,169	22,059,861	23,370,000	24,757,948	26,228,327	27,786,032	29,436,249	31,184,473	33,036,525	34,998,569	37,077,140	39,279,158	41,611,954
ORF/PHF Expense	-	-	-	-	-	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
New Debt Service	-	-	-	-	-	79,642,059	78,080,450	90,585,594	95,929,049	94,048,087	92,204,007	91,722,986	90,022,898	88,361,513	86,738,365	85,153,013	83,605,042	82,094,062	80,619,710	79,181,649	77,779,571
Total Costs	-	-	-	-	-	99,555,804	99,034,339	112,641,401	119,152,219	118,507,948	117,974,007	118,880,934	118,651,225	118,547,545	118,574,614	118,737,486	119,041,567	119,492,631	120,096,850	120,860,807	121,791,525
Net Revenue	-	-	-	-	-	14,501,846	15,898,873	16,493,900	17,618,289	19,280,817	21,032,795	22,796,787	24,739,950	26,789,787	28,952,808	31,235,905	33,646,373	36,191,942	38,880,795	41,721,599	44,723,531
Airport Project Costs	107,478,087	117,672,446	180,345,458	152,789,849	207,489,945	113,899,295	14,683,951	13,323,018	12,340,511	-	-	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
CIP Reserve Balance	-	-	-	-	-	14,501,846	30,400,719	33,571,600	38,849,378	38,849,378	38,849,378	38,849,378	38,849,378	38,849,378	38,849,378	38,849,378	38,849,378	75,041,321	113,922,116	155,643,715	200,367,246
Debt Service Coverage	-	-	-	-	-	1.21	1.23	1.21	1.21	1.23	1.25	1.27	1.30	1.33	1.36	1.40	1.43	1.47	1.51	1.56	1.61
Airline Cost per Enplanement	$ -	$ -	$ -	$ -	$ -	$ 37.22	$ 34.84	$ 37.65	$ 37.64	$ 28.71	$ 26.48	$ 24.82	$ 22.93	$ 24.75	$ 24.12	$ 22.44	$ 16.68	$ 15.40	$ 14.19	$ 13.07	$ 12.04
10-year Average Cost per Enplanement						$ 29.92															

Sources: Table A.5 and HNTB analysis.

This re-allocation would generate additional revenues and expenses at the airport. To perform this sensitivity analysis, the following changes were made to the Base Case:

- Due to the closure of ORF, operations activity at ORF was redistributed between PHF and the new airport.

- The additional GA and cargo activity at the new airport resulted in an increase in non-airline revenue (7 percent over Base Case) and O&M expenses (5 percent over Base Case), as well as an increase in cargo entitlement funds.

- The cash flow model was run to reflect these changes. Because the construction requirements were the same as for the Base Case, two bond issues were required. These two issues were of the same amounts as in the Base Case: the first bond issue was a $460.9 million issue in 2020, and the second was a $507.4 million issue in 2023.

The resulting cash flow model is presented in **Table 16.17**. Because the bond issue sizes were similar to those for the Base Case and net revenues were higher, slightly lower airline cost per enplanement figures are depicted. In 2025, costs of $33.19 are anticipated, decreasing to $18.34 by 2035. The 10-year average cost per enplanement is estimated at $23.95. These cash flows depict a slightly more feasible situation than the Base Case, though still not feasible overall. Given the assumptions, the Close ORF Case of the preferred airport system would not likely be feasible.

16.5.6 Estimated Impacts to ORF

If ORF were changed to a GA facility or closed in the future, the impacts would affect both the City of Norfolk and the region. These impacts were estimated for a range of categories, as summarized in **Table 16.18**.

Two scenarios were analyzed and compared to the economic impact analysis that was conducted for ORF in 1998. The first scenario involved ORF changing its airport role to GA and redeveloping 20 percent of the land for commercial/industrial use. The second scenario closed the airport altogether and redeveloped 65 percent of the land. All the assumptions were based on information gathered in Chapter 14 or from local government agencies.

As shown in Table 16.18, in 1997, ORF provided 1,400 direct jobs and $350 million direct output to the City and region. If ORF were changed to a GA airport in 2025, the direct jobs at the airport would be reduced to about 280 and the direct output would be reduced to $70 million in 2000 dollars. It is assumed that about 260 acres of airport property would be redeveloped for commercial and industrial use, and that these facilities would provide an additional 6,600 direct jobs and $180 million in direct output. Local sales and property taxes would increase to about $1.2 million. If ORF were closed in 2025, airport direct jobs and output would be zero, but the 845 acres of redeveloped land could provide 21,500 direct jobs and $586 million in direct output. Local sales and property taxes would also increase to around $3.9 million.

ORF would be negatively and positively impacted if its role were changed to a GA operation or closed. A change to a GA airport would, for the most part, have more negative than positive impacts in terms of jobs and output. However, if ORF were closed, the City and region could experience more positive than negative impacts overall.

Table 16.17

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Preliminary Cash Flow Analysis: CLOSE ORF ANALYSIS

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Capital Costs and Grants (Calendar Year)																					
Total Costs	114,349,000	124,695,000	187,973,000	161,889,000	220,751,000	133,224,064	35,538,000	36,506,000	37,570,000	4,874,000	6,152,000	8,629,000	11,349,000	41,251,000	50,794,000	61,059,000	24,603,000	28,275,000	29,250,000	30,266,000	31,324,000
AIP Entitlements	-	-	-	-	-	-	-	2,807,583	2,881,926	2,960,587	3,043,819	3,131,890	3,225,082	3,323,695	3,428,047	3,538,473	3,655,331	3,778,995	3,909,867	4,048,367	4,194,944
AIP Discretionary	24,877,600	35,216,600	43,332,100	35,437,800	47,210,200	7,566,815	4,665,450	2,594,867	3,329,124	748,963	1,632,431	3,418,260	5,378,318	9,248,005	11,592,903	14,152,077	14,874,669	17,464,105	18,010,733	18,575,983	19,159,406
PFCs	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	194,190	245,650	345,270	455,070	13,792,400	18,586,150	19,026,150	962,130	1,118,860	1,171,200	1,226,260	1,284,320
State Entitlement	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
State Discretionary	6,870,913	7,022,554	7,627,542	7,785,951	7,947,855	531,900	516,350	1,124,466	1,793,165	63,383	226,855	580,452	972,102	8,227,081	8,375,119	8,524,432	2,780,177	3,343,648	3,485,791	3,634,821	3,791,623
Airport	82,600,487	82,455,846	82,600,487	117,352,049	160,279,745	106,736,540	10,865,641	9,936,618	8,954,111	-	-	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
Cash Flow (Fiscal Year)																					
Bond Issue	460,893,925	-	-	507,353,755	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Revenues																					
Proceeds from Sale of Land	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Available PFC Funds for Debt Service	-	-	-	-	-	-	-	-	-	19,176,133	20,275,080	21,394,189	22,575,500	10,605,959	7,261,232	8,356,312	28,046,581	29,612,684	31,385,496	33,263,983	35,254,305
Non-Airline Revenues	-	-	-	-	-	29,032,950	30,757,222	32,583,899	34,519,062	36,569,155	38,741,004	41,041,839	43,479,321	46,061,565	48,797,169	51,695,242	54,765,431	58,017,959	61,463,656	65,113,993	68,981,124
Required Airline Revenues	-	-	-	-	-	77,499,709	75,327,024	72,823,087	80,501,237	65,015,788	63,485,899	63,435,271	62,064,915	73,936,165	77,276,720	76,275,185	56,780,032	55,514,733	54,152,809	52,799,987	32,735,453
Total Revenues	-	-	-	-	-	106,532,660	106,084,246	105,406,986	115,020,299	120,761,076	122,501,982	125,871,299	128,119,735	130,603,689	133,335,121	136,326,739	139,592,045	143,145,376	147,001,961	151,177,963	136,970,883
Costs																					
Operating	-	-	-	-	-	18,389,432	19,481,583	20,638,598	21,864,328	23,162,854	24,538,500	25,995,846	27,539,744	29,175,334	30,908,062	32,743,697	34,688,351	36,748,498	38,930,998	41,243,116	43,692,552
ORF/PHF Expense	-	-	-	-	-	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
New Debt Service	-	-	-	-	-	70,762,761	69,375,256	68,014,956	74,800,019	73,333,352	71,895,443	71,998,823	70,699,291	69,431,362	68,194,749	66,989,191	65,814,450	64,670,313	63,556,593	62,473,130	41,452,149
Total Costs	-	-	-	-	-	90,352,193	90,056,839	89,853,554	97,864,347	97,696,206	97,633,943	99,194,669	99,439,035	99,806,696	100,302,811	100,932,888	101,702,800	102,618,811	103,687,591	104,916,246	86,344,701
Net Revenue	-	-	-	-	-	16,180,467	16,027,408	15,553,431	17,155,952	23,064,869	24,868,039	26,676,630	28,680,700	30,796,994	33,032,310	35,393,852	37,889,244	40,526,566	43,314,370	46,261,717	50,626,181
Airport Project Costs	82,600,487	82,455,846	137,013,358	117,352,049	160,279,745	106,736,540	10,865,641	9,936,618	8,954,111	-	-	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
CIP Reserve Balance	-	-	-	-	-	16,180,467	21,342,233	26,959,046	35,160,887	35,160,887	35,160,887	35,160,887	35,160,887	35,160,887	35,160,887	65,015,133	102,904,378	143,430,943	186,745,313	233,007,030	283,633,211
Debt Service Coverage	-	-	-	-	-	1.25	1.25	1.25	1.25	1.33	1.36	1.39	1.42	1.46	1.50	1.55	1.59	1.65	1.70	1.76	2.25
Airline Cost per Enplanement	$ -	$ -	$ -	$ -	$ -	$ 33.19	$ 30.45	$ 27.79	$ 28.99	$ 22.10	$ 20.37	$ 19.22	$ 17.75	$ 19.96	$ 19.69	$ 18.34	$ 12.89	$ 11.90	$ 10.95	$ 10.08	$ 5.90
10-year Average Cost per Enplanement						$ 23.95															

Sources: Table A.6 and HNTB analysis.

Table 16.18

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

2025 Impact Scenarios to ORF

Impact	ORF: 1997[1]	ORF: GA Use	ORF Closed 65% Re-Developed
Airport			
Jobs - Direct	1,400	280	-
Jobs - Indirect	7,500	1,500	-
Jobs - Induced	16,800	3,360	-
Taxes - local property and sales	$ 600,000	$ 120,000	$ -
Direct output	$ 350,000,000	$ 70,000,000	$ -
Authority Lease Payment to City[3]	$ 1,500,000	$ 1,200,000	$ -
Redevelopment Acres	N/A	260	845
Land Sales	N/A	$ 28,600,000	$ 92,950,000
Jobs - Direct	N/A	6,630	21,548
Jobs - Indirect	N/A	3,315	10,774
Jobs - Induced	N/A	3,315	10,774
Taxes - local property & sales	N/A	$ 1,201,200	$ 3,903,900
Direct output	N/A	$ 180,583,658	$ 586,896,887

Assumptions		
Land Sales Price / acre	$ 110,000	Task 14, based on sales in area
Jobs / acre	25.5	Task 14, HRPDC
Ratio of Improvement $ / Land $	2	Commercial real estate ranges up to 10:1
Norfolk Property Tax	$ 1.40	Norfolk Tax Office
Norfolk Sales Tax	1.0%	VA Tax Office

Notes

(1) Norfolk International Airport Economic Impact Study, 1998.

(2) 1999 dollars

(3) Based on acreage reduction

16.5.7 Close ORF and PHF Upon New Airport Opening

This sensitivity analysis was designed to measure the impact of closing ORF and PHF upon the opening of the new airport. Such a closure would not generate any additional capital with which to construct the airport, but would cause a reallocation of operational activity to the new airport. This reallocation would generate additional revenues and expenses at the airport. To perform this sensitivity analysis, the following changes were made to the Base Case:

- Due to the closure of ORF, a majority of operations activity at ORF and PHF was redistributed between PHF and the new airport. It was presumed that only enough activity to raise the airport's operations levels to its capacity would be reallocated. Other operations from PHF and ORF were assumed to be accommodated at other regional facilities or lost altogether.

- The additional GA and cargo activity at the new airport resulted in an increase in non-airline revenue (12 percent over Base Case) and O&M expenses (8 percent over Base Case), as well as an increase in cargo entitlement funds.

- The cash flow model was run to reflect these changes. Because the construction requirements are the same as for the Base Case, two bond issues were required. These two issues were of amounts similar to those in the Base Case; the first bond issue was a $459.9 million issue in 2020, and the second was a $507.4 million issue in 2023.

The resulting cash flow model is presented in **Table 16.19**. Compared to the Close ORF model, minimal changes resulted. Because the bond issue sizes were the same as for the Base Case and net revenues were higher, slightly lower airline cost per enplanement figures are depicted. In 2025, costs of $32.93 are anticipated, decreasing to $18.21 by 2035. The ten-year average cost per enplanement is estimated at $23.67. These cash flows depict a slightly more feasible situation than the Base Case, though still not feasible overall. Given the assumptions, the Close ORF Case of the preferred airport system would not likely be feasible.

16.6 INDUSTRIAL/ COMMERCIAL DEVELOPMENT

This section of the study focuses on potential industrial/commercial development adjacent to the airports considered in the recommended Virginia Airport System. To assess potential development near the airports included in this study, an analysis of catalytic development around similar airports in Chapter 14 was conducted. In this subsection, assumptions will be defined relating to:

- Land costs
- Impact of taxes
- Services required

Subsequently, this section presents potential absorption rates for different categories of development, including land requirements, parcel sizes, total area, and service and infrastructure requirements and relationships to the airport.

Market Studies

Market studies for DFW, DEN, IAD, and MCI were conducted, and are presented in

Table 16.19

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Preliminary Cash Flow Analysis: CLOSE ORF and PHF ANALYSIS

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Capital Costs and Grants (Calendar Year)																					
Total Costs	114,349,000	124,695,000	187,973,000	161,889,000	220,751,000	133,224,064	35,538,000	36,506,000	37,570,000	4,874,000	6,152,000	8,629,000	11,349,000	41,251,000	50,794,000	61,059,000	24,603,000	28,275,000	29,250,000	30,266,000	31,324,000
AIP Entitlements	-	-	-	-	-	-	-	2,832,583	2,907,926	2,987,627	3,071,941	3,161,136	3,255,498	3,355,328	3,460,945	3,572,687	3,690,913	3,816,002	3,948,353	4,088,393	4,236,570
AIP Discretionary	24,877,600	35,882,130	43,332,100	35,437,800	47,210,200	7,566,815	4,665,450	2,569,867	3,303,124	721,923	1,604,309	3,389,014	5,347,902	9,216,372	11,560,005	14,117,863	14,839,087	17,427,098	17,972,247	18,535,957	19,117,780
PFCs	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	194,190	245,650	345,270	455,070	13,792,400	18,586,150	19,026,150	962,130	1,118,860	1,171,200	1,226,260	1,284,320
State Entitlement	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
State Discretionary	6,870,913	7,022,554	7,627,542	7,785,951	7,947,855	531,900	516,350	1,124,466	1,793,165	63,383	226,855	580,452	972,102	8,227,081	8,375,119	8,524,432	2,780,177	3,343,648	3,485,791	3,634,821	3,791,623
Airport	82,600,487	81,790,316	82,600,487	117,352,049	160,279,745	106,736,540	10,865,641	9,936,618	8,954,111	-	-	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
Cash Flow (Fiscal Year)																					
Bond Issue	459,871,933	-	-	507,353,755	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Revenues																					
Proceeds from Sale of Land	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Available PFC Funds for Debt Service	-	-	-	-	-	-	-	-	-	19,176,133	21,042,125	22,235,874	23,464,934	11,544,556	7,723,014	8,665,233	28,393,191	30,748,411	32,615,432	34,568,601	36,637,049
Non-Airline Revenues	-	-	-	-	-	30,389,630	32,194,475	34,106,511	36,132,103	38,277,994	40,551,331	42,959,682	45,511,065	48,213,975	51,077,411	54,110,907	57,324,563	60,729,079	64,335,789	68,156,703	72,204,541
Required Airline Revenues	-	-	-	-	-	76,907,646	74,329,760	72,020,190	79,592,254	64,800,241	62,496,238	62,363,369	60,937,101	72,750,433	76,558,422	75,699,707	56,156,124	54,090,228	52,621,838	51,181,253	26,798,808
Total Revenues	-	-	-	-	-	107,297,277	106,524,235	106,126,701	115,724,357	122,254,368	124,089,694	127,558,925	129,913,100	132,508,964	135,358,847	138,475,847	141,873,878	145,567,719	149,573,059	153,906,557	135,640,398
Costs																					
Operating	-	-	-	-	-	18,739,707	19,852,661	21,031,714	22,280,791	23,604,051	25,005,900	26,491,005	28,064,310	29,731,054	31,496,787	33,367,386	35,349,081	37,448,469	39,672,540	42,028,699	44,524,791
ORF/PHF Expense	-	-	-	-	-	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
New Debt Service	-	-	-	-	-	70,678,976	69,293,114	67,934,425	74,721,067	73,255,948	71,819,557	71,924,425	70,626,352	69,359,853	68,124,642	66,920,458	65,747,065	64,604,249	63,491,825	62,409,632	36,882,342
Total Costs	-	-	-	-	-	91,418,683	91,145,775	90,966,140	99,001,859	98,860,000	98,825,457	100,415,429	100,690,662	101,090,907	101,621,429	102,287,845	103,096,146	104,052,719	105,164,366	106,438,331	83,407,133
Net Revenue	-	-	-	-	-	15,878,594	15,378,460	15,160,562	16,722,498	23,394,368	25,264,237	27,143,496	29,222,438	31,418,057	33,737,418	36,188,002	38,777,732	41,515,000	44,408,694	47,468,225	52,233,265
Airport Project Costs	82,600,487	81,790,316	137,013,358	117,352,049	160,279,745	106,736,540	10,865,641	9,936,618	8,954,111	-	-	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
CIP Reserve Balance	-	-	-	-	-	15,878,594	20,391,413	25,615,356	33,383,743	21,778,111	22,042,348	24,185,844	28,408,282	30,658,279	36,175,037	66,823,434	105,601,166	147,116,166	191,524,860	238,993,085	291,226,350
Debt Service Coverage	-	-	-	-	-	1.25	1.25	1.25	1.25	1.35	1.38	1.41	1.44	1.48	1.52	1.57	1.62	1.67	1.73	1.79	2.47
Airline Cost per Enplanement	$ -	$ -	$ -	$ -	$ -	$ 32.93	$ 30.05	$ 27.48	$ 28.67	$ 22.03	$ 20.06	$ 18.89	$ 17.42	$ 19.64	$ 19.51	$ 18.21	$ 12.75	$ 11.59	$ 10.64	$ 9.77	$ 4.83
10-year Average Cost per Enplanement						$ 23.67															

Sources: Table A.7 and HNTB analysis.

Chapter 14 along with the results of the analysis.

16.6.1 Search Area Land Costs

Land prices at the proposed site for the new airport will impact the feasibility of the airport, not only because they affect the total acquisition price of airport property, but because they affect the airport's ability to generate economic impacts from catalytic development. Local real estate agents that follow land sales were contacted, in addition to the Isle of Wight County Assessor's Office, and the Isle of Wight County Department of Economic Development. In addition, online research was conducted to estimate current values for land in the search region. The research focused on Isle of Wight County, as the greatest portion of the site area is located in this jurisdiction, although land price data were also gathered for the neighboring Suffolk City. Data were collected for raw land as well as improved parcels.

Factors Driving Land Costs

Geographic location and marketing have a greater impact on land prices than zoning. The asking price for improved farmland that is zoned industrial has a premium of $2,000 to $3,000 per acre over unimproved farmland.

Land costs within the search region are strongly influenced by geographic location. For example, land in Suffolk northeast of the search area that is proximate to I-664 commands a significant premium over land to the west and south. In general, land is less expensive in Isle of Wight, Southampton, Sussex and Surry than in Suffolk. As a result, Suffolk County will be evaluated separately from the other counties. In addition, rural land is less expensive than land located in the more urban and industrial portions of the counties, such as near Smithfield and Franklin.

Information was primarily sought on large parcels, since it was assumed that the majority of land acquired for the new airport would be in large parcels.

Isle of Wight County

In Isle of Wight, the cost of raw unimproved land is estimated to be $1,000 to $1,500 per acre according to a local real estate agent. This compares closely with a recent 214-acre transaction, which sold for $300,000 or $1,500 per acre, noted by the Isle of Wight County Assessor's Office (ca. 3/17/00). The transaction involved two parcels, one of 137 acres and another of 77 acres, and one building valued at $29,000. The *Smithfield Times* reported that Isle of Wight County purchased approximately 270 acres located on US258 about two miles north of Windsor for a park at a cost of $400,000 or $1,482 per acre. North of the search region, along US460 at Disputanta in Prince George and Sussex Counties, a 136-acre farm, zoned agricultural/rural, which includes 45 acres of crop land and a 38-acre pine plantation, is marketed at $142,500 or $1,048 per acre (3/13/00).

Unimproved land that can be zoned and developed for industrial purposes is marketed at a premium over this base; it may command between $4,500 to $7,500 per acre for parcels over 100 acres. Such prices are generally corroborated by data from the Facility Locator page on the Internet site of the Hampton Roads Economic Development Alliance, which are summarized in **Table 16.20**.

It should be noted that all the above prices are asking prices; sales prices for commercial properties of this type and price

Table 16.20

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Land Marketed for Industrial Purposes
Isle of Wight County, Virginia

Name & Location	Zoning Status	Size of Parcel	Asking Price	Utilities	Ground Covering
Windsor Coal Storage US460 adjacent to SR 603, SR608, SR610, SR635	M-2	1,600 acres	$4,000 per acre	Some available on site	Level to gently sloping
Eley Frontage on US460	Agricultural	195 acres	$2,820 per acre	Some available on site	
Felton East of Franklin at US58 and SR616	Agricultural	447 acres, some wetlands	$15,000 per acre	None, but can be provided	Flat, mostly cleared
Kingsdale Industrial Park US58 and SR616 near International Paper/Union Camp	M-2	231 acres	$4,000 per acre	None currently	45% cleared, Phase I environmental impact study is available
Cutchins US58 adjacent to Kingsdale site	Agricultural	145 acres	$7,000 per acre	Some available on site	45% clear, environmental impact study may be in progress
Lawnes Creek SR10 near Smithfield	Agricultural	600 acres	$6,000 per acre	On site	Mostly wooded
Wakirk SR32/US258 north of James River bridge	Agricultural	102 acres	$10,000 per acre	On site	Flat, 20% cleared

Source: Facility locator on the Internet site of the Hampton Roads Economic Development Alliance (HREDA), Loopnet.com (internet-based commercial real estate database).

It should be noted that all the above prices are asking prices; sales prices for commercial properties of this type and price range would typically be 10 to 25 percent lower.

The table summarizes data provided on each site in Isle of Wight County, including information such as location, zoning status, size of parcel, asking price, current utilities, and ground covering. Only parcels of greater than 100 acres were included in the analysis to balance the fact that smaller parcels generally command higher per-acre prices. The parcels are loosely grouped by location: two near Smithfield, two on US460, and three in the southern portion of the County near Franklin. The asking prices illustrate the importance of location, as the two parcels that are located on or near SR460 have lower asking prices than those more proximate to existing urban or industrial locations in the County (e.g., Smithfield and Franklin).

Improved commercial land with infrastructure (e.g., access and utilities) commands a premium over the price for farmland marketed for industrial or commercial purposes. IMG's survey of real estate agents and Isle of Wight County officials indicates that prices for improved

land range between $20,000 to $40,000 per acre. Two industrial parks are located in Isle of Wight County:

- On US460 near Windsor, the Isle of Wight County Industrial Development Authority is developing a 92-acre industrial park. Sites range from 2.3 acres to 17 acres, and utilities are available on the site. Asking prices begin at $20,000 per acre.

- On SR10, one mile east of Smithfield, asking prices at a 99-acre privately owned Isle of Wight Industrial Park begin at $20,000 per acre. This park currently has six tenants.

Suffolk City

Land costs would be higher for a new airport in Suffolk than in Isle of Wight. As previously described, the most significant driver of land prices in Western Suffolk is the proximity to I-664. The properties described in **Table 16.21** are generally organized in a northeast-to-southwest order. Commercial land that is proximate to I-664 may command prices between $65,000 and $85,000 per acre. Further south and west of this area, commercial land prices drop to approximately $40,000 per acre. As one travels south toward Suffolk and the portion of the search area in Suffolk, commercial land prices drop to between $10,000 and $20,000 per acre.

It should be noted that all the above prices are asking prices; sales prices for commercial properties of this type and price range would typically be 10-to-25 percent lower.

Conclusions of Land Pricing Analysis

The significant disparity between raw agricultural land and improved commercially zoned land suggests that a new airport would create high economic value if properly planned, developed, and leased. Land generally tends to become less expensive as one travels west away from I-664, which is to the east of the search region. As such, land prices in Suffolk are more expensive than in the rest of the search area. As expected, land is more expensive if it is close to existing urban or industrial locations in the search area.

Some broad conclusions can be drawn about land prices for various categories of land in the search region. Raw, unimproved farmland is priced between $1,000 and $3,000 per acre, depending on location. For the financial analysis, a cost estimate between $1,500 and $2,000 per acre for land should be adequate, unless the project will be located in Suffolk, at which point the cost estimate should be increased to reflect its higher land costs.

Observed prices for unimproved land that is marketed for industrial purposes are generally between $4,000 to $10,000 per acre. Factors that influence prices include proximity to population/industrial centers and utilities. It is anticipated that unimproved land for development in the vicinity of the new airport would earn a premium similar to that observed for Suffolk and the industrial/urban areas of Isle of Wight. Therefore, unimproved land adjacent to the airport may command prices between $4,000 to $8,000 per acre.

Improved land earns an additional premium. Land prices range between $15,000 (Suffolk) and $40,000 (Isle of Wight) per acre for land in industrial parks in the search region. It is anticipated that improved land in the vicinity of the new airport may be sold for prices comparable to those at other county industrial parks.

Table 16.21

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Land Marketed for Industrial Purposes
Suffolk, Virginia

Name & Location	**Zoning Status**	**Size of Parcel**	**Asking Price**	**Utilities**	**Notes**
Harbour View Commerce Park Harbour View Blvd.	M-1/ B-2	2,000 acres (260 acres available)	$80,000 to $100,000 per acre	All on site	Northeast of Search Area. Part of mixed-use office, commercial/light industrial, planned residential community. Adjacent to I-664 and US17.
Lake View Technology Park College Dr.	M-1/ B-2	150 acres (5 acres available)	$60,000 to $80,000 per acre	All on site	Northeast of Search Area. Mixed-use office, technology, industrial park adjacent to I-664 and US17.
Bridgeway Commerce Park **College Dr.**	M-1/ B-2	375 acres	$70,000 per acre	All on site	Northeast of Search Area. Adjacent to Harbour View (I-664 and US17).
Hampton Roads Technology Park **College Dr.**	CP	60 acres	$75,000 per acre	All on site	Northeast of Search Area. Adjacent to I-664 and US17.
Northgate Commerce Park Nansemond Pkwy and Shoulders Hill Rd.	M-2	460 acres	$40,000	Adjacent to site	Northeast of Search Area at SR337 and SR626 and 2.5 miles west of I-664. Mixed-use industrial and office park.
Cotton Site **Pughsville Rd. and SR659**	M-2	57 acres	$15,000 per acre	Adjacent to site	Northeast of Search Area. Located one mile west of I-664 and south of Pughsville Rd. on SR659 near Chesapeake.
Hampton Roads Airport **Military Highway**	M-1	1,030 acres (600 acres available)	$45,000 per acre	All on site	Northeast of Search Area. Straddles Chesapeake and Suffolk on US58/US460. Adjacent to I-64, I-264 and I-664. Site has 400 acres of wetlands.
Ehrenzeller Site **Portsmouth Blvd.**	M-2	464 acres (364 acres of wetlands)	$3 million for entire parcel or $25,000 per acre for upland	All on site	Privately owned site, located off Military Hwy (US13/US58/US460).
Wilroy Industrial Park Progress Rd. and SR642 (Wilroy Rd.)	M-2	200 acres (35 acres available)	$30,000 per acre	All on site	Established park located at extreme eastern edge of Search Area near Nansemont and Wilroy. Available parcel: 19 acres owned by Suffolk IDA; adjacent 15 acres available from private owners.
Hillpoint Business Park **Godwin Blvd. And Hillpoint Blvd.**	B-2	62 acres (24 acres available)	$79,832 per acre	All on site	Northeast of Search Area. Proximate to SR58/460 and SR10/32. Adjacent to 1,800 home residential and office building development.
IDA Suburban Drive Site Suburban Dr. between US58 and SR337	M-2	22 acres	$30,000 per acre	All on site	Located at eastern edge of Search Area between Magnolia and Suffolk (US58 and SR337).
Ballard Farm **Route 337**	M-2	400 acres	$7,500 per acre	Adjacent to site	At northeast corner of Search Area near Magnolia at intersection of SR337, US13, and US58.
Falk/Philhower Site US13 and US58	M-1	37 acres	$20,000 to $25,000 per acre	Adjacent to site	Two industrial parcels at US13 and US58: one of 20 acres and another of 17 acres adjacent to Vulcan Materials.
Suffolk Industrial Park 595 Carolina Rd.	M-2	150 acres	$20,000 per acre	All on site	On US13 at Obici Road. Available for immediate occupancy. Phase I environment study completed.
CSX/Suffolk Industrial Park Carolina Rd. (US13) and Dill Rd.	M-2	81 acres	$10,000 per acre	Adjacent to property	At US13 and Dill Road. An additional 60 acres are available and held by one other owner. Some wetlands.
Dill Road Site **Dill Rd.**	M-2	32 acres	$27,200 per acre	Adjacent to property	Located proximate to Carolina Rd. (US13) in Suffolk.
Benton Road Industrial Park **Benton Rd.**	M-1/ M-2	73 acres	$15,000 per acre	All on site	Located between the Suffolk Industrial Park and the Suffolk Airport off of US13.
Suffolk Airport Industrial Park Carolina Rd. (US13)	M-2	430 acres	$20,000 per acre	Adjacent to property	At southeast corner of Search Area near SR688. Additional acreage available on adjacent properties.
Manning Road	Ag	64 acres	$580,000 or $9,063 per acre	All on site	Located off US58 in western Suffolk.

Source: Facility locator on the Internet site of the Hampton Roads Economic Development Alliance (HREDA), Loopnet.com (internet-based commercial real estate database).

16.6.2 Impact of Taxes on Industrial/Commercial Development

This section provides an overview of the taxes that impact businesses operating in the search region. Hampton Roads Economic Development Alliance (HREDA) suggests that the Hampton Roads area, which includes the search region, is an employer-friendly region with regard to taxes. It provides the following general information on corporate taxation:

- The corporate income tax for the Commonwealth of Virginia is 6.0 percent and has not been raised since 1972.
- There are no inventory or intangible property taxes in Virginia.
- Personal property taxes on automobiles are in the process of being phased out.
- The sales and use tax rates are 3.5 percent for state and 1.0 percent for local, equaling a total of 4.5 percent.
- Items such as customized computer software and certain purchases in designated Enterprise Zones are exempt from tax.
- Furniture and fixtures used by manufacturers are exempt from personal property taxation.
- Real estate is taxed at the local level based on 100 percent of fair market value.
- Counties and cities are separate taxing entities; companies pay either county or city tax, but not both.

The following section offers more detail with respect to taxes that will impact business and development in the search region. Most significant are the tax rates for real estate and tangible personal property. Sales, worker-related taxes, gasoline, and other local taxes that are deemed relevant to the area's development are also considered.

Real Estate Taxes

According to the Virginia Economic Development Partnership, real estate is taxed at the local level based on 100 percent of fair market value. Actual tax rates on real estate vary and are set by locality. In 1997, the effective true tax rate on real estate ranged from a low of $0.31 per $100 of value in a rural county, to $1.42 in a northern Virginia city. The average effective rate for all counties and cities in the state, exclusive of town levies, was $0.72 per $100 of fair market value. Due to the fact that real estate taxes vary, **Table 16.22** provides differing rates for Isle of Wight, Suffolk, Franklin, and Southampton Counties.

Table 16.22

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Real Estate Tax Rates in Search Area Counties

County/Area	Real Estate Tax Per $100 of Assessed Value
Isle of Wight	$0.72
Suffolk	$1.21
Franklin	$0.77
Southampton	$0.47

Property Taxes

Tangible personal property is taxed at the local level and is based on a percentage of original cost. Tangible personal property includes, but is not limited to, machinery and equipment, furniture, fixtures, and trucks and automobiles. Many exemptions or partial exemptions apply and are decided at the county or city level. These include

certified pollution-control facilities and equipment, solar energy facilities and equipment, and recycling equipment. **Table 16.23** shows property tax rates for counties within the search region.

Table 16.23

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Property Tax Rates in Search Area Counties

County/Area	Machinery & Tools per $100	Personal Property per $100
Isle of Wight	$0.95	$4.40
Suffolk	-	$4.25
Franklin	$0.61	$4.50
Southampton	$0.72	$4.00

Utilities

Utility rates in Hampton Roads are generally competitive, and power outages are extremely rare. In Hampton Roads, average cents per kilowatt hour (kWh) equals 3.77 compared to the U.S. average of 4.63 cents per kWh. Prices for gas and water are also competitive.

Sales and Use Tax

The Virginia sales and use tax is 3.5 percent of the selling price of tangible personal property and taxable services sold to the retail consumer. Cities or counties collect an additional one percent local tax.

Worker-Related Taxes

According to the HREDA, tax rates for worker's compensation and unemployment insurance are attractive in Virginia. At 0.2 percent of wages, unemployment insurance taxes are the nation's second lowest. New employers pay 2.5 percent on the first $8,000 of each employee's wages for as little as two years. Experienced employers' rates range from zero percent up to a maximum of 6.2 percent. Worker's Compensation rates are also among the country's lowest. For clerical workers (Code 8810), the average cost is around $0.18 cents per $100 payroll and $1.92 per $100 payroll for manufacturing workers as a whole. The maximum weekly benefit is two-thirds of the worker's weekly pay. Worker's compensation benefits cannot exceed $534 per week (as of July 1, 1998).

For corporations whose facilities are solely within the state boundaries, the tax is six percent of federal taxable income. For multi-state corporations, the net income attributed to the Virginia operation is based upon the percentage of the corporation's business located in Virginia. A business tax obligation is determined by a three-factor formula using the proportion of sales, property, and dollar payroll attributable to the Virginia facility.

Other tax facts of note include:

- A $1,000 tax credit is offered for every job created past the first 100 jobs in each year before the year 2005. In economically distressed communities, credits are awarded for every job after 50.
- A 10 percent tax credit is available for the purchase of certified recycling equipment. Any piece of equipment used solely for the purpose of recycling is qualified for the tax credit.

Zero Tax on Intangible Property

The Virginia General Assembly exempted intangible personal property from taxation in 1984 by making the tax rate zero. Intangible personal property includes stocks, bonds, money, accounts receivable, merchandise within a Virginia foreign trade zone, inventory, computer application software,

and tangible personal property used in manufacturing (with the exceptions of the manufacture of machinery and tools, motor vehicles, delivery equipment, trunk and feeder cables, studio equipment, and office furniture and equipment).

If a manufacturer's headquarters, regional offices, or research and development facilities are located in Virginia, its office furniture, fixtures, and aircraft are intangible property and are exempt from taxation.

Gasoline Tax

Virginia levies a gasoline tax of $0.175 per gallon and a tank storage fee of $0.006 per gallon. Tax revenue from fuel consumption totaled $703,874,000 in 1997. This revenue supports two funds: the transportation trust fund and the Highway Maintenance Operation (HMO). Of the total gasoline tax, $0.1485 per gallon is dedicated to the HMO to maintain highways and provide traffic safety and financial assistance to localities. The transportation trust fund supports administrative costs and other modes of transportation such as mass transit, airports, and port facilities.

Local Taxes on Individuals

Four major taxes are assessed at the local level:

- Real estate
- Tangible personal property (e.g., motor vehicles and boats)
- Utility bills
- Sales and use tax of 1.0 percent

In addition, localities have the option to impose local excise taxes on cigarettes, entertainment admission, room rentals, and meals.

16.6.3 Services Required for Industrial/Commercial Development

The availability of infrastructure, such as road access, water, sewage, and electricity, influences the extent of development. Road access matched appropriately to the land use is generally perceived to be the most important infrastructure requirement.

Good road access is essential, not only to provide access for airport users but to enable the transport of goods/services produced at adjacent commercial/industrial development areas. In fact, early and adequate transportation planning and provision of 360-degree access to the airport has been cited as the single most important factor in airport-related planning for economic development by economic development officials. In the case of the airports reviewed in Chapter 14, interstate access was in place prior to opening at Kansas City and Dallas/Fort Worth (DFW). Many developers and airport officials attribute the slow development of Dulles to the delay in building the Dulles Toll Road, which opened in October 1984.

Provision of utilities such as water, sewer, and electricity may speed development and increase the value of the land. The impact on prices of the availability of utilities is outlined in a previous section. At Dulles, developers claim that the sewer line underneath Dulles International Airport was initially more vital for developers than the runways and terminal. The line ran northward to the Potomac River and was big enough to service thousands of new houses in eastern Loudoun County. In the early years of DFW, the availability of water and sewer services for only Grapevine, Freeport,

and Las Colinas concentrated development in these areas. Dallas did not extend water and sewer service to the airport until 1984, ten years after DFW opened.

Land Absorption for Industrial/Commercial Development

Absorption of real estate surrounding an airport is dependent upon a number of factors, both endogenous and exogenous to the airport. The primary endogenous factor is the quality of air service for both passengers and cargo. Exogenous factors include the local investment climate, local economy, direction of growth, promotion of the airport commercial/industrial site, macroeconomic factors (e.g., inflation, interest rates, business cycle), infrastructure (e.g., water, sewer, electricity) and financial incentives provided. The experience of other airports indicates that it is difficult to estimate the rate and volume of development.

In "traditional" development, residential development usually precedes commercial and industrial development. Development patterns around airports tend to reverse the pattern of traditional development because of zoning and the type of demand immediately created by the airport. **Table 16.24** details how commercial development may occur around the new airport.

Hotel development occurs first. Generally the greatest period of development for this sector occurs from DBO to DBO+5. Growth in owner-occupied industrial development appears to precede owner-occupied office development by about five years. Retail development and speculative development lags the owner-occupied development. Residential development also tends to follow office and industrial development, although the timing is not clear.

Generalized Land Use Plan

The positive and negative characteristics of airport operations serve to attract and repel other land uses in an urban environment. Warehousing and storage facilities, certain types of commercial activities, and hospitality services generally benefit from proximity to an airport.

After the development of a new airport, the first wave of businesses near the airport is usually composed of industrial firms directly related to air travel and hotel establishments.

As the overall volume of business activity increases, a second cluster of firms that provides *general* business services locate in the airport's environs. This wide range of businesses typically includes banks, professional associations, insurance agents and accountants, equipment rental and repair, secretarial and temporary employment services, and limited medical and dental services.

At about the same time that general business services begin to locate near the airport, a cluster of non-aviation firms that is nevertheless dependent upon timely transportation (of both cargo and people) begins to locate near the airport. This is especially true for "gateway" airports to regions or countries, and where plenty of nearby land is available for low-density industrial development. These businesses include light manufacturing, intermodal transportation and freight forwarding firms, telecommunications companies, warehousing, and data processing.

Table 16.24

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Absorption of Land at New Airport

	Proposed Area	Period of Greatest Growth	Infrastructure Requirements	Relationship to Airport
Commercial				
– Hotel	200 acres	DBO-1 to DBO+5	Road access, utilities	Strong
– Office	500 acres	Significant growth before DBO+5-10 unlikely	Road access, utilities	Not required
– Retail	300 acres	Follow office development	Road access, utilities	Not required
Industrial				
– Light	400 acres	Precedes office development by approx. 5 years	Road access, utilities	Depends
– Heavy	200 acres		Road access, utilities	Depends
Residential	400 acres	Follow industrial and office development	Road access, utilities	Depends
TOTAL	**2,000 acres**			

Figure 16-1 shows how the micro-economy near an airport tends to grow.

As the airport area matures and diversifies, corporate or regional headquarters begin to locate in the environs if Class A (top grade) office space is available to develop or rent. However, regional shopping centers and large concentrations of retail development are relatively rare in an airport's environs.

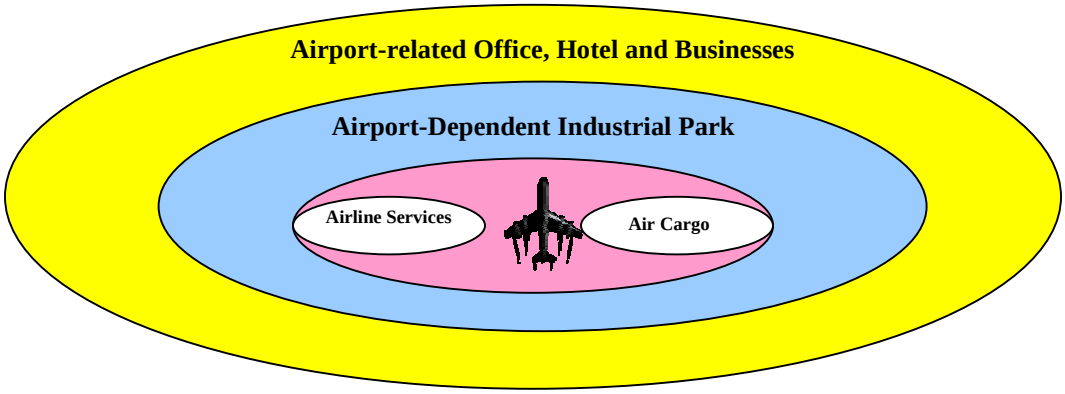
Examples of Near-Airport Developments

In addition to these representative businesses, some interesting types of businesses have developed near international airports.

- **Comprehensive car parking facilities**, located 2 to 6 miles from the airport, are an emerging big business in many international airports, and are now quite

Figure 16-1

HOW AIRPORT ENVIRONS DEVELOP



common in the United States and Canada. These facilities typically offer secured parking and even complete car maintenance services while the owner is traveling. Branch banking, convenience stores, and express package outlets are also emerging in these areas.

- **Corporate meeting and training facilities**, sometimes affiliated with hotels, are emerging at most new international airports. A near-airport location enables corporations to conduct one-day training seminars for employees without inconveniencing the employee or the corporation with excessive overnight lodging.

- **Many banks have begun to open major check-clearing operations** within the immediate environs of several international airports in the United States. These banks have found that proximity to the airport and the national reserve banks can save them one or two days of "float" interest on checks processed through their institution. These check-clearing operations typically occupy very large (100,000 square feet and up) one-story office spaces.

- **Package-sorting operations are increasingly common**. In keeping with the growth of international air cargo, many small-package shippers are locating large sorting and operations hubs either within or just outside the fences of international airports. The growth of these sorting hubs, as well as their accompanying corporate operations offices, is exceptionally strong in regions with many emerging economies. The key factors for the location of these facilities are (1) large amounts of on-airport, ramp-connected land where planes can be parked and unloaded, and (2) large amounts of near-airport land to develop supporting freight forwarding, corporate, or maintenance facilities. For example, in Indianapolis, Memphis, and Louisville (all three are central hubs for package-delivery companies), the airport accounts for over 10,000 airport-related jobs in each city.

16.7 LAND DEVELOPMENT

16.7.1 Sales/Lease Rates

Data on lease rates of unimproved land are not available. In general, annual leases are set to recoup purchase prices within ten years, so annual lease rates of unimproved land may be calculated by dividing the values in Section 16.6 by ten. For improved land, lease rates depend primarily on the extent and quality of the improvements as well as the site location, access, general economic climate, and other exogenous factors. For airport-owned industrial land, it is not unusual for lease terms to require a percentage of revenue earned by the lessee, as well as the conveyance to the airport of lessee-developed improvements upon expiration of the lease.

16.7.2 Extent and Phasing of Subsidies from Land Development Activities for Airport Purposes

In the short term, the new airport should not depend on revenue generated from land development activities to finance airport projects. Research on catalytic development at airports has indicated that development in airport environs is highly variable.

In the medium to long term, land development activities may provide a significant source of revenue for airport-development purposes. As outlined in Chapter 13, revenue from industrial parks

may represent an important source of revenues for airports. Industrial park rents and the golf course at El Paso International Airport earned approximately $2.90 per enplaned passenger in 1998. At Orlando Sanford International Airport, the industrial park building and land rentals earn approximately $1.57 per enplaned passenger.

The new airport may significantly benefit from the lease or sale of adjacent land, depending on the extent to which it controls this land. Such benefits could reasonably accrue to the airport beginning 5 to 10 years after DBO. As outlined in Chapter 13, it would also be appropriate for the airport to make available lands for commercial or industrial lease that are not anticipated to be needed within the first 15 to 20 years. The ground leases would need to have strong provisions for the airport to take back the land at the end of the lease period without compensation and before the lease period ends with some form of compensation.

16.8 CONCLUSION

There are many factors affecting the feasibility of the new airport and the preferred airport system, only some of which are financial in nature. This analysis was designed to assess the feasibility of the new airport as a financial entity. Other factors, such as the catalytic impacts or institutional requirements, may in fact have a greater impact on any decision to continue the planning process toward the preferred airport system.

With respect only to this financial analysis, the following can be determined:

- Under the Base Case, the airport's debt load would be too heavy for the projected passenger levels. Using other sensitivity analyses as a guide, it appears that an additional $282 million in alternative funding sources would be required to reduce the airport's debt to a manageable level. This investment gap is a key issue with respect to evaluating the overall feasibility of this project.

- Of the six sensitivity analyses, three produced results that suggest reasonable ways to close or shrink the investment gap.

- The restricted airline cost sensitivity reduced the construction budget to a point where the required airport debt was manageable. The result of this analysis was a feasible airport, but not enough construction. The analysis also showed that it may be possible to perform some value engineering and, as a result, lower the construction budget without reducing the quality of services provided. Such a process could shrink the investment gap by as much as $100 million.

- The high forecast sensitivity produced a scenario where the initial debt service levels were as high as in the Base Case, but decreased more rapidly as higher levels of PFCs and FAA entitlement funds became available. This rapid decrease reduced the ten year average cost per enplanement significantly. Because of the benefits post-DBO of this case, it suggests that higher levels of activity, in conjunction with other funding sources, could create a financially feasible situation.

The Enhanced Private Funding Case showed the numerous benefits of private funding at airports. This sensitivity produced lower airport debt requirements and associated decreases in airline cost per enplanement. More importantly, it produced a scenario in which financial feasibility was within reach, without reducing the services offered. According to this sensitivity, as much as

$164 million of the investment gap could be eliminated by additional private investment.

The extensive discussion of public, private, and public/private partnership management arrangements, presented previously, showed that there a variety of ways to structure the management and sponsorship of this airport. These sponsorship arrangements would have the resources to attract the additional monies (private funds, additional federal/state money, local government funds, airlines) with which to close the investment gap by as much as an additional $100 million.

Based on these observations, it can be concluded that a new airport, under the Base Case, would be feasible under the following parameters:

- The construction budget is value-engineered to reduce the cost.
- A public/private partnership is identified for airport sponsorship.
- Private funding sources are secured for key airport facilities.
- Alternative debt sources, with potentially lower interest rates, are examined.
- Aggressive marketing campaigns, designed to improve air service and enhance passenger levels, are undertaken.
- Opportunities to generate catalytic impacts are pursued to the fullest, ensuring that the construction of the airport leads to significant economic gains for the entire region.

These parameters could potentially eliminate the investment gap, making the airport financially feasible and able to serve as the region's primary economic engine.

Chapter Seventeen
INSTITUTIONAL ALTERNATIVES

The success of a new airport in eastern Virginia will depend on the selection of appropriate institutional, regulatory, ownership, and management structures. This chapter identifies potential ownership, development, and management structures and sponsors, both private and public that have been implemented in airports throughout the world. Entities and partnerships that could prove most successful for a new airport in eastern Virginia are analyzed. The structure that will operate and manage a new airport most effectively, as well as achieve the most desirable economic benefits to the region, is recommended.

17.1 INSTITUTIONAL STRUCTURES

Institutional structures that are most commonly involved in the ownership, operation, and management of airports are examined in this section. Following a discussion of current public institutions that own and operate airports, various public-private partnerships, which are typically arranged for airport operations, management, and funding, are presented. Risk, responsibility, strengths, and weaknesses are profiled for each type of government-based and public-private partnership structure.

17.1.1 Government-Based Structures

In the U.S., there are two government-based structures that typically operate and manage an airport or airport system: (1) agencies or departments of political jurisdictions and (2) semi-autonomous authorities. Some of the largest U.S. airports (e.g., Chicago O'Hare, Atlanta Hartsfield, and Los Angeles International) are run by city or county departments of aviation. Airports that are owned or operated by local government departments are often organized as enterprise funds. An enterprise fund is used to account for the financing of services to the general public where all or most of the costs involved are paid in the form of charges by users of such services.

Semi-autonomous authorities may administer one or several modes of transportation. Port authorities, which generally administer more than one transportation mode, and county or city-county authorities/commissions are equally commonplace. Some examples of authority-run airports are Orlando (City of Orlando and Orange County), JFK and LaGuardia (Port Authority of New York and New Jersey), and Charleston (South Carolina) airports.

State sponsorship is another alternative. In this case, the operations and management of an airport are controlled by an aviation department within the state department of transportation. Specific examples and details of these government-based structures are provided below.

The San Antonio Airport System is operated by the City of San Antonio Aviation Department. The Aviation Department employs 400 people to support the 24-hour operation of both San Antonio International Airport and Stinson Municipal Airport. Airport operations and improvements at San Antonio and Stinson are paid for by user

fees, bond funds, and money from the FAA's Aviation Trust Fund. San Francisco International Airport is an enterprise fund of the City and County of San Francisco. A five-member Airport Commission is responsible for the operation, development, and maintenance of San Francisco International Airport.

One strength of city-based management typically comes from slightly lower administrative costs due to a larger base of services over which to spread indirect expenses. Costs can also be saved through services such as utilities, public safety, and fire rescue, which can be shared with the municipality. Weaknesses in this type of management typically come in the form of longer approval and procurement processes (e.g., for budgets and capital improvements). Furthermore, in this type of system, the incentive to enhance an airport's performance, especially in terms of staff and operations, is potentially low.

Many large airports and entire airport systems are operated by airport authorities. The Port Authority of New York and New Jersey is an interstate agency with a jurisdiction generally within a 25-mile radius of the Statue of Liberty. The Governors of both states appoint six commissioners, each subject to approval of the respective state senates. The Governors retain the right to veto the actions of the Commissioners, but an Executive Director is appointed to effect the Port Authority's policies and to manage day-to-day operations. The aviation departments for JFK International, LaGuardia Airport, and Newark International Airport are operated by the Port Authority. Costs of providing facilities and services to the general public are recovered primarily from tolls, fares, fees, rentals, and other user charges. Washington Dulles International and Reagan National Airport, Seattle International Airport, and San Diego International Airport are also examples of semi-autonomous Port and Airport Authorities.

An authority typically has greater freedom in terms of management and finance. As a result, these airports tend to commercialize operations through terminal concessions and developing outside-the-fence property. This freedom enables staff to be available for tasks they are best qualified for, such as planning and development.

A final example of government-based management of airports falls under state jurisdiction within its Department of Transportation. In Alaska, the two main airports—Fairbanks International and Anchorage International—are owned and operated by Alaska's Department of Transportation. All airports in Hawaii are controlled by the Airports Division under the State Department of Transportation.

Few states are involved currently in the ownership and operation of airport systems. The two examples described above are certainly unique geographically. Many communities in Alaska are not connected by a road system; however, the aviation system links virtually all communities with the only dependable year-round transportation access. Similarly, Hawaii, with its fragmented archipelago, depends on air service for intrastate travel. In general, state governments are considered too far removed from a regional airport system to effectively and efficiently manage operations. The State of Connecticut runs Bradley International Airport (BDL). Concerned that the airport was not capitalizing on its economic opportunities, it has commissioned a recent study to see how the airport's commercial activities could be improved.

17.1.2 Airport Public-Private Partnership Structures

Airport public-private partnership structures span the complete spectrum of risk, responsibility, and commitment. **Figure 17-1** presents the range of choices for involving private entities in the provision of infrastructure and examines the benefits and key issues of each approach.

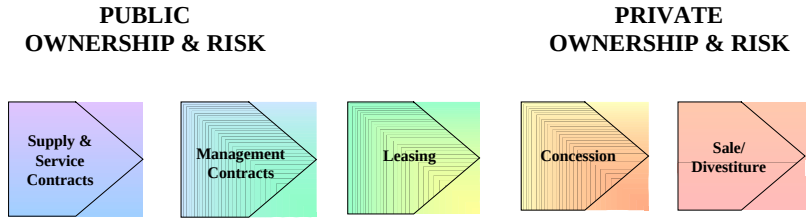
At the left end of the spectrum are supply and service contracts, which tend to be of short duration and require less commitment than the options on the right. The private contractor performs specified tasks, such as providing supplies, maintaining facilities, or billing customers. The contractor's risk and responsibility are limited to the function performed. Further along the spectrum are management leasing arrangements, where the contractor's compensation may be linked to the performance of the facility it manages. Conversely, lease payments to the owner may be established as a percentage of gross revenues. The private company may also be responsible for capital and operating financing to meet the obligations specified in its agreement or by the regulator. These contracts usually entail a wider scope of responsibilities than supply and service contracts.

At the right end of the spectrum are concession-type arrangements. The private partner assumes construction and financial risk for the construction of new or rehabilitation of old facilities. It then operates the facility for a specified period of time to recoup its investment. At some specified date, the facility and its assets may or may not be transferred back to the public entity. Concession contracts involve greater risk and commitment than the management contract.

Finally, the sale or full divestiture of airport assets involves the transfer to the private sector of the ownership of existing assets and the responsibility for future expansion and upkeep. Due to FAA regulations and Executive Order 12803 mandating repayment of federal grants and defeasement of tax-exempt debt, the sale or divestiture of airport assets is not an attractive option in the U.S.

Figure 17-1

Airport Public-Private Partnership Structures



Adapted from the World Bank Group

Source: IMG

In all these structures, a public entity grants the right and the obligation (to a private company) to provide an infrastructure service under terms and conditions specified in a contract. The private sector takes over operational responsibility and at least part of the commercial risk of service provision. The contractor is responsible for achieving specified results in service delivery and is given some freedom to choose the means for meeting those targets.

Below, the structures most relevant to eastern Virginia are discussed in detail. **Table 17.1** presents a summary of these structures, specific examples, the percentage of private risk, and the structures' strengths and weaknesses.

Service Contracts

As vendors and subcontractors, the private sector already plays an important role in many public airports. Services such as cleaning, groundskeeping, and security are often subcontracted to private companies who are responsible for providing the specified service. In this case, there is no private sector risk and the government must monitor the contracts, which allows for the promotion of competition for services.

Management Contracts

The management of all or part of the airport is contracted by the airport authority to a specialized operator for a given period of time and under specified conditions, typically including the following:

- performance criteria
- economic incentives
- maintenance and infrastructure commitments

Management contracts take different forms, depending on the types of services managed and the economic incentives. Generally, the airport operator will subcontract commercial activities through concession agreements to a number of external specialists. In some cases, management contracts may include equity participation by the private entity. This mechanism is frequently used when the government wishes to maintain ownership and divest operations and management functions to the private sector.

Management contracts are generally most effective when a contractor is given significant autonomy in decision-making, and compensation is based, in part, on performance. Relating incentives to performance may not work, however, where a government entity can interfere with setting rates and charges.

Leases

Under a lease, the government provides the major investment for the development of facilities, and a private contractor pays for the right to use the public facilities in providing services. A lease usually provides the contractor the exclusive rights to the stream of revenues from the facility for a specified period (e.g., 10 to 15 years). Under a lease arrangement, the contractor bears most of the commercial risks but not the financial risks associated with ownership of the capital asset. The private lessee may, however, have financing and development responsibility for leasehold improvements, which may or may not revert to the owner upon lease expiration. The government holds the property rights on the facility and receives lease payments on the assets.

Table 17.1a

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Public-Private Partnership Structures

Structure	Application	Incentives	Examples	% Private Risk	Strengths	Weaknesses
Service Contract	Provision of specific outsourced services, such as sanitation, billing, etc.	Permits competition among several potential service providers, each with short and specific contracts.	Provision of engineering, concessions, or other services.	10%	Government maintains ownership and control while permitting competition to ensure best services provided.	No transfer of financial or operating risks to private sector. Government must carefully monitor contracts.
Management Contract	Operation and maintenance of all or part of the facility.	Contract in which part of compensation is dependent on performance (efficiency improvements).	Indianapolis International Airport, Indiana: 10-year contract.	20%	Government maintains ownership and control with private sector involvement.	Minimal transfer of financial and operating risk to private sector.
Lease	Extended operational contract; may be responsible for capital improvements.	Contract bidding, provider assumes operational risk.	Addison Airport, Texas: 24-year lease.	40%	Government retains ownership and control, receives steady income, and avoids facility upgrade costs.	Government investment can still be required.
Lease/ Develop/ Operate (LDO)	A private firm leases the facility from the government, renovates or expands it, then operates the facility under a revenue-sharing agreement.	Private firm is able to earn a return on development costs through operating revenues.	Niagara Falls International Airport, Spanish firm CINTRA.	50%	Government retains ownership and control, receives steady income, and avoids facility upgrade costs.	Government investment still typically required.
Buy/Build/ Operate (BBO)	A private firm buys a public facility with the intention of renovating or expanding the facility.	The private firm operates the facility indefinitely and expects to earn a reasonable return on its investment.	London City Airport.	60%	Government receives up-front income from disposal of facility and avoids potentially costly facility upgrade.	Government cedes ownership and some control; locked into one operator.

Source: IMG

Table 17.1b

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Public-Private Partnership Structures

Structure	Application	Incentives	Examples	% Private Risk	Strengths	Weaknesses
Build/ Transfer/ Operate (BTO), Super-Turnkey, and Management and Operating Contract after Addition	A private firm completes the construction of a facility and transfers title to the government. Super-Turnkey involves private design, construction financing, and construction, after which the facility is turned over to the government for permanent financing.	The firm operates the facility long enough to realize a return on its investment.	Common in cargo facilities and toll roads.	70%	With no capital investment, government receives public service facility.	Government locked into one operator.
Build/ Operate/ Transfer (BOT) and Turnkey	A private firm builds and operates a facility for a specified number of years, then transfers title to the government.	Private firm makes a reasonable return on operations.	$300 million Passenger Terminal in Istanbul, Turkey.	80%	With no capital investment, government eventually receives public service facility. Project receives private financing, design, and construction.	Government must carefully monitor operator to ensure facility is viable at time of transfer.
Build/Own/ Operate (BOO)	A private firm is granted permission to design, build, operate, and own a facility indefinitely.	The firm expects to earn a return on its investment, but is subject to regulatory restraints.	Fixed Base Operators in U.S.	90%	Retains regulatory oversight. Public service provided without public capital or operating investment.	Government locked into one operator for indefinite time period.
Concession	All features of lease, plus financing some or all fixed assets.	Contract bidding with contract period up to 30 years. Provider assumes operational and some or all financial risk.	JFK International Arrivals Building, New York.	90%	Up-front cash is maximized; liabilities are minimized.	Government oversight and legal authority is minimized.

Source: IMG

Concessions

Concessions incorporate all of the features of a lease but give the contractor the added responsibility of investments, such as expansion of capacity or replacement of fixed assets. Concession agreements include a regulatory framework, including rates and charges, degree of competition, and performance targets. Because of the element of monopoly, public service obligations tend to include detailed specifications on the service provided, the obligation to supply, equal treatment of users, continuity of service, etc.

The greatest strength of the concession instrument is that it can be designed to overcome a broad range of obstacles to private participation in infrastructure. The option of leaving formal ownership of existing sector assets to the government entity makes it particularly useful in cases where private ownership may not be feasible. Contracts can be tailored to allocate risks in a variety of ways to give investors comfort.

Designing a scheme that strikes the right balance between the investors, the consumers, and the public authorities is a delicate art. "Cut and Paste" contracts can rarely be used due to the significantly differing circumstances of each concession arrangement. The terms of the concession must also be monitored and enforced, and may need to be periodically revised.

17.1.3 Summary

Having examined the most common institutional structures in place at airports in terms of their ownership, operation, and management, it is evident that the public-private partnership holds significant advantages over the government-based structures. The public sector holds advantages for ownership due to its access to grants and other funding mechanisms typically not seen in the private realm. However, the private sector possesses advantages in terms of institutional expertise and developmental efficiency.

17.2 POTENTIAL SPONSORS OF THE NEW AIRPORT

This section identifies and assesses potential sponsors for the new airport. Sponsors who are currently vested in Virginia and may be interested in the project are discussed, along with their potential roles.

17.2.1 Potential Government Sponsors

Virginia Public Entities and Departments

Under current law in Virginia, the Virginia Aviation Board (VAB) is the only public entity that may operate airports in the Commonwealth. Among its powers and duties, the Board is responsible for disseminating the rules and regulations relating to airports, as well as the promotion and development of safe aviation practices and operations. The Virginia Department of Aviation (DOAV) provides financial and technical assistance to eligible sponsors for the planning, development, construction, and operations of airports and airport facilities, and makes recommendations to the Board for the distribution of funds. Currently, all airports in Virginia are either owned by regional or municipal authorities/ commissions, cities, counties, or the private sector.

Local Government

The local governments in the new airport search region, either individually or in combination, do not currently possess the technical wherewithal to sponsor a new

airport. Nevertheless, the County of Isle of Wight, City of Suffolk, and Counties of Southampton, Sussex, and Surry have all expressed genuine interest in the new airport project.

Existing Airport Authorities

The region's current airports—Norfolk International Airport and Newport News-Williamsburg International Airport—are not run by local government but rather by independent authorities. Given the substantial capital plans at both airports, it seems unlikely that staff at either or both of the two airport authorities would be interested in taking on the burden of building and running a new airport. Certainly with additional investments in development and operating staff, one or both of the airport authorities could assume sponsorship. This arrangement could have definite advantages, given the experience and knowledge the officials and staff possess. Regardless of the operating status of the two existing airports, the mission and markets of the two or three remaining airports would need to be coordinated. If, however, the two airports were closed and redeveloped, it is conceivable that the existing authorities could be combined to control the new airport.

New Airport Authority

The most logical scenario for the development of a new airport would be through a new airport authority. The majority of authority boards are composed of vested community leaders with an executive director responsible for day-to-day operations. Commissioners or board members are usually appointed by participating political subdivisions, as well as state appointees. If the authorities and ORF and/or PHF were to remain operational, the new airport authority would need to negotiate joint use agreements with them. This authority would be a state-chartered authority.

Virginia Port Authority

Many port authorities are involved in airport operations in the U.S. The Virginia Port Authority is located in the heart of Hampton Roads and is one of the most efficient ports in the U.S. The Port Authority handles the financial management and operations of the Port, which include all transportation via ship, truck, and rail. With its global reach and intermodal expertise, it is possible that the Port would be capable of adopting a new airport. Much of the cargo and people moving, rate setting, and customer relations expertise would be transferable to an airport environment. However, financing and technical experience that is unique to airports would be missing.

17.2.2 Sample Airport Private Operators and Developers

Table 17.2 provides a sampling of the more than 30 internationally respected airport developers and operators, with summaries of their airport experiences and example projects noted.

Table 17.2

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Airport Developers and Operators

Developer/ Operator	**Headquarters Location**	**Summary of Experience**	**Sample Airport Projects**
Airport Group International/ TBI plc	Glendale, CA and Orlando, FL	15 airports with 31 million total passengers.	Airports managed include Albany, Burbank-Glendale-Pasadena, Costa Rica, Terminal 3 in Toronto, 3 major airports in Bolivia, and 6 major airports in Australia.
Schipol (Amsterdam Airport Company)	Amsterdam, The Netherlands	One of the world's best-regarded public airport operators.	Participating in JFK International Terminal 4; Brisbane, Australia 50-year contract; management in St. Maarten; advisory services in Russia, southeast Asia, and Latin America.
BAA	London, England	World's largest commercial operator of airports with nearly 30 years of experience.	Owns and operates 7 airports in U.K. serving 130 million passengers. Contracts at Pittsburgh International and Indianapolis International.
Bechtel Enterprises	San Francisco, CA	75 airport systems projects. Total development: over $40 billion.	Projects at Hartsfield-Atlanta, Chicago International, Dallas-Ft. Worth International, JFK International, Los Angeles, Miami, Hong Kong, and New Seoul.
Ogden Corporation	New York, NY	World's largest aviation services company, a leader since 1946. Increasingly involved in wholesale takeover and development of larger airports.	Major international player in financing, operating, and developing airports (including 33 Argentine airports). Holds a $1.5 billion, 19-year concession to develop and operate a cargo, maintenance, and ground handling center at Macau International Airport. Developed the new, second runway at Bogota's Eldorado Airport, among others.
Skanska AB	Sweden	One of the world's largest construction-related services company with $8 billion in annual revenues. 110 years old with operations in 50 countries.	Currently constructing airport projects at Budapest, Hungary; Logan Airport, Boston; JFK International; and Pulkovo International, St. Petersburg, Russia. Participated in over 20 projects throughout the U.S.
YVR Airport Services	Vancouver, British Columbia, Canada	Base airport handles 15 million passengers.	Recently won BOT contract for terminal in Santiago, Chile; operates several airports in Canada and Bermuda.

Source: IMG

17.2.3 Summary

Having examined the most common sponsorship entities in place at airports in terms of their ownership, operation, and management, it is evident that the creation of a new airport authority would be best suited for a new regional airport in eastern Virginia, primarily due to the lack of financial resources and technical expertise among existing organizations and/or entities.

17.3 RECOMMENDED INSTITUTIONAL STRUCTURE

17.3.1 Advantages of Public-Private Sponsorship Over Government Alone

Public sponsorship (ownership) would be necessary to marshal political support and to convince potential investors of then project's financial feasibility. It would also be a convenient vehicle for issuing tax-exempt bonds and accessing any available federal- or state-funding assistance. Finally, a government entity would provide essential continuing oversight for the airport's operation, public service, and safety. However, none of these considerations means that the airport should actually be designed, constructed, and operated by a government agency.

Based upon observations in the U.S. and abroad, there appear to be significant advantages to the public-private partnership model for airport ownership, development, and operation for the type of airport envisioned for eastern Virginia. Following are salient characteristics for the administration of a new airport in eastern Virginia:

- The new airport would probably *not* be located within the jurisdiction of a government that already operates a commercial service airport; therefore, there is no obvious governmental operator already in existence.

- The new airport would probably be governed, overseen, or regulated by an entity representing several different government entities.

- Taking on the development, financing, and construction management of a large, new airport is a huge task that is likely well beyond the financial and institutional capabilities of any of the existing governments.

The task of creating an entirely new independent governing body and then tasking it to design, build, and construct a new, large airport is a daunting and relatively unprecedented task. In fact, the institutional burden may be sufficient to significantly delay the development of the airport.

For these reasons, it may be most advantageous for the government body to utilize a strong public-private partnership for the development and operation of the airport, with the government entity providing tax-exempt financial support and oversight, and the private entity providing detailed design, construction, commercialization, and continuing operation. Such a partnership could also provide the strength of both sectors in furthering the economic development of the region.

A public-private partnership would provide the following advantages:

- The risks and management burden associated with construction cost escalation, time-certain delivery, and operations would be allocated to the private partner via a franchise agreement, lease, or management and development contract. Developing and enforcing such a contract is vastly simpler

and less risky for the governing entity than attempting to carry out those activities itself.

- Private airport developer/operators have demonstrated outstanding efficiencies in planning, construction, and operating large airports. These efficiencies could significantly lower both the construction cost of the airport and the cost of operations. Such efficiencies would make the airport financially feasible sooner than traditional methods, and would improve its financial attractive-ness to user airlines.

- Private airport developer/operators have demonstrated exceptional success in commercializing airports (i.e., developing customer-appealing facilities and services, increasing non-airline revenues, marketing the airport, fostering economic development on airport land, and taking the airport's assets to their highest and best economic use). Not only do such non-airline revenues and commercial activities contribute to the financial feasibility and lower airline cost of the airport, but they foster rapid job growth and nurturing of nearby supporting businesses.

17.3.2 The Governing Body

The governing body should represent the communities served by the new airport, as well as the Commonwealth's interests. Similar bodies have been composed of local government representatives, plus several representatives appointed by the Governor. The body would act like a traditional airport authority with state-chartered powers to develop, finance, and operate the airport for the benefit of the surrounding communities and the Commonwealth of Virginia. There are many sample charter documents available for such bodies.

The first activity of the governing body would be to review and select a private entity to actually construct and operate the airport. This process would include the following steps:

- Hire a staff and consultants to develop bid documents, including an Airport Concept Plan that would provide the framework for the competing proposals.

- Develop the terms of reference for the solicitation, and issue the Request For Proposals to potential bidders. There may be a pre-qualification step in between.

- Draft a long-term contract for the development, finance (the private portion), construction, and operation of the airport. This should include a regulatory framework for continuing oversight of the private partner after the airport is operational. Both the contract and the regulatory approach would benefit from the many similar public-private development transactions that have been executed for airports around the world.

- Select the preferred bidder and refine the details of the contract in negotiation.

- Assist the selected bidder in marketing the airport to prospective tenants, including airlines, air cargo carriers and third-party service providers.

- Monitor construction, inspect and confirm the facilities prior to opening, and open the facility to the public.

- Oversee operations and expansion, including providing forums for regular public input during both the construction and operations phases of the project.

- Continue to work with the private partner to foster economic development around the airport and support of the communities' economic development and air service ambitions.

It is possible for the governing body to take upon itself all of the duties envisioned herein for the private partner. However, the

unique circumstances surrounding the development of a new greenfield airport in eastern Virginia present special challenges to this approach. For many of the same reasons, the state of Illinois is planning to use the public-private partnership approach to develop a third airport for the Chicago region. Other governments worldwide are developing all-new airports for their capitals under a similar public-private partnership model.

The public-private partnership is the recommended institutional alternative to be applied to the new airport in eastern Virginia.

ACRONYMS

B

BEA – Bureau of Economic Analysis

D

DOT – Department of Transportation (Federal)

E

EVASS - Eastern Virginia Airport System Study

F

FAA – Federal Aviation Administration
FRA – Federal Rail Administration

G

GA – General Aviation
GDP – Gross Domestic Product
GPS – Global Positioning Satellite

H

HNTB - HNTB Corporation (consultant)
HOV – High Occupancy Vehicle
HSCT – High-speed Civil Transport

I

IFR – Instrument Flight Rules
ILS - Instrument Landing System
ISTEA – Intermodal Surface Transportation Efficiency Act

J

JIT – Just in Time

M

MIS – Major Investment Study
MPO – Metropolitan Planning Organization

N

NAFTA – North American Free Trade Agreement
NASA – National Aeronautics and Space Administration

O

ORF – Norfolk International Airport

P

PDC – Planning District Commission
PHF – Newport News International Airport

R

RFS – Road Feeder Service
RIC – Richmond International Airport

U

US – United States

V

VA – Virginia
VDOA – Virginia Department of Aviation
VDOT – Virginia Department of Transportation
VEC – Virginia Employment Commission
VFR – Visual Flight Rules – Department of Transportation

Appendix A

Projected Facility Costs 2030

Table A.1

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Projected Facility Costs through 2030 and Master Plan Projects for Richmond International Airport

			Three Airport System		One Airport System		Two Airport System		Two Airport System	
		Unit	Status Quo***		New Airport - Area One****		RIC/PHF****		RIC/New Airport-Area 2C****	
Richmond	**Units**	**Costs**	**Net Req.**	**Cost Est.***	**Net Req.**	**Cost Est.***	**Net Req.**	**Cost Est.***	**Net Req.**	**Cost Est.***
Land Acquisition	acre	$1,700	mp	$2,685,000	mp	$2,685,000	mp	$2,685,000	mp	$2,685,000
Site Preparation	cu. yd.	$2	0	$0	0	$0	0	$0	0	$0
Utilities	various	n/a	0	$0	0	$0	0	$0	0	$0
Wetland Mitigation **	acre	$70,000	mp	$3,000,000	10	$700,000	mp	$3,000,000	mp	$3,000,000
Runway/taxiway	n/a	n/a	mp	$240,263,000	mp	$108,963,000	mp	$108,963,000	mp	$108,963,000
Airport Roadways	lane mile	$1,307,750	mp	$45,110,000	mp	$45,110,000	mp	$45,110,000	mp	$45,110,000
Off-Airport Roadways	lump sum	n/a	mp	$80,753,000	mp	$5,753,000	mp	$5,753,000	mp	$5,753,000
NAVAIDS	per ILS	$2,500,000	2	$5,000,000	2	$5,000,000	2	$5,000,000	2	$5,000,000
ARFF	sq. ft.	$86	mp	$2,500,000	0	$0	0	$0	0	$0
Fuel Storage Facilities	gal. of cap.	$3.10	mp	$5,000,000	mp	$1,250,000	mp	$1,250,000	mp	$5,000,000
Terminal Building	sq. ft.	$160	mp	$145,100,000	mp	$92,600,000	mp	$92,600,000	mp	$92,600,000
Terminal Parking - at grade	spaces	$1,000	mp	$4,600,000	mp	$4,600,000	6,400	$6,400,000	7,200	$7,200,000
Terminal Parking - structure	spaces	$8,500	mp	$46,876,000	mp	$26,876,000	mp	$26,876,000	mp	$26,876,000
Air Carrier Gates	gates	$250,000	na	$0	na	$0	16	$0	18	$0
Regional Carrier Positions	positions	$0	na	$0	na	$0	2	$0	5	$0
Apron Area	sq. yd.	$142	mp	$9,000,000	mp	$9,000,000	65,000	$9,230,000	65,000	$9,230,000
Air Cargo Building	sq. ft.	$70	mp	$7,000,000	mp	$7,000,000	143,645	$10,055,000	143,645	$10,055,000
Air Cargo Apron	sq. yd.	$142	mp	$5,300,000	mp	$5,300,000	mp	$5,300,000	mp	$5,300,000
GA Terminal	sq. ft.	$118	0	$0	0	$0	0	$0	0	$0
GA Auto Parking	spaces	$1,000	0	$0	0	$0	0	$0	0	$0
GA Apron	sq. yd.	$95	0	$0	0	$0	0	$0	0	$0
GA Conventional Hangars	sq. yd.	$237	2,636	$625,000	2,636	$625,000	2,636	$625,000	2,636	$625,000
GA T-Hangars	hangars	$14,133	72	$1,018,000	72	$1,018,000	72	$1,018,000	72	$1,018,000
A/E and Contingency *****	n/a	n/a	n/a	$135,862,000	n/a	$71,208,000	n/a	$72,870,000	n/a	$73,893,000
TOTAL				**$739,692,000**		**$387,688,000**		**$396,735,000**		**$402,308,000**

* Rounded to nearest thousand.

** Including land acquisition cost

*** Costs from latest Airport Master Plan through 2030

**** Costs from latest Airport Master Plan through 2005 or projections, which ever is greater.

***** Assumed to be 22.5% of project costs for existing airports

Source: HNTB analysis.

Table A.2

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Projected Facility Costs through 2030 and Master Plan Projects for Norfolk International Airport

			Three Airport System Status Quo***		One Airport System New Airport - Area One****		Two Airport System RIC/PHF****		Two Airport System RIC/New Airport-Area 2C****	
Norfolk	**Units**	**Unit Costs**	**Net Req.**	**Cost Est.***	**Net Req.**	**Cost Est.***	**Net Req.**	**Cost Est.***	**Net Req.**	**Cost Est.***
Runway/Taxiways	n/a	n/a	mp	$101,500,000	mp	$89,900,000	mp	$89,900,000	mp	$89,900,000
Fuel Storage Facilities	gal. of cap.	$3.10	mp	$2,490,000	mp	$1,660,000	mp	$1,660,000	mp	$1,660,000
Terminal Building	sq. ft.	$160	mp	$59,970,000	mp	$56,970,000	mp	$56,970,000	mp	$56,970,000
Terminal Parking - at grade	spaces	$1,000	mp	$1,100,000	mp	$0	mp	$0	mp	$0
Terminal Parking - structure	spaces	$8,500	mp	$77,760,000	mp	$38,880,000	mp	$38,880,000	mp	$38,880,000
Air Carrier Gates	gates	$250,000	na	$0	na	$0	na	$0	na	$0
Regional Carrier Positions	positions	$0	na	$0	na	$0	na	$0	na	$0
Apron Area	sq. yd.	$142	mp	$16,600,000	mp	$16,600,000	mp	$16,600,000	mp	$16,600,000
Air Cargo Building	sq. ft.	$70	mp	$8,500,000	mp	$5,500,000	mp	$5,500,000	mp	$5,500,000
Air Cargo Apron	sq. yd.	$142	mp	$11,320,000	mp	$7,540,000	mp	$7,540,000	mp	$7,540,000
GA Terminal	sq. ft.	$118	0	$0	0	$0	0	$0	0	$0
GA Auto Parking	spaces	$1,000	0	$0	0	$0	0	$0	0	$0
GA Apron	sq. yd.	$95	0	$0	0	$0	0	$0	0	$0
GA Conventional Hangars	sq. yd.	$237	7,778	$1,843,000	7,778	$1,843,000	7,778	$1,843,000	7,778	$1,843,000
GA T-Hangars	hangars	$14,133	10	$136,000	10	$136,000	10	$136,000	10	$136,000
A/E and Contingency **	n/a	n/a	n/a	$40,437,000	n/a	$29,054,000	n/a	$29,054,000	n/a	$29,054,000
TOTAL				**$321,656,000**		**$248,083,000**		**$248,083,000**		**$248,083,000**

* Rounded to nearest thousand.

** Assumed to be 22.5% of project costs for existing airports

*** Costs from latest Airport Master Plan through 2030

**** Costs from latest Airport Master Plan through 2005 or projections, which ever is greater.

Source: HNTB analysis.

Table A.3

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Projected Facility Costs through 2030 and Master Plan Projects for Newport News/Williamsburg International Airport

Newport News/ Williamsburg	Units	Unit Costs	Three Airport System Status Quo***		One Airport System New Airport - Area One****		Two Airport System RIC/PHF****		Two Airport System RIC/New Airport-Area 2C****	
			Net Req.	Cost Est.*	Net Req.	Cost Est.*	Net Req.	Cost Est.*	Net Req.	Cost Est.*
Parallel Runway 7N-25N **	n/a	n/a	mp	$31,950,000	0	$0	n/a	$45,000,000	0	$0
Extension of Runway 2-20 **	n/a	n/a	mp	$11,916,000	0	$0	n/a	$29,000,000	0	$0
Misc. Runway/Taxiways	lump sum	n/a	mp	$38,340,000	mp	$30,229,000	mp	$30,229,000	mp	$30,229,000
Land Acquisition	lump sum	n/a	mp	$3,250,000	mp	$3,250,000	mp	$3,250,000	mp	$3,250,000
On-Airport Roadways	lump sum	n/a	mp	$982,000	mp	$982,000	mp	$982,000	mp	$982,000
Control Tower	lump sum	n/a	mp	$21,000,000	0	$0	mp	$21,000,000	0	$0
Off-Airport Roadways	lump sum	n/a	0	$3,154,000	mp	$21,000,000	mp	$21,000,000	mp	$21,000,000
NAVAIDS **	n/a	n/a	0	$0	0	$0	n/a	$15,000,000	0	$0
ARFF	sq. ft.	$86	0	$0	0	$0	10,000	$860,000	0	$0
Fuel Storage Facilities	gal. of cap.	$3.10	mp	$500,000	mp	$500,000	mp	$500,000	mp	$500,000
Terminal Building	sq. ft.	$160	mp	$17,165,000	mp	$10,915,000	500,706	$80,113,000	mp	$10,915,000
Terminal Parking - at grade	spaces	$1,000	mp	$1,484,000	mp	$934,000	14,831	$14,831,000	mp	$934,000
Terminal Parking - structure	spaces	$8,500		$0	0	$0	6,356	$54,026,000	0	$0
Air Carrier Gates	gates	$250,000		$0	0	$0	45	$11,250,000	0	$0
Regional Carrier Positions	gates	$0	0	$0	3	$0	15	$0	0	$0
Apron Area	sq. yd.	$142	mp	$5,000,000	mp	$2,725,000	253,000	$35,926,000	mp	$2,725,000
Air Cargo Building	sq. ft.	$70	3,381	$237,000	3,381	$237,000	5,152	$361,000	3,381	$237,000
Air Cargo Apron	sq. yd.	$142	939	$133,000	939	$133,000	1,431	$203,000	939	$133,000
GA Terminal	sq. ft.	$118	0	$0	0	$0	0	$0	0	$0
GA Auto Parking	spaces	$1,000	0	$0	0	$0	0	$0	0	$0
GA Apron	sq. yd.	$95	0	$0	0	$0	0	$0	0	$0
GA Conventional Hangars	sq. yd.	$237	10,020	$2,375,000	10,020	$2,375,000	6,258	$1,483,000	10,020	$2,375,000
GA T-Hangars	hangars	$14,133	29	$410,000	29	$410,000	16	$220,000	29	$410,000
A/E and Contingency **	n/a	n/a	n/a	$31,027,000	0	$16,580,000	n/a	$64,974,000	0	$16,580,000
TOTAL				**$168,923,000**		**$90,270,000**		**$430,208,000**		**$90,270,000**

* Rounded to nearest thousand.

** Assumed to be 22.5% of non-roadway project costs for existing airports

*** Costs from latest Airport Master Plan through 2030

**** Costs from latest Airport Master Plan through 2005 or projections, which ever is greater.

Source: HNTB analysis.

Table A.4

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Facility Costs through 2030 for Search Area 1

.

Search Area 1	Units	Unit Costs	Three Airport System Status Quo***		One Airport System New Airport - Area One****		Two Airport System RIC/PHF****		Two Airport System RIC/New Airport-Area 2C	
			Net Req.	Cost Est.*	Net Req.	Cost Est.*	Net Req.	Cost Est.*	Net Req.	Cost Est.*
Land Acquisition	acre	$1,700	0	$0	5,000	$8,500,000	0	$0	0	$0
Site Preparation	cu. yd.	$2	0	$0	17,122,200	$34,244,000	0	$0	0	$0
Utilities **	various	n/a	0	$0	n/a	$21,670,000	0	$0	0	$0
Wetland Mitigation ***	acre	$70,000	0	$0	855	$59,850,000	0	$0	0	$0
Runway/taxiway	sq. yd.	$142	0	$0	778,600	$110,561,000	0	$0	0	$0
Airport Roadways	lane mile	$1,307,750	0	$0	24	$33,233,000	0	$0	0	$0
Off-Airport Roadways	lump sum	n/a	0	$0	n/a	$22,580,000	0	$0	0	$0
NAVAIDS	per ILS	$2,500,000	0	$0	4	$10,000,000	0	$0	0	$0
Air Traffic Control Tower	lump sum	$21,000,000	0	$0	1	$21,000,000	0	$0	0	$0
ARFF	sq. ft.	$86	0	$0	10,000	$860,000	0	$0	0	$0
Fuel Storage Facilities	gal. of cap.	$3.10	0	$0	304,870	$945,000	0	$0	0	$0
Terminal Building	sq. ft.	$200	0	$0	834,670	$166,934,000	0	$0	0	$0
Terminal Parking - at grade	spaces	$1,000	0	$0	19,703	$19,703,000	0	$0	0	$0
Terminal Parking - structure	spaces	$8,500	0	$0	8,444	$71,774,000	0	$0	0	$0
Air Carrier Gates	gates	$250,000	0	$0	61	$15,244,000	0	$0	0	$0
Regional Carrier Positions	positions	$0	0	$0	26	$0	0	$0	0	$0
Apron Area	sq. yd.	$142	0	$0	418,113	$59,372,000	0	$0	0	$0
Air Cargo Building	sq. ft.	$70	0	$0	112,700	$7,889,000	0	$0	0	$0
Air Cargo Apron	sq. yd.	$142	0	$0	31,306	$4,445,000	0	$0	0	$0
GA Terminal	sq. ft.	$118	0	$0	186	$22,000	0	$0	0	$0
GA Auto Parking	spaces	$1,000	0	$0	1	$1,000	0	$0	0	$0
GA Apron	sq. yd.	$95	0	$0	4,045	$384,000	0	$0	0	$0
GA Conventional Hangars	sq. yd.	$237	0	$0	1,833	$434,000	0	$0	0	$0
GA T-Hangars	hangars	$14,133	0	$0	7	$93,000	0	$0	0	$0
A/E and Contingency ****	n/a	n/a	0	$0	n/a	$179,910,000	0	$0	0	$0
TOTAL				**$0**		**$849,648,000**		**$0**		**$0**

* Rounded to nearest thousand.

** Assumes gas, electricity, telephone, and cable systems are provided by local purveyor

*** Including land acquisition cost

**** Assumed to be 27.8% of non-off airport roadways project costs for new airports

Source: HNTB analysis.

Table A.5

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Facility Costs through 2030 for Search Area 2

Search Area 2	Units	Unit Costs	Three Airport System Status Quo***		One Airport System New Airport - Area One****		Two Airport System RIC/PHF****		Two Airport System RIC/New Airport-Area 2C	
			Net Req.	Cost Est.*	Net Req.	Cost Est.*	Net Req.	Cost Est.*	Net Req.	Cost Est.*
Land Acquisition	acre	$1,700	0	$0	0	$0	0	$0	5,000	$8,500,000
Site Preparation	cu. yd.	$2	0	$0	0	$0	0	$0	17,122,200	$34,244,000
Utilities **	various	n/a	0	$0	0	$0	0	$0	n/a	$21,670,000
Wetland Mitigation ***	acre	$70,000	0	$0	0	$0	0	$0	1,530	$107,100,000
Runway/taxiway	sq. yd.	$142	0	$0	0	$0	0	$0	778,600	$110,561,000
Airport Roadways	lane mile	$1,307,750	0	$0	0	$0	0	$0	20	$29,731,000
Off-Airport Roadways	lump sum	n/a	0	$0	0	$0	0	$0	n/a	$18,900,000
NAVAIDS	per ILS	$2,500,000	0	$0	0	$0	0	$0	4	$10,000,000
Air Traffic Control Tower	lump sum	$21,000,000	0	$0	0	$0	0	$0	1	$21,000,000
ARFF	sq. ft.	$86	0	$0	0	$0	0	$0	10,000	$860,000
Fuel Storage Facilities	gal. of cap.	$3.10	0	$0	0	$0	0	$0	166,860	$517,000
Terminal Building	sq. ft.	$200	0	$0	0	$0	0	$0	455,071	$91,014,000
Terminal Parking - at grade	spaces	$1,000	0	$0	0	$0	0	$0	10,839	$10,839,000
Terminal Parking - structure	spaces	$8,500	0	$0	0	$0	0	$0	4,645	$39,483,000
Air Carrier Gates	gates	$250,000	0	$0	0	$0	0	$0	33	$8,343,000
Regional Carrier Positions	positions	$0	0	$0	0	$0	0	$0	14	$0
Apron Area	sq. yd.	$142	0	$0	0	$0	0	$0	228,830	$32,494,000
Air Cargo Building	sq. ft.	$70	0	$0	0	$0	0	$0	112,700	$7,889,000
Air Cargo Apron	sq. yd.	$142	0	$0	0	$0	0	$0	31,306	$4,445,000
GA Terminal	sq. ft.	$118	0	$0	0	$0	0	$0	186	$22,000
GA Auto Parking	spaces	$1,000	0	$0	0	$0	0	$0	1	$1,000
GA Apron	sq. yd.	$95	0	$0	0	$0	0	$0	4,045	$384,000
GA Conventional Hangars	sq. yd.	$237	0	$0	0	$0	0	$0	1,833	$434,000
GA T-Hangars	hangars	$14,133	0	$0	0	$0	0	$0	7	$93,000
A/E and Contingency ****	n/a	n/a	0	$0	0	$0	0	$0	n/a	$150,015,000
TOTAL				**$0**		**$0**		**$0**		**$708,539,000**

* Rounded to nearest thousand.

** Assumes gas, electricity, telephone, and cable systems are provided by local purveyor

*** Including land acquisition cost

**** Assumed to be 27.8% of non-off airport project costs for new airports

Source: HNTB analysis.

Appendix B

Travel Time Calculations

Table B.1

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Travel Time Calculations

	One-Airport System		**Two-Airport System**		**Two-Airport System**		**Three-Airport System**	
CITY/COUNTY	**Travel Time, hh:mm**	**Miles**	**Travel Time, hh:mm**	**Miles**	**Travel Time, hh:mm**	**Miles**	**Travel Time, hh:mm**	**Miles**
VIRGINIA								
Accomack	2:16	135	1:42	99	1:31	91	1:21	76
Amelia	1:37	84	1:03	46	1:03	46	1:03	46
Brunswick	1:40	69	1:36	73	1:30	86	1:36	73
Buckingham	2:27	119	1:30	75	1:30	75	1:30	75
Caroline	1:54	100	0:57	49	0:57	49	0:57	49
Charles City	1:06	50	0:30	25	0:30	25	0:30	25
Charlotte	2:30	116	2:02	95	2:02	95	2:02	95
Chesterfield	1:14	58	0:44	22	0:44	22	0:44	22
Cumberland	2:05	100	1:08	56	1:08	56	1:08	56
Essex	2:08	98.2	1:13	48	1:13	48	1:13	48
Fluvanna	2:20	129	1:23	78	1:23	78	1:23	78
Gloucester	1:29	75	0:27	24	0:57	54	0:27	24
Goochland	1:54	101	0:59	50	0:59	50	0:59	50
Greene	2:45	152	1:49	102	1:49	102	1:49	102
Hanover	1:28	76	0:32	26	0:32	26	0:32	26
Henrico	1:12	60	0:12	4	0:12	4	0:12	4
Isle of Wight	0:57	21	0:47	30	0:18	6	0:47	30
King and Queen	1:52	97	0:53	46	0:53	46	0:53	46
King George	2:09	119	1:13	68	1:13	68	1:13	68
King William	1:39	80	0:44	30	0:44	30	0:44	30
Lancaster	2:04	111	1:11	58	1:25	74	1:11	58
Louisa	2:04	110	1:09	59	1:09	59	1:09	59
Lunenberg	2:03	99	1:56	92	1:56	92	1:56	92
Madison	2:49	153	1:54	103	1:54	103	1:54	103
Mathews	1:26	64	0:45	36	1:16	63	0:45	36
Mecklenburg	2:04	102	1:58	95	1:58	95	1:58	95
Middlesex	1:23	66	0:45	41	0:53	50	0:45	41
Nelson	3:03	165	2:08	115	2:08	115	2:08	115
New Kent	1:11	53	0:29	22	0:29	22	0:29	22
Northampton	1:42	103	1:08	67	1:01	59	0:47	44
Northumberland	2:04	100	1:22	71	1:26	80	1:22	71
Nottoway	1:34	72	1:27	65	1:27	65	1:27	65
Orange	2:37	144	1:40	94	1:40	94	1:40	94
Powhatan	1:50	82	0:53	39	0:53	39	0:53	39
Prince Edward	2:21	103	1:35	77	1:35	77	1:35	77
Richmond	1:57	108	1:02	58	1:02	58	1:02	58
Stafford	2:17	126	1:21	76	1:21	76	1:21	76
Surry	0:18	8	0:53	34	0:47	39	0:53	34
Sussex	0:38	24	1:08	47	1:08	47	1:08	47
Westmoreland	2:16	120	1:21	70	1:21	70	1:21	70
Chesapeake City	1:05	56	0:55	43	0:26	12	0:31	21
Hampton City	1:25	42	0:13	12	0:25	22	0:13	12

Table B.1

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Travel Time Calculations

	One-Airport System		**Two-Airport System**		**Two-Airport System**		**Three-Airport System**	
CITY/COUNTY	**Travel Time, hh:mm**	**Miles**	**Travel Time, hh:mm**	**Miles**	**Travel Time, hh:mm**	**Miles**	**Travel Time, hh:mm**	**Miles**
Newport News City	1:20	42	0:14	7	0:32	23	0:14	7
Norfolk City	1:04	55	0:28	26	0:23	21	0:08	4
Portsmouth City	1:22	43	0:36	31	0:21	11	0:25	18
Richmond City	1:12	59	0:15	10	0:15	10	0:15	10
Suffolk City	0:41	37	0:47	42	0:15	12	0:39	35
Virginia Beach City	1:21	73	0:54	46	0:33	19	0:30	20
Albemarle	2:33	141	1:36	91	1:36	91	1:36	91
Charlottesville	2:26	136	1:30	86	1:30	86	1:30	86
Dinwiddie	1:20	51	1:14	44	1:14	44	1:14	44
Colonial Heights	0:46	34	0:34	25	0:34	25	0:34	25
Petersburg	0:44	33	0:34	23	0:34	23	0:34	23
Greensville	1:26	52	1:16	66	1:15	68	1:16	66
Emporia	1:21	51	1:10	64	1:09	66	1:10	64
Halifax	2:42	139	2:13	119	2:13	119	2:13	119
South Boston	2:38	135	2:32	127	2:32	127	2:32	127
James City	1:37	72	0:29	21	0:54	44	0:29	21
Williamsburg	1:27	68	0:20	16	0:48	46	0:20	16
Prince George	0:49	27	0:50	26	0:50	26	0:50	26
Hopewell	0:51	37	0:26	16	0:26	16	0:26	16
Southampton	1:13	35	1:21	75	0:51	43	1:13	68
Franklin	0:40	38	0:59	54	0:35	31	0:57	54
Spotsylvania	2:17	113	1:22	63	1:22	63	1:22	63
Fredericksburg	2:04	115	1:08	65	1:08	65	1:08	65
York	1:22	61	0:13	10	0:43	41	0:13	10
Poquoson	1:34	49	0:15	11	0:36	32	0:15	11
NORTH CAROLINA								
Beaufort	3:25	156	3:33	165	2:52	135	3:25	157
Bertie	1:56	92	2:03	101	1:21	70	1:54	93
Camden	1:34	81	1:24	68	0:37	28	0:59	48
Chowan	1:46	87	1:56	92	1:14	62	1:56	86
Currituck	1:43	91	1:28	76	0:42	30	1:04	50
Dare	2:44	158	2:29	143	1:43	98	2:05	118
Gates	1:36	59	1:46	64	1:04	34	1:38	57
Halifax	2:10	85	1:59	98	1:59	98	1:59	98
Hertford	1:22	71	1:32	77	0:50	46	1:23	69
Hyde	3:01	146	3:00	155	2:22	117	2:40	137
Martin	2:21	115	2:29	123	1:48	93	2:21	116
Northampton	1:57	65	1:52	98	1:29	68	1:51	93
Pasquotank	1:42	87	1:33	74	0:46	37	1:13	57
Perquimans	1:38	80	1:35	86	0:57	48	1:16	69
Tyrrell	2:31	124	2:30	133	1:52	95	2:10	116
Washington	2:20	111	2:19	120	1:41	83	1:59	103
AVERAGE FOR EACH SYSTEM	1:46	86	1:16	63	1:08	57	1:11	59

Appendix C

Existing Airports Environmental Overviews

Data Not Available Digitally

Appendix D

Summary of Debt Service

Table D.1

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Debt Service With 20 Percent AIP Participation
One-Airport System
(1997 Dollars)

	Base Case Forecast				High Forecast
Alternative	**1996**	**2010**	**2020**	**2030**	**2030**
One-Airport					
Search Area 1					
Annual Enplanements	-	-	5,349,000	7,066,000	11,744,000
Total Cost	-	-	1,599,763,000	219,590,000	401,336,000
AIP Eligible	-	-	784,349,423	114,274,174	162,326,456
AIP Funded	-	-	319,952,600	43,918,000	80,267,200
PFC Eligible	-	-	1,089,497,032	164,585,911	261,931,866
Available PFC Funds	-	-	-	69,225,000	95,309,000
PFC Funded	-	-	-	69,225,000	95,309,000
GARB Funded	-	-	1,279,810,400	106,447,000	225,759,800
Annual Debt Service	-	-	147,006,910	12,227,158	25,932,162
Cumulative Debt Service	-	-	147,006,910	121,614,106	135,319,110
Richmond					
Annual Enplanements	1,080,661	2,038,000	-	-	-
Total Cost	-	474,196,000	-	65,000	65,000
AIP Eligible	-	185,452,336	-	30	30
AIP Funded	-	94,839,200	-	30	30
PFC Eligible	-	263,464,272	-	42	42
Available PFC Funds	-	33,320,000	35,385,000	-	-
PFC Funded	-	33,320,000		-	-
GARB Funded	-	346,036,800	-	64,970	64,970
Annual Debt Service	3,003,571	39,747,920	-	7,463	7,463
Cumulative Debt Service	3,003,571	41,639,310	29,518,427	20,013,860	20,013,860
Newport News/Williamsburg					
Annual Enplanements	171,262	432,000	-	-	-
Total Cost	-	99,558,000	-	-	-
AIP Eligible	-	37,302,553	-	-	-
AIP Funded	-	19,911,600	-	-	-
PFC Eligible	-	52,238,183	-	-	-
Available PFC Funds	-	6,445,000	6,474,000	-	-
PFC Funded	-	6,445,000	-	-	-
GARB Funded	-	73,201,400	-	-	-
Annual Debt Service	-	8,408,364	-	-	-
Cumulative Debt Service	-	8,408,364	5,764,588	4,289,395	4,289,395
Norfolk					
Annual Enplanements	1,389,664	2,596,000	-	-	-
Total Cost	-	279,209,000	-	76,700,000	76,700,000
AIP Eligible	-	49,482,174	-	64,515,635	64,515,635
AIP Funded	-	28,064,695	-	15,340,000	15,340,000
PFC Eligible	-	70,647,695	-	85,816,648	85,816,648
Available PFC Funds	-	42,583,000	19,453,000	-	-
PFC Funded	-	42,583,000	-	-	-
GARB Funded	-	208,561,305	-	61,360,000	61,360,000
Annual Debt Service	2,524,916	23,956,637	-	7,048,188	7,048,188
Cumulative Debt Service	2,524,916	23,956,637	17,825,988	20,312,397	20,312,397
Total Cumulative Debt Service	5,528,487	74,004,310	200,115,913	166,229,758	179,934,762

Sources: HNTB analysis.

Table D.2

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Debt Service With 20 Percent AIP Participation
Two-Airport System - RIC & PHF
(1997 Dollars)

	Base Case Forecast				High Forecast
Alternative	**1996**	**2010**	**2020**	**2030**	**2030**
Two-Airport RIC & PHF					
Search Area					
Annual Enplanements	-	-	-	-	-
Total Cost	-	-	-	-	-
AIP Eligible	-	-	-	-	-
AIP Funded	-	-	-	-	-
PFC Eligible	-	-	-	-	-
Available PFC Funds	-	-	-	-	-
PFC Funded	-	-	-	-	-
GARB Funded	-	-	-	-	-
Annual Debt Service	-	-	-	-	-
Cumulative Debt Service	-	-	-	-	-
Richmond					
Annual Enplanements	1,080,661	2,038,000	2,602,000	3,465,000	3,409,000
Total Cost	-	474,196,000	137,611,000	6,869,000	6,869,000
AIP Eligible	-	185,452,336	101,738,053	2,112,751	2,112,751
AIP Funded	-	94,839,200	27,522,200	-	-
PFC Eligible	-	263,464,272	135,650,756	2,816,980	2,816,980
Available PFC Funds	-	33,320,000	34,770,000	33,829,000	33,517,000
PFC Funded	-	33,320,000	34,770,000	2,816,980	2,816,980
GARB Funded	-	346,036,800	75,318,800	4,052,020	4,052,020
Annual Debt Service	3,003,571	39,747,920	8,651,582	465,440	465,440
Cumulative Debt Service	3,003,571	41,639,310	40,859,268	27,412,218	27,435,930
Newport News/Williamsburg					
Annual Enplanements	171,262	432,000	4,064,000	5,359,000	7,992,000
Total Cost	-	99,558,000	243,202,000	51,243,000	136,333,000
AIP Eligible	-	37,302,553	92,117,634	7,825,996	15,030,828
AIP Funded	-	19,911,600	48,640,400	-	-
PFC Eligible	-	52,238,183	143,348,105	11,827,037	45,130,644
Available PFC Funds	-	6,445,000	33,691,000	52,542,000	67,223,000
PFC Funded	-	6,445,000	33,691,000	11,827,037	45,130,644
GARB Funded	-	73,201,400	160,870,600	39,415,963	91,202,356
Annual Debt Service	-	8,408,364	18,478,589	4,527,560	10,476,065
Cumulative Debt Service	-	8,408,364	24,735,201	19,838,536	27,202,358
Norfolk					
Annual Enplanements	1,389,664	2,596,000	-	-	-
Total Cost	-	279,209,000	-	76,700,000	76,700,000
AIP Eligible	-	49,482,174	-	64,515,635	64,515,635
AIP Funded	-	28,064,695	-	15,340,000	15,340,000
PFC Eligible	-	70,647,695	-	85,816,648	85,816,648
Available PFC Funds	-	42,583,000	44,632,000	-	-
PFC Funded	-	42,583,000	-	-	-
GARB Funded	-	208,561,305	-	61,360,000	61,360,000
Annual Debt Service	2,524,916	23,956,637	-	7,048,188	7,048,188
Cumulative Debt Service	2,524,916	23,956,637	14,433,956	17,788,406	17,788,406
Total Cumulative Debt Service	5,528,487	74,004,310	80,028,425	65,039,160	72,426,694

Sources: HNTB analysis.

Table D.3

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Debt Service With 20 Percent AIP Participation
Two-Airport System - RIC & Search Area 2C
(1997 Dollars)

	Base Case Forecast				High Forecast
Alternative	**1996**	**2010**	**2020**	**2030**	**2030**
Two-Airport - RIC & Search Area 2C					
Search Area 2C					
Annual Enplanements	-	-	2,976,000	3,957,000	5,895,000
Total Cost	-	-	1,282,485,000	65,214,000	451,964,000
AIP Eligible	-	-	838,156,380	20,153,399	242,253,445
AIP Funded	-	-	256,497,000	20,153,399	90,392,800
PFC Eligible	-	-	1,140,080,714	32,089,008	380,419,323
Available PFC Funds	-	-	-	38,658,000	49,464,000
PFC Funded	-	-	-	18,504,601	49,464,000
GARB Funded	-	-	1,025,988,000	26,556,000	312,107,200
Annual Debt Service	-	-	117,851,305	3,050,386	35,850,557
Cumulative Debt Service	-	-	117,851,305	89,211,167	123,542,996
Richmond					
Annual Enplanements	1,080,661	2,038,000	3,276,000	4,321,000	4,244,000
Total Cost	-	474,196,000	137,611,000	7,849,000	7,849,000
AIP Eligible	-	185,452,336	101,738,053	2,112,751	2,112,751
AIP Funded	-	94,839,200	27,522,200	2,112,751	2,112,751
PFC Eligible	-	263,464,272	135,650,756	2,816,980	2,816,980
Available PFC Funds	-	33,320,000	39,821,000	42,360,000	41,931,000
PFC Funded	-	33,320,000	39,821,000	704,229	704,229
GARB Funded	-	346,036,800	70,267,800	5,032,020	5,032,020
Annual Debt Service	3,003,571	39,747,920	8,071,393	578,009	578,009
Cumulative Debt Service	3,003,571	41,639,310	40,279,079	25,425,504	25,458,108
Newport News/Williamsburg					
Annual Enplanements	171,262	432,000	-	-	-
Total Cost	-	99,558,000	-	-	-
AIP Eligible	-	37,302,553	-	-	-
AIP Funded	-	19,911,600	-	-	-
PFC Eligible	-	52,238,183	-	-	-
Available PFC Funds	-	6,445,000	6,474,000	-	-
PFC Funded	-	6,445,000	-	-	-
GARB Funded	-	73,201,400	-	-	-
Annual Debt Service	-	8,408,364	-	-	-
Cumulative Debt Service	-	8,408,364	5,764,588	4,289,395	4,289,395
Norfolk					
Annual Enplanements	1,389,664	2,596,000	-	-	-
Total Cost	-	279,209,000	-	76,700,000	76,700,000
AIP Eligible	-	49,482,174	-	64,515,635	64,515,635
AIP Funded	-	28,064,695	-	15,340,000	15,340,000
PFC Eligible	-	70,647,695	-	85,816,648	85,816,648
Available PFC Funds	-	42,583,000	19,453,000	-	-
PFC Funded	-	42,583,000	-	-	-
GARB Funded	-	208,561,305	-	61,360,000	61,360,000
Annual Debt Service	2,524,916	23,956,637	-	7,048,188	7,048,188
Cumulative Debt Service	2,524,916	23,956,637	17,825,988	20,312,397	20,312,397
Total Cumulative Debt Service	5,528,487	74,004,310	181,720,961	139,238,462	173,602,895

Sources: HNTB analysis.

Table D.4

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Summary of Debt Service With 20 Percent AIP Participation
Three Airport System
(1997 Dollars)

	Base Case Forecast				High Forecast
Alternative	**1996**	**2010**	**2020**	**2030**	**2030**
Three-Airport					
Search Area					
Annual Enplanements	-	-	-	-	-
Total Cost	-	-	-	-	-
AIP Eligible	-	-	-	-	-
AIP Funded	-	-	-	-	-
PFC Eligible	-	-	-	-	-
Available PFC Funds	-	-	-	-	-
PFC Funded	-	-	-	-	-
GARB Funded	-	-	-	-	-
Annual Debt Service	-	-	-	-	-
Cumulative Debt Service	-	-	-	-	-
Richmond					
Annual Enplanements	1,080,661	2,038,000	2,684,000	3,545,000	3,545,000
Total Cost	-	474,196,000	137,611,000	7,849,000	7,849,000
AIP Eligible	-	185,452,336	101,738,053	2,112,751	2,112,751
AIP Funded	-	94,839,200	27,522,200	2,112,751	2,112,751
PFC Eligible	-	263,464,272	135,650,756	2,816,980	2,816,980
Available PFC Funds	-	33,320,000	35,385,000	34,732,000	34,732,000
PFC Funded	-	33,320,000	35,385,000	704,229	704,229
GARB Funded	-	346,036,800	74,703,800	5,032,020	5,032,020
Annual Debt Service	3,003,571	39,747,920	8,580,939	578,009	578,009
Cumulative Debt Service	3,003,571	41,639,310	40,788,626	26,384,382	26,384,382
Newport News/Williamsburg					
Annual Enplanements	171,262	432,000	688,000	1,041,000	1,041,000
Total Cost	-	99,558,000	118,889,000	132,490,000	132,490,000
AIP Eligible	-	37,302,553	84,641,812	39,648,704	39,648,704
AIP Funded	-	19,911,600	23,777,800	39,648,704	39,648,704
PFC Eligible	-	52,238,183	114,387,006	52,864,939	52,864,939
Available PFC Funds	-	6,445,000	8,393,000	9,641,000	9,641,000
PFC Funded	-	6,445,000	8,393,000	9,641,000	9,641,000
GARB Funded	-	73,201,400	86,718,200	83,200,296	83,200,296
Annual Debt Service	-	8,408,364	9,960,987	9,556,899	9,556,899
Cumulative Debt Service	-	8,408,364	16,217,599	21,624,316	21,624,316
Norfolk					
Annual Enplanements	1,389,664	2,596,000	3,360,000	4,310,000	4,310,000
Total Cost	-	279,209,000	150,273,000	53,177,000	53,177,000
AIP Eligible	-	49,482,174	79,113,802	6,500,296	6,500,296
AIP Funded	-	28,064,695	30,054,600	6,500,296	6,500,296
PFC Eligible	-	70,647,695	101,597,571	963,405	963,405
Available PFC Funds	-	42,583,000	44,632,000	42,767,000	42,767,000
PFC Funded	-	42,583,000	44,632,000	-	-
GARB Funded	-	208,561,305	75,586,400	46,676,704	46,676,704
Annual Debt Service	2,524,916	23,956,637	8,682,320	5,361,574	5,361,574
Cumulative Debt Service	2,524,916	23,956,637	26,508,308	21,835,952	21,835,952
Total Cumulative Debt Service	5,528,487	74,004,310	83,514,533	69,844,650	69,844,650

Sources: HNTB analysis.

Appendix E

Search Area Maps

Data Not Available Digitally

Appendix F

GIS Data Compiled for

Potential Search Area

GIS Data Compiled for Potential Airport Search Areas

In Chapter 12, an immense amount of data was collected to develop a database for use in the Geographic Information System (GIS) to analyze the identified search region for potential areas for a new airport. The two-airport system search region is located in the Counties of Surry, Sussex, Isle of Wight, Southampton and Suffolk, centered on U.S. Route 460 and extending out 10 miles on each side of this road. This appendix contains all sources for the specialized shapefiles and analyses used during the project. The digital data files are available upon request. Below are the various data compiled for this analysis:

1) **Basemap**- contains base information that is aggregated as single coverage that encompass our entire study area. These data sets were originally at the county or sub-county level and then mosaiced together.

2) **Aggregated Land Use**- contains normalized land use of entire study area, existing and future. Data originates from comp plans and USGS lulc sources.

3) **Aggregated Wetlands**- contains National Wetland Inventory (NWI) wetlands of entire study area. The folder also contains a sliver of wetlands digitized by Virginia Geotechnical Services, a subconsultant. This VGS info is not error-checked and is in line format.

4) **Chesapeake Watershed**- contains the watershed boundary around Chesapeake bay and clipped to the study area. This was needed because some of the counties use this line as the resource management area boundary (part of Chesapeake Bay Preservation Act). This does not hold true for city of Suffolk County, however. They have a highly specialized boundary system.

5) **Historic Properties**- contains the historic property points within the study area. Data was aggregated from Virginia Dept. of Historic Resources by LAW Engineering.

6) **Travel Times**- contains the approximate drive time contours based on the study done by URS, a subconsultant. It was originally digitized based on an existing 8x11 color copy showing the contours.

7) **Search Grid**- the 1 square mile search grid used as the basis for 14 search grids. The attributes of the grid (the corresponding value based on the overlay of different themes, like wetlands, roads, etc.) were added to produce the thematic view used to create the 14 individual 5-mile search areas. No spatial analyst or grid extension was used in this analysis. In fact, i deleted the actual shapefile that contained the attribute of each theme.

8) **Wetland by USGS quad**- the NWI data by individual USGS quad name.

Appendix G

Summary of Environmental Factors Data

Environmental Consequences – Special Impact Categories (refer to corresponding section in 5050.4A , or subsequent revisions, for more information and direction to complete each category, including discussions of Thresholds of Significance).

(1) NOISE

1) Does the proposal require a noise analysis per Order 5050.4A? Explain. (Note: Noise sensitive land uses are defined in Table 1 of FAR Part 150). Yes _X__ No ____ **Runway location and runway extensions.**

2) If "yes," determine whether the proposed project is likely to have a significant impact on noise levels over noise sensitive areas within the DNL 65 dBA noise contour.

(2) COMPATIBLE LAND USE

(a) Would the proposed project result in other (besides noise) impacts exceeding thresholds of significance that have land use ramifications, such as disruption of communities, relocation of residences or businesses, or impact natural resource areas? Explain. **Trailer park on airport property would be removed.**

(b) Would the proposed project be located near or create a wildlife hazard as defined in FAA Advisory Circular 150/5200-33, "Wildlife Hazards on and Near Airports"? Explain. **In close proximity to open water and natural preserve areas.**

(3) SOCIAL IMPACTS

(a) Would the proposed project cause relocation of any homes or businesses? Yes_X_ No __ Explain. **Trailer park removal.**

(b) If "yes," describe the availability of adequate relocation facilities.

(c) Would the proposed project cause an alteration in surface traffic patterns, or cause a noticeable increase in surface traffic congestion? Explain.
Yes – roadways within the proposed airport property would be relocated.

(4) INDUCED SOCIOECONOMIC IMPACTS

Would the proposed project cause induced, or secondary, socioeconomic impacts to surrounding communities, such as change business and economic activity in a community; impact public service demands; induce shifts in population movement and growth, etc.? Yes____ No ___ Explain

(5) AIR QUALITY

(a) Does the proposed project have the potential to increase airside or landside capacity, including an increase in capacity to handle surface vehicles?

Yes, the expansion of the existing airport will involve substantial works of construction that at a minimum will include construction of a new runway and extension of an existing runway, with associated taxiways and aprons; and the construction of a new terminal building.

(b) Identify whether the project area is in a non-attainment or maintenance area for any of the six (6) criteria air pollutants having National Ambient Air Quality Standards (NAAQS) established under the Clean Air Act Amendments (CAAA), and identify which pollutant(s) apply. If the proposed project is in an attainment area, no further air quality analysis is needed; skip to item (6). See the EPA Green Book at www.epa.gov/oar/oaqps/greenbk for current attainment areas.

According Mr. Thomas R. Ballou, of Air Data Analysis with the Virginia Department of Environmental Quality (DEQ), the project area is situated in the Hampton Roads ozone standard maintenance area. The applicable pollutants are volatile organic compounds (VOCs) and oxides of nitrogen (NOx).

(c) Is an air quality analysis needed with regard to indirect source review requirements or levels of aircraft activity (See Order 5050.4A and the 1997 FAA Handbook "Air Quality Procedures for Civilian Airports and Air Force Bases"). Explain. If "yes," comply with state requirements.

According Mr. Thomas R. Ballou of DEQ, the project area would be subject to the general conformity requirements of Section 176 (c) of the Clean Air Act Amendments of 1990. These requirements would involve quantification of air pollutant emissions increase using the FAA's Emissions and Dispersion Modeling System (EDMS) or other acceptable methodology. These estimates can then be compared to the applicable general conformity de minimis levels, which, according to DEQ are 100 tons a year for VOCs and NOx.

If the predicted increases in these two pollutants are below 100 tons per year, then the project can be considered to conform to the applicable State Implementation Plan (SIP) and no further action would be required.

If the predicted increased emissions of either of these pollutants is above 100 tons per year, a formal conformity analysis of the project would be required. This analysis would have to demonstrate that the project conforms to the applicable SIP and would not contribute to any new violations of the ozone standard. DEQ suggests that if predicted increases are above the 100 tons per year de minimis threshold, then consultation between the airport sponsor and DEQ should be entered into before any analysis is performed.

The correspondence from DEQ is contained in Appendix A.

(d)(1) Would the proposed action be an "exempted action," as defined in 40 C.F.R Part 51.853(c)(2) of the General Conformity Rule? If exempt, skip to item (6). List exemption claimed.

The proposed action would not be an exempted action as defined.

(d)(2) Would the increase in the emission level of the regulated air pollutants for which the project area is in non-attainment or maintenance exceed the de minimis standards? Yes _____ No____

This has yet to be determined and will be based on predicting the increase in levels of VOCs and NOx to be generated by the project.

(d)(3) If "no," would the proposed project cause a violation of any NAAQS, delay the attainment of any NAAQS, or worsen any existing NAAQS violation? Explain.

Not applicable.

(d)(4) Would the proposed project conform to the State Implementation Plan (SIP) approved by the state air quality resource agency? Explain, and provide supporting documentation.

If the predicted increase of VOCs and NOx emissions does not exceed 100 tons per year, then the project will be in conformance with the applicable SIP. Correspondence from DEQ with this information is contained in Appendix A.

6) WATER QUALITY

Describe the potential of the proposed project to impact water quality, including ground water, surface water bodies, any public water supply systems, etc. Provide documentation of consultation with agencies having jurisdiction over such water bodies, as applicable.

H&A:
The existing airport is currently served by public water supply and wastewater disposal systems. No adverse effects to the groundwater, surface water bodies, or public water supply system are anticipated.

VGS:
The proposed airport *expansion* could reasonably be expected to impact water quality including groundwater and surface water. Public water supplies may be affected.

Normal airport operations such as de-icing, fuel storage, and non-point source pollution associated with intensive land use can be expected to impact groundwater and surface water. Under environmental regulations in effect as of October 1999, we anticipate that a Virginia Pollution Discharge Elimination System (VPDES) permit will be required for storm water discharges from the airport. Additional plans such as Storm Water Pollution Prevention Plans will probably be required. Periodic monitoring of storm water discharges should be anticipated. Specific regulations for fuel storage also focus on the maintenance of groundwater and surface water quality. Above ground storage of petroleum in the quantities that we anticipate will be required to service the airport will require leak detection systems designed to detect leakage to groundwater. Separate VPDES permits will probably be necessary for fuel storage containment areas. In addition, oil discharge contingency plans and/or Spill Prevention, Control, and Countermeasure Plans will be necessary.

The regulatory programs discussed are designed to prevent and detect releases of contaminants to groundwater and surface water. Conversion of large rural tracts to intensive land use such as airport, roadway, fuel storage, commercial, maintenance, and other uses will degrade water quality in most cases. The Chesapeake Bay Preservation Act (CBA) is designed to mitigate these impacts. The facility will be required to comply with CBA requirements for siting and construction related activities. De-icing is particularly problematic since de-icing chemicals are usually applied at gates or apron

areas and over-spray is not contained for treatment or disposal. Current fuel storage standards emphasize containment and early detection of releases. This may reduce the impact of fuel storage activities on water quality at the proposed airport. Historically, fuel storage activities have had significant impacts on water quality at airports.

We anticipate potential impact to public drinking water systems. Two reservoirs are located near the airport; the Harwood Mills Reservoir and the Beverdam Reservoir, owned by Newport News Water Works. Potable groundwater sources large enough for public water supplies occur at depth below several confining layers and are believed to recharge at areas distant from the proposed site. Site activities are not expected to impact these aquifers.

(7) DEPARTMENT OF TRANSPORTATION SECTION 303/4(f)

Does the proposed project require the use of any publicly owned land from a public park, recreation area, or wildlife or waterfowl refuge of national, state, or local significance, or land of an historic site of national, state, or local significance? Provide justification for your response. Include concurrence of appropriate officials having jurisdiction over such land regarding the use determination.

The Newport News/Williamsburg International Airport and the area designated for expansion in the Airport Layout Plan (Search Area), lie in a well-developed part of Newport News. Portions of the Search Area lie in the County of York which is less developed.

Information on DOT Section 303/4(f) lands within the Search Area has been requested from local, state and federal officials, namely the City of Newport News, the Virginia Department of Conservation and Recreation (DCR), the Virginia Department of Historic Resources (DHR), and the US Fish and Wildlife Service (FWS). Copies of the letters to these entities and their responses are included in Appendix B. To date no response has been received from DHR.

The FWS provided information on endangered/threatened species for York County and the City of Newport News and suggested requesting information from other sources including DCR, and the Virginia Departments of Game and Inland Fisheries (GIF) and Agriculture and Consumer Services (ACS). The latter two departments have been consulted, and copies of the correspondence and the responses are contained in Appendix B.

ACS responded with information on listed endangered plant or insect species in the Search Area. This information is contained in Section 10 below.

GIF responded with information on threatened or endangered fish and wildlife species in the vicinity of the Search Area. This information is contained in Section 10 below.

There are believed to be no National Wildlife Refuges, State Parks, Wildlife Management Areas, State Natural Preserves or Nature Conservancy Preserves within the Search Area, according to DCR. However, according to DCR there is a dedicated Natural Area known as the Kentucky Farms Natural Area located in the Search Area. DCR states that "*this area should be avoided to the greatest extent practicable during the expansion*".

DCR also states that the Search Area contains habitat associated with a complex of coastal plain sink holes and wetlands known as Grafton Ponds. Reportedly due to it's high biodiversity significance, a portion of this complex has been designated as the Grafton Ponds Nature Preserve System which lies approximately 1½ miles north of the Search Area. The Grafton Ponds Natural Area Preserve is owned by the City of Newport News and is protected by the Natural Area Preserves Act and Open Space legislation which, according to DCR, provides strong restrictions against conversion of these natural lands to other uses.

DCR state that "*while the expansion will impact several vernal ponds in the Grafton Ponds complex, this alternative seems more acceptable than building a new airport in Southeastern Virginia*". DCR have reportedly been working with Newport News/Williamsburg International Airport on mitigation alternatives and state that *they "support their current plan to mitigate through preservation of land within the Grafton Ponds complex*".

The airport lies adjacent in part to Newport News Park and Harwoods Mill Reservoir. This area is a public recreation area, and therefore a DOT Section 303/4 (f) land.

Mr. Michael D. Poplawski, Administrator of Parks for the City of Newport News provided information on recreational facilities within the park owned and operated by the City. Correspondence from Mr. Poplawski is contained in Appendix B. He identified Harwoods Mill Fishing Station, Picnic Area, and Mountain Bike Trail as being *"very significant recreational features within the Newport News Park and Watershed Property and account for considerable park visitation*". These areas are situated in close proximity west of the airport expansion area as shown on the annotated map contained in Mr. Poplawski's correspondence.

There are believed to be no historic sites listed with DHR within the Search Area, however there are believed to be eight historic sites in the vicinity of the Search Area (within 2-3 miles).

Further information on these sites is detailed in Section (8) below and information on their significance is anticipated from DHR.

In conclusion, there are believed to be DOT Section 303/4 (f) lands within the Search Area that may be affected by the proposed project.

(8) HISTORIC, ARCHITECTURAL, ARCHEOLOGICAL, AND CULTURAL RESOURCES

(a) Describe any impact the proposed project might have on any properties in or eligible for inclusion in the National Register of Historic Places. Provide justification for your response, and include a record of your consultation with the State Historic Preservation Officer (SHPO), if applicable (attach correspondence with SHPO).

Information on the existence of any properties in or eligible for inclusion in the National Register of Historic Places has been requested from the State Historic

Preservation Officer at the Virginia Department of Historic Resources (DHR). A copy of the correspondence is contained in Appendix C. To date no reply has been received.

Previous informal requests for information from DHR have yielded the following information.

DHR staff believe that there are no historic sites listed with DHR within the Search Area, however there are believed to be eight historic sites in the vicinity of the Search Area.

The eight historic sites, listed with DHR include (with latitude/longitude):

- Virginia Farm Group (poor farm), located near Harwoods Mill in York County (37 08.414/76 27.335);
- Grafton Christian Church, located north of the town of Grafton (37 10.227/76 28.528);
- Wainwright Store, located in Grafton (37 09.873/76 28.112);
- A.R. Carter House, located in Grafton (37 09.916/76 28.016);
- Ernest E. Armory House, located in Grafton (37 09.929/76 28.111);
- Young's Mill, located by Mills Creek in Newport News (37 06.348/76 30.874);
- Oyster Point Railroad Station, located at Oyster Point in Newport News (37 06.359/76 30.244); and
- Providence Mennonite Church, located by Deep Creek in Newport News (37 06.448/76 31.004).

The information previously received from the DHR indicates that the Virginia Farm Group, Christian Church and Young's Mill sites have not been evaluated for eligibility for inclusion on the national or state registers. The Wainwright store was reportedly found eligible for inclusion in 1994. The A.R. Carter and Ernest E. Armory Houses were reportedly found to be ineligible for inclusion in 1996. The Oyster Point Railroad Station is believed to be destroyed, and Providence Mennonite Church was found to be ineligible in 1997.

The Virginia Farm Group site lies east of Harwoods Mill Reservoir, approximately 1.3 miles east of the airport site with the reservoir lying in-between.

Similarly the Grafton Christian Church site lies on the eastern side of the reservoir.

Young's Mill lies over one mile southeast of the airport with development including an Interstate in-between.

The Wainwright Store, known to be eligible for inclusion to the historic register lies in the town of Grafton, approximately two miles northeast of the airport with the Harwoods mill reservoir in-between.

Further information, including an actual determination on all these sites, their significance and possible impact from the project is anticipated from DHR.

(b) Describe whether there is reason to believe that significant scientific, prehistoric, historic, archeological, or paleontological resources would be lost or destroyed as a result of the proposed project. Include a record of consultation with persons or organizations with relevant expertise, including the SHPO, if applicable.

This information has been requested from the Virginia Department of Historic Resources and a copy of the correspondence is contained in Appendix C.

(9) BIOTIC COMMUNITIES

Describe the potential of the proposed project to directly or indirectly impact plant communities and/or the displacement of wildlife. This answer should also reference Section 6, Water Quality, if jurisdictional water bodies are present.

Information on biotic communities was requested from the Virginia Department of Conservation and Recreation (DCR), US Fish and Wildlife Service (FWS), Virginia Department of Game and Inland Fisheries (GIF), and the Virginia Department of Agriculture and Consumer Services (ACS). Copies of the correspondence are included in Appendix D. The responses are contained in Appendix D and the following narrative is based on the responses received.

The Newport News/Williamsburg International Airport and the area possibly designated for expansion in the Airport Layout Plan (Search Area), lie in a well-developed part of Newport News. Portions of the Search Area lie in the County of York which is less developed.

The main wildlife areas lie in the York County part of the Search Area and include Newport News Park and Harwoods Mill Reservoir. Due to the rural nature of this part of the area, there are likely to be extensive plant and wildlife communities within the project boundary, in addition to the endangered and threatened species, discussed in Section (10) below. Some displacement of such wildlife by the expansion project would not be unlikely.

ACS responded with information on listed endangered plant or insect species in the Search Area. This information is contained in Section 10 below.

GIF responded with information on threatened or endangered fish and wildlife species in the vicinity of the Search Area. This information is contained in Section 10 below.

The FWS has provided information on endangered and threatened species in York County and City of Newport News.

DCR has stated that the Search Area contains habitat associated with a complex of coastal plain sinkhole ponds and wetlands known as Grafton Ponds. According to DCR, the pond system of this natural region is the *"best remaining example of a coastal plain sinkhole pond complex in Virginia*". Since fish cannot survive in these seasonal ponds, the ponds provide predator-free breeding

habitat for many amphibians. Due to it's high biodiversity significance, a portion of the complex, approximately 1½ miles north of the Search Area, has been dedicated as the Grafton Ponds Natural Area Preserve.

DCR monitors the complex and calls it "an exemplary natural community".

Additionally, an area designated by DCR as the Kentucky Farms Natural Area was reportedly identified during DCR's inventory of the Lower Peninsula and is located within the Search Area. This area reportedly contains a number of small coastal plain sinkhole ponds and supports a "*significant natural community*". DCR state *that "this area should be avoided to the greatest extent practicable during the expansion*."

DCR state that "*the cumulative impacts from a new facility would cause greater damage to the environment than expanding the existing facility*", and that the expansion of the Newport News/Williamsburg International Airport *"seems more acceptable than building a new airport in Southeastern Virginia*".

DCR staff have reportedly been working with Newport News/Williamsburg International Airport on mitigation alternatives and "*support their current plan to mitigate through preservation of land within the Grafton Ponds complex*".

In conclusion, there are documented biotic communities that would be likely to be affected by the proposed project.

(10) FEDERAL and STATE-LISTED ENDANGERED AND THREATENED SPECIES

Would the proposed project impact any federally- or state-listed or proposed endangered or threatened species of flora and fauna, or impact critical habitat? Explain, and discuss and attach records of consultation efforts with jurisdictional agencies, if applicable.

Information on the existence of federally- or state- listed or proposed endangered or threatened species of flora and fauna, or impact critical habitat, was requested from the US Fish and Wildlife Service (FWS) and the Virginia Department of Conservation and Recreation (DCR). Copies of correspondence to these entities and responses are included in Appendix D.

The FWS responded with information on the endangered and threatened species that are documented or may occur in York County and City of Newport News, and made recommendation to approach DCR and the Virginia Departments of Game and Inland Fisheries (GIF) and Agriculture and Consumer Services (ACS). GIF and ACS have been approached and copies of the correspondence and the responses are contained in Appendix D.

The FWS species listed for York County included the federally threatened bald eagle and small whorled pogonia, and federal species of concern: tidewater interstitial amphipod; large-leaf peatmoss; Harper's fimbristylis; New Jersey rush; pondspice; sweet pine sap; and Virginia least trillium.

The FWS species listed for the City of Newport News included the federally threatened bald eagle.

ACS responded with information relating to listed threatened or endangered plant or insect species in the Search Area. They stated that *Fimbristylis perpusilla*, a state endangered plant occurs in the Poquoson West USGS topographic quadrangle area, but is not documented in the Search Area. They also state that "*the absence of data does not necessarily mean that no listed species occur in the area, but that our files do not currently contain information to document their presence".*

GIF responded with information on the threatened or endangered fish and wildlife species in the vicinity of the Search Area. They state that the anadromous fish species, alewife (*Alosa pseudoharengus*) and striped *bass (Morone saxatilis*), have been documented in the project area. They further state that *"the applicant should coordinate with this Department to evaluate specific impacts on this species*".

DCR responded with information on endangered and threatened species specific to the Search Area. DCR states that there is the potential for rare species to occur at the project site, including the state threatened Mabee's salamander and barking treefrog; the state endangered Harper's fimbristylis (*Fimbristylis perpusilla)* and canebrake rattlesnake; and the state listed species of special concern, pondspice.

Additionally, DCR lists state rare species that have been documented at the nearby Grafton Ponds complex and that may also occur in the Search Area. These are the state ranked extremely rare pine barren reedgrass and duckweed firetail; and the state ranked very rare featherfoil, Cuthbert turtlehead, slender marsh rose-pink, and large-leaf peatmoss.

DCR has stated that the Search Area contains habitat associated with a complex of coastal plain sinkhole ponds and wetlands known as Grafton Ponds. According to DCR, the pond system of this natural region is the *"best remaining example of a coastal plain sinkhole pond complex in Virginia*". Since fish cannot survive in these seasonal ponds, the ponds provide predator-free breeding habitat for many amphibians. Due to it's high biodiversity significance, a portion of the complex, approximately 1½ miles north of the Search Area, has been dedicated as the Grafton Ponds Natural Area Preserve. DCR calls it "an exemplary natural community".

Additionally, the Kentucky Farms Natural is located within the Search Area. This area reportedly contains a number of small coastal plain sinkhole ponds and supports a "*significant natural community*". DCR state *that "this area should be avoided to the greatest extent practicable during the expansion*."

Mr. Michael D. Poplawski, Administrator of Parks for the City of Newport News, has indicated that the Newport News Park, located adjacent and east of the airport, "*contains one of the City's last remaining canebrake rattlesnake breeding sites-and has been utilized as a release site for relocated canebrake specimens for a number of years*". The release site is located between an existing runway

at the airport and the proposed parallel runway, southeast of Kentucky Farms. A copy of the correspondence from Mr. Poplawski is contained in Appendix D.

In conclusion, there is documented potential for rare species, including federal and state threatened, state endangered and federal and state species of concern to occur in the Search Area and there is documented critical habitat within the Search Area. However, mitigation methods undertaken with consultation and approval from the applicable agencies may successfully reduce impact to these communities.

(11) WETLANDS

Does the proposed project involve the modification of delineated wetlands (wetlands must be delineated using methods in the US Army Corps of Engineers (ACE) 1987 Wetland Delineation Manual; delineations must be performed by a person certified in wetlands delineation). Provide justification for your response.

The 1986 National Wetland Inventory maps for PHF were reviewed. According to this information, the PHF site includes approximately 10% wetlands. A copy of the National Wetlands Inventory map with the airport RPZ boundary was also provided.

(12) FLOODPLAINS

(a) Would the proposed project be located in, or would it encroach upon, any 100-year floodplains, as designated by the Federal Emergency Management Agency (FEMA)? Yes__X___ No____

Based on the proximity of the RPZ to the Harwoods Mill Reservoir, it is estimated that approximately 10% of the PHF area contains 100-year floodplain. This floodplain area appears to be constrained to the reservoir area. A copy of the Flood Insurance Rate Map for York County, VA was also provided.

(b) Would the proposed project be located in a 500-year floodplain, as designated by FEMA? Yes_____ No__X___

The PHF site does not appear to be located within any 500-year floodplains.

(c) If “yes,” is the proposed project considered a "critical action", as defined in the Water Resources Council Floodplain Management Guidelines? (see FR Vol. 43, No. 29, 2/10/78) Yes____ No_X__

The PHF site does not appear to be located within any 500-year floodplains.

(d) You must attach the corresponding FEMA Flood Insurance Rate Map (FIRM) or other documentation showing the project area. Map attached? Yes__X___ No_____ If “no,” why not?

(e) If the proposed project would cause an encroachment of a base floodplain (the base floodplain is the 100-year floodplain for non-critical actions and the 500-year

floodplain for critical actions), what measures would be taken to provide an opportunity for early public review, in accordance with Order 5050.4A Par. 47 (g)(6)?

These measures will need to be evaluated by the Virginia Department of Aviation if this site is selected for development.

(13) COASTAL ZONE MANAGEMENT PROGRAM

(a) Would the proposed project occur in, or affect, a coastal zone, as defined by a state's Coastal Zone Management Plan (CZMP)? Explain

According to the Coastal Resources Management of the Virginia Department of Environmental Quality (DEQ), any county or locality that is in contact with a coastal body of water must comply with the Coastal Zone Management Plan. The DEQ indicated that York, Isle of Wight, and Suffolk counties would be governed by the plan. Southampton County is not governed by the plan. This means that the PHF site is affected by the state's CZMP.

(b) If "yes," is the project consistent with the State's CZMP? Explain. If applicable, attach the sponsor's consistency certification and the state's concurrence of that certification. Early coordination is recommended.

The CZM program requires compliance with several state programs and laws. These include the Fisheries management program, Subaqueous Lands Management program, Wetlands Management program, Dunes Management (Coastal Primary Sand Dune Protection Act), Non-Point Source Pollution Control (Virginia Erosion and Sediment Control Law), point Source Pollution Control program, Shoreline Sanitation program and the Air Pollution Control program (Clean Air Act). The PHF site would require consistency certifications from each program.

(14) COASTAL BARRIERS

Is the location of the proposed project within the Coastal Barrier Resources System, as delineated by the US Fish and Wildlife Service (FWS) or FEMA coastal barrier maps? Explain.

The Coastal Barrier Resources System (CBRS) information on the FEMA internet site was reviewed. As such, this site was not listed as being part of the CBRS.

(15) WILD AND SCENIC RIVERS

Would the proposed project affect any portion of the free-flowing characteristics of a Wild and Scenic River or a Study River, or any adjacent areas that are part of such rivers, listed on the Wild and Scenic Rivers Inventory? Consult the (regional) National Parks Service (NPS), U.S. Forest Service (FS), or other appropriate federal authority for information. Early consultation is recommended.

The Wild and Scenic Rivers Act (P.L. 90-542, as amended) was reviewed on the U.S. National Park Service internet site. According to the list of wild and scenic rivers, and study rivers listed in the Act, the PHF site is not located in proximity to any such rivers.

(16) FARMLAND

(a) Would the proposed project involve the use of federal financial assistance or conversion of federal government land? Explain

Yes, it is believed that the expansion of the existing Newport News/Williamsburg International airport will involve the use of federal financial assistance.

(b) If "yes" would it convert farmland protected by the Farmland Protection Policy Act (FPPA) (prime or unique farmland) to non-agricultural uses? Yes _X_ No___

(c) If "yes," determine the extent of project-related farmland impacts by completing (and submitting to the Natural Resources Conservation Service) the "Farmland Conversion Impact Rating Form" (NRCS Form AD 1006). Coordinate with the state or local agricultural authorities. Explain your response, and attach the Form AD 1006, if applicable.

USDA Farmland Conversion Impact Rating Form AD-1006 (10-83) has been completed and submitted to the USDA Natural Resource Conservation Service (NRCS) Quinton Office. Copies of the correspondence to the USDA, Form AD-1006 and the response are contained in Appendix E.

Mr. Kilby D. Majette of the USDA NRCS Quinton, Virginia Office responded by completing Parts II, III, IV and V of USDA Form AD-1006 including the Land Evaluation Criteria Relative Value. His input indicates that the project area contains 55,300 acres of farmland as defined in the Farmland Protection Policy Act, 57.9 acres of prime and unique farmland, and no statewide or local important farmland. The Land Evaluation Criteria Relative Value of Farmland to be Converted figure he provides is 79 out of 100 points.

Mr. Majette stated that "*there are no prime farmlands for this project in the City of Newport News*".

Mr, Majette also provided information on soil types, land capability classifications, hydric soils, engineering index properties, physical properties of soils, soil water features, and building site development for the project areas.

Part VI of the USDA Form AD-1006 requires completion by the FAA in accordance with 7 CFR Part 658. This Part forms the Site Assessment Criteria to be completed if a local site assessment is not performed. These criteria are used to assess the suitability of each proposed site or design alternative for protection of farmland, by examining the site, the surrounding area, and the programs and policies of the State or local unit of government in which the site is located.

Mr. Majette stated that there are no existing or proposed State or unit of local government policies or programs to protect farmland to the best of NRCS's knowledge. He recommended contacting the local Commissioner of the Revenue to obtain further information. A request for this information has therefore been made to the respective Commissioners of the Revenue for the City of Newport News and York County.

Once generated, the Total Site Assessment value (or the figure resulting from a local site assessment) is added to the Land Evaluation Criteria provided by NRCS and a combined score is generated. This is used to identify the effect of the project on farmland, and to aid a determination as to the suitability of the site for protection of farmland.

(17) ENERGY SUPPLY AND NATURAL RESOURCES

What effect would the proposed project have on energy or other natural resource consumption? Would demand exceed supply? Explain. Letters from local public utilities and suppliers regarding their abilities to provide energy and resources needed for large projects may be necessary.

Electrical energy usage at this existing facility will increase essentially proportionally with the square footage increase of existing facilities. Virginia Power, the serving electric utility should not have any significant problems meeting this increased demand.

(18) LIGHT EMISSIONS

Would the proposed project have the potential for airport-related lighting impacts on nearby residents? Explain, and, if necessary, provide a map depicting the location of residences in the airport vicinity in relation to the proposed lighting system.

All lighting improvements/modifications are anticipated to lie within airport property.

(19) SOLID WASTE

Would the proposed project generate solid waste? Yes__X___ No_____

If "yes," are local disposal facilities capable of handling the additional volumes of waste resulting from the project? Explain.

NOTE: A sanitary landfill is incompatible with airport operations if the landfill is located within 10,000 feet of a runway serving turbo-powered aircraft, or 5,000 feet of a runway serving piston-powered aircraft. Refer to FAA Advisory Circular 150/5200.33 " Hazardous Wildlife Attractants on or Near Airports," and FAA Order 5200.5B, "Guidance Concerning Sanitary Landfills on or Near Airports."

(20) CONSTRUCTION IMPACTS

Would construction of the proposed project: 1) increase ambient noise levels due to equipment operation; 2) degrade local air quality due to dust, equipment exhausts and burning debris; 3) deteriorate water quality when erosion and pollutant runoff occur; 4) or disrupt off-site and local traffic patterns? Explain.

(21) OTHER CONSIDERATIONS

(a) Is the proposed project likely to be highly controversial on environmental grounds? Explain.

(b) Is the proposed project likely to be inconsistent with any federal, state or local law or administrative determination relating to the environment? Explain.

(b) Is the proposed project reasonably consistent with plans, goals, policies, or controls that have been adopted for the area in which the airport is located? Explain

(22) HAZARDOUS SITES/MATERIALS

Would the proposed project require the use of land that may contain hazardous substances or may be contaminated? Explain your response and describe how such land was evaluated for hazardous substance contamination. Early consultation with appropriate expertise agencies (e.g., US Environmental Protection Agency (EPA), EPA-certified state and local governments) is recommended.

The Newport News/Williamsburg International Airport lies in a developed part of the City of Newport News. Portions of the airport also lie in York County, in a less developed area. A request for information has been made to the US EPA (USEPA) and Virginia Department of Environmental Quality (DEQ) regarding the occurrence of hazardous waste sites and contaminated lands in the vicinity of the airport and the area included in the airport layout plan. Copies of the correspondence are included in Appendix F.

To date responses have been received from the USEPA Waste and Chemicals Management Division and USEPA PRP Investigation and Site Information Section and are contained in Appendix F. Responses from other USEPA divisions may be forthcoming.

The response from the USEPA Waste and Chemicals Management Division provided information on registered Resource Conservation and Recovery Act (RCRA) handlers and compliance reports for the various zip codes that lie in the Search Area.

Based on the information provided, there appears to be one registered RCRA large quantity generator of hazardous waste which may be located within the Search Area. This is Siemens Automotive located at 615 Bland Boulevard. A portion of Bland Boulevard lies within the Search Area. A large quantity generator is one that generates more 1000 kg of hazardous waste per month. This facility also has a compliance report for three violations which were identified on July 9, 1993 during a compliance evaluation by the state. The violations included: no home telephone number posted for the emergency coordinators; a lack of hazardous waste labeling; and no date on drums. The enforcement type was listed as written informal and no financial penalty was assessed for any of the violations. The compliance date was reported as July 14, 1993 for the first violation and July 29, 1993 for the latter two.

Two registered RQRA small quantity generators exist within the Search Area. A small quantity generator is one that generates between 100 and 1000 kg of hazardous waste per month. These sites are Flight International and Henson Aviation, Inc. both located at the airport.

One limited quantity generator is reported within the Search Area. This is North Shore Maintenance Facility, located at 2401A Avenue G. A limited quantity generator is one that generates less than 100 kg of hazardous waste per month.

A number of small quantity generators and limited quantity generators are also reported in the vicinity of the airport, generally to the northwest and west of the Search Area in the City of Newport News. They include: New Horizons Technical Center located at 13400 Woodside Lane; Riverside Clinical Laboratory located at 1300 Old Denbigh Boulevard; Patrick Henry Hospital located at Denbigh Boulevard; Newport Marine Inc., SGS Control Services, and Carter Machinery Company located on McManus Boulevard; and Pomoco Chrysler Plymouth/Lincoln Mercury of Newport News, Racetrac gas station, a 7-eleven store and a Sam's Club store all located on Jefferson Avenue.

No compliance reports are listed for the Search Area with the exception of the Siemens Automotive facility discussed above.

The response from the USEPA PRP Investigation and Site Information Section provided information on the location of sites listed on the Comprehensive Environmental Response, Compensation and Liability System (CERCLIS) for the State of Virginia. The CERCLIS list includes known or potential hazardous waste sites that are either proposed for inclusion or on the National Priorities List (Superfund) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

The USEPA states that the CERCLIS System contains only those potential hazardous waste sites that have been brought to the attention of the EPA prior to the last update and that it does not contain all potential hazardous waste sites that exist.

Newport News/Williamsburg International Airport is listed as a CERCLIS site and appears to have been listed since at least 1983. No information on the nature of the hazardous waste is provided. Further information could be obtained by conducting a Freedom of Information Act review of the USEPA files on the site.

There are no other CERCLIS sites listed within one mile of the Search Area.

Information on current and historic hazardous waste sites is also available on the USEPA Internet sites.

The USEPA CERCLIS database located on the Internet at http://www.epa.gov/superfund/sites/cursites/toc/index.htm, was reviewed and revealed that there are three CERCLIS sites in the database for the City of Newport News and three for York County. One is listed at the airport and the remainder are over one mile from the Search Area. The CERCLIS site at the airport is reportedly not on the National Priorities List and has the EPA ID Number VAD980830483. This corresponds with the EPA ID Number received from the USEPA Investigation and Site Information Section.

The USEPA Archive No Further Remedial Action Planned (NFRAP) database located on the Internet at http://www.epa.gov/superfund/sites/arcsites/arcstate.htm,

contains information on sites which have been removed and archived from the inventory of Superfund sites. Archive status indicates that to the best of the EPA's knowledge, Superfund has completed its assessment of a site and has determined that no further steps will be taken to list that site on the National Priorities List. A review of the NFRAP database revealed that there are six such sites for the City of Newport News, and six for York County. One, Kmart Corporation is approximately 2 miles west of the airport, and the remainder are not in the vicinity of the site. Confirmation on the Archive sites is anticipated from USEPA.

There are currently believed to be no DEQ permitted hazardous waste disposal sites in Virginia.

To date DEQ have not responded officially to the request for information, however they have stated that information on leaking Underground storage Tank (LUST) sites is available in the download library on their Internet website. LUST sites have the potential to contaminate the project area due to subsurface contaminant migration.

The DEQ website was accessed and revealed two listed LUST sites at the airport, five within ¼ mile of the airport and two within ½ mile of the airport.

The two LUST sites at the airport are listed for Flight International Aviation and based on the DEQ assigned Pollution Compliant numbers, the respective dates for the listings are 1993 and 1995. Both cases are listed as closed with DEQ on August 23, 1993 and September 15, 1994 respectively.

Four of the five listed LUST sites within ¼ mile of the airport are for a Miller Mart #40 facility, located at 12445 Jefferson Avenue, southwest of the airport. The listings are for 1990, 1991, 1992, and 1993 and the respective DEQ closure dates are December 13, 1999, August 23, 1994, august 23, 1994, and march 31, 1994. The other site is listed for Ace Rent A Car located at 12499 Jefferson Avenue also southwest of the airport. This case was listed in 1996 and closed on March 26, 1996.

The two LUST sites within ½ mile of the airport are a Bell Atlantic facility located at 12804 Jefferson Avenue, west of the airport and Exxon Service Station #2-4528 located at 12800 Jefferson Avenue, southwest of the airport. The Bell Atlantic facility was listed in 1992 and closed on July 6, 1994; and the Exxon site was listed in 1990 and closed on August 20, 1994.

(23) PERMITS

List all required permits for the proposed project. Indicate whether any difficulties are anticipated in obtaining the required permits.

Air

a. Clean Air Act construction and operating permit(s) for stationary sources at the site
b. Building permits (also for installation of underground storage tanks)

Water

c. Virginia Pollutant Discharge Elimination System permit during and after construction – for stormwater runoff
d. Groundwater Management Area Withdrawal Permit – for groundwater withdrawal (if over 300,000 gallons/month)
e. Sewage Disposal Permits – for construction, operation, expansion, modification of sewer system
f. Private well permit – required if project involves the construction, alteration, rehabilitation, abandonment or extension of a private well
g. Permit for construction in waters of the commonwealth and wetlands – plans to fill in, build in, on or in any way disturb any waterway or wetland area

Waste

h. A hazardous waste permit - for the treatment, storage and/or disposal of hazardous waste
i. Solid Waste Transfer Station Permit – for the temporary storage and/or collection of solid waste

NOTE: Even though the airport sponsor has/shall obtain one or more permits from the appropriate federal, state, and/or local agencies for the proposed project, initiation of such project shall NOT be approved until FAA has issued its environmental determination.

(24) ENVIRONMENTAL JUSTICE

Would the proposed project impact minority and/or low-income populations? Consider human health, social, economic, and environmental issues in your evaluation. Explain.

(25) CUMULATIVE IMPACTS

When considered together with other past, present, and reasonably foreseeable future development projects on or off the airport, federal or non-federal, would the proposed project produce a cumulative effect on any of the environmental impact categories above? You should consider projects that are connected, cumulative and similar (common timing and geography). Provide a list of such projects considered. For purposes of this Evaluation Form, generally use 3 years for past projects and 5 years for future foreseeable projects.

Environmental Consequences – Special Impact Categories (refer to corresponding section in 5050.4A, or subsequent revisions, for more information and direction to complete each category, including discussions of Thresholds of Significance).

(1) NOISE

1) Does the proposal require a noise analysis per Order 5050.4A? Explain. (Note: Noise sensitive land uses are defined in Table 1 of FAR Part 150). Yes _X_ No ____ Yes – construction of a new airport.

2) If "yes," determine whether the proposed project is likely to have a significant impact on noise levels over noise sensitive areas within the DNL 65 dBA noise contour.

(2) COMPATIBLE LAND USE

(a) Would the proposed project result in other (besides noise) impacts exceeding thresholds of significance that have land use ramifications, such as disruption of communities, relocation of residences or businesses, or impact natural resource areas? Explain. Yes - large area to be developed for airport related uses.

(b) Would the proposed project be located near or create a wildlife hazard as defined in FAA Advisory Circular 150/5200-33, "Wildlife Hazards on and Near Airports"? Explain. Possible- standing water, rivers and open areas.

(3) SOCIAL IMPACTS

(a) Would the proposed project cause relocation of any homes or businesses? Yes_X_ No __ Explain.

(b) If "yes," describe the availability of adequate relocation facilities.

(c) Would the proposed project cause an alteration in surface traffic patterns, or cause a noticeable increase in surface traffic congestion? Explain.
Possible relocation of roads due to development of airport and related facilities.

(4) INDUCED SOCIOECONOMIC IMPACTS

Would the proposed project cause induced, or secondary, socioeconomic impacts to surrounding communities, such as change business and economic activity in a community; impact public service demands; induce shifts in population movement and growth, etc.? Yes__X__ No ___ Explain
It is quite likely that the airport will attract business and economic activity in the immediate vicinity, along with a shift in population towards the newly created business centers.

(5) AIR QUALITY

(a) Does the proposed project have the potential to increase airside or landside capacity, including an increase in capacity to handle surface vehicles?

Yes, the building of a new airport will involve substantial works of construction that at a minimum will include construction of two runways with associated

taxiways and aprons, terminal building, roads and parking areas, air cargo hangars, control tower, fuel storage and dispensing areas, and support services.

(b) Identify whether the project area is in a non-attainment or maintenance area for any of the six (6) criteria air pollutants having National Ambient Air Quality Standards (NAAQS) established under the Clean Air Act Amendments (CAAA), and identify which pollutant(s) apply. If the proposed project is in an attainment area, no further air quality analysis is needed; skip to item (6). See the EPA Green Book at www.epa.gov/oar/oaqps/greenbk for current attainment areas.

The project area is situated in an attainment area for all of the six criteria pollutants having NAAQS. The project area is not situated in a maintenance area. According to Mr. Thomas R. Ballou, of Air Data Analysis with the Virginia Department of Environmental Quality (DEQ), requirements and procedures outlined in the air quality section of FAA Order 5050.4(A) apply when evaluating the air quality impacts of a new airport, once the preferred site alternative is selected. A copy of the correspondence from DEQ is included in Appendix A.

(c) Is an air quality analysis needed with regard to indirect source review requirements or levels of aircraft activity (See Order 5050.4A and the 1997 FAA Handbook "Air Quality Procedures for Civilian Airports and Air Force Bases"). Explain. If “yes,” comply with state requirements.

According to Mr. Thomas R. Ballou, of DEQ, an analysis of criteria pollutant emissions from the build scenario as opposed to the no-build “zero emissions” scenario would be required if the project is expected to generate activity levels above those identified in FAA Order 5050.4(A). The FAA forecast activity levels for which no analysis is needed are a) if it is a commercial service airport and has less than 1.3 million passengers and less than 180,000 general aviation operations forecast annually; or b) if it is a general aviation airport and has less than 180,000 operations forecast annually. The proposed airport is likely to exceed these activity levels and therefore an air analysis will be required once the preferred alternative has been selected. DEQ indicate the FAA’s Emissions and Dispersion Modeling System (EDMS) as the preferred model for performing this type of analysis.

(d)(1) Would the proposed action be an “exempted action,” as defined in 40 C.F.R Part 51.853(c)(2) of the General Conformity Rule? If exempt, skip to item (6). List exemption claimed. The proposed action would not be an exempted action as defined.

(d)(2) Would the increase in the emission level of the regulated air pollutants for which the project area is in non-attainment or maintenance exceed the de minimis standards? Yes _____ No____ Not applicable, the project area is in an attainment area.

(d)(3) If “no,” would the proposed project cause a violation of any NAAQS, delay the attainment of any NAAQS, or worsen any existing NAAQS violation? Explain.
Not applicable.

(d)(4) Would the proposed project conform to the State Implementation Plan (SIP) approved by the state air quality resource agency? Explain, and provide supporting documentation. This has yet to be determined, based on the air analysis performed using the FAA EDMS.

6) WATER QUALITY

Describe the potential of the proposed project to impact water quality, including ground water, surface water bodies, any public water supply systems, etc. Provide documentation of consultation with agencies having jurisdiction over such water bodies, as applicable.

The proposed project will require groundwater wells for the water supply. Special permitting will be required to ensure that the withdrawal rates do not adversely affect the aquifer nor impact other wells nearby.

Wastewater for this project will be pumped to the Hampton Roads Sanitation Plant at Nansemond. No discharges to surface waters are anticipated.

VGS:
The proposed airport could reasonably be expected to impact water quality including groundwater and surface water. Public water supplies are not likely to be affected.

Normal airport operations such as de-icing, fuel storage, and non-point source pollution associated with intensive land use can be expected to impact groundwater and surface water. Under environmental regulations in effect as of October 1999, we anticipate that a Virginia Pollution Discharge Elimination System (VPDES) permit will be required for storm water discharges from the airport. Additional plans such as Storm Water Pollution Prevention Plans will probably be required. Periodic monitoring of storm water discharges should be anticipated. Specific regulations for fuel storage also focus on the maintenance of groundwater and surface water quality. Above ground storage of petroleum in the quantities that we anticipate will be required to service the airport will require leak detection systems designed to detect leakage to groundwater. Separate VPDES permits will probably be necessary for fuel storage containment areas. In addition, oil discharge contingency plans and/or Spill Prevention, Control, and Countermeasure Plans will be necessary.

The regulatory programs discussed are designed to prevent and detect releases of contaminants to groundwater and surface water. Conversion of large rural tracts to intensive land use such as airport, roadway, fuel storage, commercial, maintenance, and other uses will degrade water quality in most cases. The Chesapeake Bay Preservation Act (CBA) is designed to mitigate these impacts. The facility will be required to comply with CBA requirements for siting and construction related activities. De-icing is particularly problematic since de-icing chemicals are usually applied at gates or apron areas and over-spray is not contained for treatment or disposal. Current fuel storage standards emphasize containment and early detection of releases. This may reduce the impact of fuel storage activities on water quality at the proposed airport. Historically, fuel storage activities have had significant impacts on water quality at airports.

There is potential for impact to public surface water supplies. Search Area 2 is located near and upgradient of Western Branch Reservoir. This reservoir is owned by the City of Norfolk. Potable groundwater sources large enough for public water supplies occur at depth below several confining layers and are believed to recharge at areas distant from the proposed site. Site activities are not expected to impact these aquifers.

(7) DEPARTMENT OF TRANSPORTATION SECTION 303/4(f)

Does the proposed project require the use of any publicly owned land from a public park, recreation area, or wildlife or waterfowl refuge of national, state, or local significance, or land of an historic site of national, state, or local significance? Provide justification for your response. Include concurrence of appropriate officials having jurisdiction over such land regarding the use determination.

Search Area 2 encompasses an area that is relatively sparsely populated and includes the town of Whitley and other small residential dwellings along Routes 460 and 258. Information on DOT Section 303/4(f) lands within the Search Area has been requested from local, state and federal officials, namely Isle of Wight County, the Virginia Department of Conservation and Recreation (DCR), the Virginia Department of Historic Resources (DHR), and the US Fish and Wildlife Service (FWS). Copies of the letters to these entities and their responses are included in Appendix B.

According to Alan S. Nogiec, Director of the County of Isle of Wight Department of Parks and Recreation, the county owns approximately 262 acres in the Search Area that will reportedly be developed into the Central County Park. Also Mr. Nogiec indicates that within the Search Area is an elementary school "that houses certain recreational amenities".

The FWS suggested requesting information from other sources including DCR, and the Virginia Departments of Game and Inland Fisheries (GIF) and Agriculture and Consumer Services (ACS). The latter two departments have been consulted, and copies of the correspondence and responses are contained in Appendix B.

ACS responded with information on listed endangered plant or insect species in the Search Area. Further information is contained in Section 10 below.

GIF responded with information on threatened or endangered fish and wildlife species in the vicinity of the Search Area. This information is contained in Section 10 below.

There are believed to be no National Wildlife Refuges, State Parks, Wildlife Management Areas, State Natural Preserves, or Nature Conservancy Preserves in the Search Area according to DCR. Two State Natural Preserves lie west of the Search Area. These are the Antioch Pines Preserve which covers 400 acres and lies approximately 2.6 miles from the western boundary of the Search area, and Blackwater Ecological Preserve which covers 318 acres and lies approximately 2.8 miles from the western boundary of the Search Area.

DCR has indicated that much of the Search Area has not been surveyed. Several populations of the state ranked very rare many-headed bunched beakrush have been documented in powerline right-of-ways in the Search Area, and short-beard plumegrass, a state ranked extremely rare species, has also been documented in the Search Area, according to DCR. DCR also state that absence of data does not necessarily confirm that the area lacks natural heritage resources. No further information on natural heritage resources was received from DCR.

According to the Comprehensive Plan for Isle of Wight County (1991), there are no locally managed parks or recreational facilities within the Search Area. Confirmation is anticipated from the County.

There are believed to be three historic sites, listed with the State Department of Historic Resources, within the Search Area and 23 in the vicinity of the Search Area, including two believed to be on the Federal Register. Further information on these sites is detailed in Section (8) below and information on their significance is anticipated from DHR.

According to the Isle of Wight Comprehensive Plan (dated 1991) there is also the Marshall-Edwards house, located in the northwest of the Search Area by Route 649. This site is not included on the DHR list. Additionally, the Isle of Wight Courthouse, located approximately 0.3 mile northeast of the Search Area was designated as a Historic District Zone by an Isle of Wight County Zoning Ordinance in 1989, according to the Comprehensive Plan. Further information on the area's historic resources is anticipated from Isle of Wight County.

(8) HISTORIC, ARCHITECTURAL, ARCHEOLOGICAL, AND CULTURAL RESOURCES

(a) Describe any impact the proposed project might have on any properties in or eligible for inclusion in the National Register of Historic Places. Provide justification for your response, and include a record of your consultation with the State Historic Preservation Officer (SHPO), if applicable (attach correspondence with SHPO).

Information on the existence of any properties in or eligible for inclusion in the National Register of Historic Places has been requested from the State Historic Preservation Officer at the Virginia Department of Historic Resources (DHR). A copy of the correspondence is contained in Appendix C. To date no reply has been received.

Previous informal requests for information from DHR have yielded the following information.

There are believed by DHR staff to be three historic sites within the Search Area and 23 in the vicinity of the Search Area. The historic sites believed to lie within the Search Area include (with latitude/longitude):

- Cedar Acres, located south of Isle of Wight (36 53.191/76 42.439);
- Sam Beale House, located southwest of Whitley (36 52.409/76 46.655); and
- Elem (Carr House), also located southwest of Whitley (36 51.658/76 46.786).

Of the 23 sites in the vicinity of the Search Area, two are believed to be on the National Register. These are Boykin's Tavern, located in the town of Isle of Wight approximately 0.3 miles north of the Search Area (36 54.492/76 42.502) and William Scott Farmstead, located approximately 0.64 miles south of the Search Area, east of Windsor. Of the remaining 21 sites, most lie along Route

603 west of Windsor and in the vicinity of Isle of Wight, northeast of the Search Area. Further information on these sites including their eligibility for inclusion on the National Register, their significance and possible impact from the project is anticipated from DHR.

In addition to the state-listed historic resources, according to the Isle of Wight Comprehensive Plan (dated 1991) there is also the Marshall-Edwards house, located in the northwest of the Search Area by Route 649. This site is not included on the DHR list. Additionally, the Isle of Wight Courthouse, located approximately 0.3 mile northeast of the Search Area was designated as a Historic District Zone by an Isle of Wight County Zoning Ordinance in 1989, according to the Comprehensive Plan. Further information on the area's historic resources is anticipated from Isle of Wight County.

(b) Describe whether there is reason to believe that significant scientific, prehistoric, historic, archeological, or paleontological resources would be lost or destroyed as a result of the proposed project. Include a record of consultation with persons or organizations with relevant expertise, including the SHPO, if applicable.

This information has been requested from the Virginia Department of Historic Resources and a copy of the correspondence is contained in Appendix C.

(9) BIOTIC COMMUNITIES

Describe the potential of the proposed project to directly or indirectly impact plant communities and/or the displacement of wildlife. This answer should also reference Section 6, Water Quality, if jurisdictional water bodies are present.

Information on biotic communities was requested from the Virginia Department of Conservation and Recreation (DCR), US Fish and Wildlife Service (FWS), Virginia Department of Game and Inland Fisheries (GIF) and Virginia Department of Agriculture and Consumer Services (ACS). Copies of the correspondence are included in Appendix D. The responses are contained in Appendix D.

The Search Area is generally rural in nature. The area is predominantly undeveloped with the exception of the small town of Whitley in the northern part of the Search Area, and other residential development along roadways, notably Route 258 which bisects the Search Area in a north-south direction, and Route 460 which runs across the southwest corner of the Search Area.

According to the Isle of Wight Comprehensive Plan (1991), the Search Area is currently designated as Undeveloped: Agricultural/Forest. According to the Plan, the area is conceptually planned in the future to be designated as a Rural/Agricultural Conservation District with a Highway Corridor District along Route 258 and a Development Service District in the southern part of the Search Area, north of Windsor.

Due to the rural nature of Search Area, there are likely to be extensive plant and wildlife communities within the project boundary, in addition to the endangered and threatened species, discussed in Section (10) below. Some displacement of such wildlife by the project is anticipated.

ACS responded with information on listed endangered plant or insect species in the Search Area. Further information is contained in Section 10 below.

GIF responded with information on the threatened or endangered fish and wildlife species in the vicinity of the Search Area. This information is contained in section 10 below.

The response from FWS does not include information on the Search Area.

DCR stated in their response that much of the Search Area has not been surveyed by their department but that this does not necessarily indicate a lack of natural heritage resources. Natural heritage resources are defined by DCR as "*the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations*". Several populations of a state ranked very rare plant species have been reportedly documented in the powerline right-of-ways and short-bearded plumegrass, a state ranked extremely rare plant species has also been documented in the Search Area, according to DCR. No further information on biotic communities in the Search Area was received from DCR.

In conclusion, based on the responses received to date, no information on the likely impacts to biotic communities in the Search Area has been received and therefore a determination on the degree and nature of impacts to biotic communities cannot currently be made.

(10) FEDERAL and STATE-LISTED ENDANGERED AND THREATENED SPECIES

Would the proposed project impact any federally- or state-listed or proposed endangered or threatened species of flora and fauna, or impact critical habitat? Explain, and discuss and attach records of consultation efforts with jurisdictional agencies, if applicable.

Information on the existence of federally- or state- listed or proposed endangered or threatened species of flora and fauna, or impact critical habitat, has been requested from the US Fish and Wildlife Service (FWS) and the Virginia Department of Conservation and Recreation (DCR). Copies of correspondence to these entities and their responses are included in Appendix D.

The FWS responded by making recommendation to approach DCR and the Virginia Departments of Game and Inland Fisheries (GIF) and Agriculture and Consumer Services (ACS). GIF and ACS have been approached and copies of the correspondence and the response from ACS are contained in Appendix D.

ACS responded with information on listed endangered plant or insect species in the Search Area. They state that their records indicate that no threatened or endangered plant or insect species have been documented in the Raynor, Smithfield, Windsor or Zuni USGS topographic quadrangles. Search Area 2 lies within parts of each of these quadrangles. They also state that "*the absence of data does not necessarily mean that no listed species occur in the area, but that our files do not currently contain information to document their presence*".

GIF responded with information on threatened or endangered fish and wildlife species in the vicinity of the Search Area. They state that no threatened or endangered species have been documented within the Search Area. They report that a portion of the Blackwater River that has been identified as a spawning area for anadromous American shad (*Alosa sapidissima*) is within 1 mile of the project area and that "*the applicant should coordinate with this Department to evaluate the specific impacts on this species*".

DCR responded and stated that much of the Search Area has not been surveyed by their department. DCR state that several populations of many-headed beakrush have been documented in the powerline right-of-ways. This plant species is a state ranked very rare and global ranked very common subspecies. Additionally DCR report that short-beard plumegrass, a state ranked extremely rare species and global ranked rare to uncommon/very common species, has been documented in the Search Area.

The GIF Virginia Fish and Wildlife Information Service database (http://www.dgif.state.va.us/wildlife/index.cfm) was used to obtain information on endangered and threatened species in the vicinity of the Search Area. The following are the species listed on the database.

There are three federally endangered animal species in the vicinity of the Search Area. These are the peregrine falcon, the Roanoke logperch and the red-cockaded woodpecker. One federally threatened animal species, the bald eagle, is also believed to exist in the vicinity of the Search Area.

Eight federally listed species of special concern are believed to occur in the vicinity of the Search Area. One, the eastern big-eared bat is also on the state endangered list, and two others, the migrant loggerhead shrike and the Bachman's sparrow are also on the state threatened species list.

The other five animal species of federal special concern include the northern diamondback terrapin, black rail, the cerulean warbler, the Chowanoke crayfish, and the Diana fritillary butterfly.

There are believed to be two state listed endangered animal species in the vicinity of the Search Area. These are the eastern tiger salamander and the canebrake rattlesnake. Four state listed threatened animal species are also believed to occur in the vicinity of the Search Area. These are the Mabee's salamander, the barking treefrog, the upland sandpiper, and the loggerhead shrike. Additionally there are believed to be 26 animal species of special concern listed on the state list in the vicinity of the Search Area.

Confirmation on this information is anticipated from GIF.

(11) WETLANDS

Does the proposed project involve the modification of delineated wetlands (wetlands must be delineated using methods in the US Army Corps of Engineers (ACE) 1987

Wetland Delineation Manual; delineations must be performed by a person certified in wetlands delineation). Provide justification for your response.

Wetland acreage information was obtained from the National Wetland Inventory maps for Search Area 2. It is estimated that the area which is approximately 16,000 acres in size, includes approximately 1,660.38 acres of wetlands (10.4%).

(12) FLOODPLAINS

(a) Would the proposed project be located in, or would it encroach upon, any 100-year floodplains, as designated by the Federal Emergency Management Agency (FEMA)? Yes__X___ No____ The search area does not appear to be located within any 100-year floodplains

(b) Would the proposed project be located in a 500-year floodplain, as designated by FEMA? Yes_____ No__X___ The search area does not appear to be located within any 500-year floodplains.

(c) If "yes," is the proposed project considered a "critical action", as defined in the Water Resources Council Floodplain Management Guidelines? (see FR Vol. 43, No. 29, 2/10/78) Yes____ No__X__ The search area does not appear to be located within any 500-year floodplains.

(d) You must attach the corresponding FEMA Flood Insurance Rate Map (FIRM) or other documentation showing the project area. Map attached? Yes__X___ No_____ If "no," why not?

(e) If the proposed project would cause an encroachment of a base floodplain (the base floodplain is the 100-year floodplain for non-critical actions and the 500-year floodplain for critical actions), what measures would be taken to provide an opportunity for early public review, in accordance with Order 5050.4A Par. 47 (g)(6)?

These measures will need to be evaluated by the Virginia Department of Aviation if this site is selected for development.

(13) COASTAL ZONE MANAGEMENT PROGRAM

(a) Would the proposed project occur in, or affect, a coastal zone, as defined by a state's Coastal Zone Management Plan (CZMP)? Explain

According to the Coastal Resources Management of the Virginia Department of Environmental Quality (DEQ), any county or locality that is in contact with a coastal body of water must comply with the Coastal Zone Management Plan. The DEQ indicated that York, Isle of Wight, and Suffolk counties would be governed by the plan. Southampton County is not governed by the plan. This means that the Search Area 2 is affected by the state's CZMP.

(b) If "yes," is the project consistent with the State's CZMP? Explain. If applicable, attach the sponsor's consistency certification and the state's concurrence of that certification. Early coordination is recommended.

The CZM program requires compliance with several state programs and laws. These include the Fisheries management program, Subaqueous Lands Management program, Wetlands Management program, Dunes Management (Coastal Primary Sand Dune Protection Act), Non-Point Source Pollution Control (Virginia Erosion and Sediment Control Law), point Source Pollution Control program, Shoreline Sanitation program and the Air Pollution Control program (Clean Air Act). The search area would require consistency Certifications from each program.

(14) COASTAL BARRIERS

Is the location of the proposed project within the Coastal Barrier Resources System, as delineated by the US Fish and Wildlife Service (FWS) or FEMA coastal barrier maps? Explain.

The Coastal Barrier Resources System (CBRS) information on the FEMA internet site was reviewed. As such, this site was not listed as being part of the CBRS.

(15) WILD AND SCENIC RIVERS

Would the proposed project affect any portion of the free-flowing characteristics of a Wild and Scenic River or a Study River, or any adjacent areas that are part of such rivers, listed on the Wild and Scenic Rivers Inventory? Consult the (regional) National Parks Service (NPS), U.S. Forest Service (FS), or other appropriate federal authority for information. Early consultation is recommended.

The Wild and Scenic Rivers Act (P.L. 90-542, as amended) was reviewed on the U.S. National Park Service internet site. According to the list of wild and scenic rivers, and study rivers listed in the Act, the search area is not located in proximity to any such rivers.

(16) FARMLAND

(a) Would the proposed project involve the use of federal financial assistance or conversion of federal government land? Explain

Yes, it is believed that the construction of a new airport will involve the use of federal financial assistance.

(b) If "yes" would it convert farmland protected by the Farmland Protection Policy Act (FPPA) (prime or unique farmland) to non-agricultural uses? Yes _X_ No___

(c) If "yes," determine the extent of project-related farmland impacts by completing (and submitting to the Natural Resources Conservation Service) the "Farmland Conversion Impact Rating Form" (NRCS Form AD 1006). Coordinate with the state or local agricultural authorities. Explain your response, and attach the Form AD 1006, if applicable.

The USDA Farmland Conversion Impact Rating Form AD-1006 (10-83) has been completed and submitted to the USDA Natural Resource Conservation Service (NRCS) Smithfield Office. Copies of the correspondence to the USDA and Form AD-1006 are contained in Appendix E. To date a response has not been received.

The total amount of prime farmland in the Search Area has been estimated at 10,068.99 acres, of which 3,682.38 acres is prime farmland, and 6,386.61 acres is prime farmland if drained.

(17) ENERGY SUPPLY AND NATURAL RESOURCES

What effect would the proposed project have on energy or other natural resource consumption? Would demand exceed supply? Explain. Letters from local public utilities and suppliers regarding their abilities to provide energy and resources needed for large projects may be necessary.

The new airport would be a major user of electrical energy in this rural area. Estimated demand is in the 10 to 15 megawatt range and will require its own service substation. Single point service would be provided by the utility serving the area at no charge. However if redundant service from different substations is required (probably necessary) the cost of these extra facilities will be born by the airport development. Discussions with Virginia Power's Tuckatuck District Office in Suffolk found that Community Electric Cooperative serves Search Area 2. Transmission lines owned by Virginia Power cross this area. If these lines must be relocated due to the airport development, cost to relocate will be significant.

(18) LIGHT EMISSIONS

Would the proposed project have the potential for airport-related lighting impacts on nearby residents? Explain, and, if necessary, provide a map depicting the location of residences in the airport vicinity in relation to the proposed lighting system.

All impacts associated with light emissions are anticipated to remain on airport property.

(19) SOLID WASTE

Would the proposed project generate solid waste? Yes__X___ No_____

If "yes," are local disposal facilities capable of handling the additional volumes of waste resulting from the project? Explain.

NOTE: A sanitary landfill is incompatible with airport operations if the landfill is located within 10,000 feet of a runway serving turbo-powered aircraft, or 5,000 feet of a runway serving piston-powered aircraft. Refer to FAA Advisory Circular 150/5200.33 " Hazardous Wildlife Attractants on or Near Airports," and FAA Order 5200.5B, "Guidance Concerning Sanitary Landfills on or Near Airports."

(20) CONSTRUCTION IMPACTS

Would construction of the proposed project: 1) increase ambient noise levels due to equipment operation; 2) degrade local air quality due to dust, equipment exhausts and burning debris; 3) deteriorate water quality when erosion and pollutant runoff occur; 4) or disrupt off-site and local traffic patterns? Explain.

(21) OTHER CONSIDERATIONS

(a) Is the proposed project likely to be highly controversial on environmental grounds? Explain.

(b) Is the proposed project likely to be inconsistent with any federal, state or local law or administrative determination relating to the environment? Explain.

(c) Is the proposed project reasonably consistent with plans, goals, policies, or controls that have been adopted for the area in which the airport is located? Explain

(22) HAZARDOUS SITES/MATERIALS

Would the proposed project require the use of land that may contain hazardous substances or may be contaminated? Explain your response and describe how such land was evaluated for hazardous substance contamination. Early consultation with appropriate expertise agencies (e.g., US Environmental Protection Agency (EPA), EPA-certified state and local governments) is recommended.

Search Area 2 lies in a generally undeveloped part of Isle of Wight County. A request for information has been made to the US EPA (USEPA) and Virginia Department of Environmental Quality (DEQ) regarding the occurrence of hazardous waste sites and contaminated lands in the Search Area. Copies of the correspondence are included in Appendix F.

To date responses have been received from the USEPA Waste and Chemicals Management Division and USEPA PRP Investigation and Site Information Section and are contained in Appendix F. Responses from other USEPA divisions may be forthcoming.

The response from the USEPA Waste and Chemicals Management Division provided information on registered Resource Conservation and Recovery Act (RCRA) handlers and compliance reports for the various zip codes that lie in the Search Area. Based on the information provided there appear to be no registered RCRA hazardous waste generators located within the Search Area.

One limited quantity generator is reportedly located approximately 0.9 miles south of the Search Area. This facility is Tidewater Petroleum located at 9242 Windsor Road. A limited quantity generator is one that generates less than 100 kg of hazardous waste per month. No compliance reports are listed for the Search Area.

The response from the USEPA PRP Investigation and Site Information Section provided information on the location of sites listed on the Comprehensive Environmental Response, Compensation and Liability System (CERCLIS) for the State of Virginia. The CERCLIS list includes known or potential hazardous waste sites that are either proposed for inclusion or on the National Priorities List (Superfund) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

The USEPA states that the CERCLIS System contains only those potential hazardous waste sites that have been brought to the attention of the EPA prior to the last update and that it does not contain all potential hazardous waste sites that exist.

There are no reported CERCLIS sites within a one-mile radius of the Search Area.

Information on current and historic hazardous waste sites is also available on the USEPA Internet sites.

The USEPA CERCLIS database located on the Internet at http://www.epa.gov/superfund/sites/cursites/toc/index.htm, was reviewed and revealed that there is one CERCLIS site in the database for Isle of Wight County. This site is not within the Search Area and not within a one-mile radius of the area.

The USEPA Archive No Further Remedial Action Planned (NFRAP) database located on the Internet at http://www.epa.gov/superfund/sites/arcsites/arcstate.htm, contains information on sites which have been removed and archived from the inventory of Superfund sites. Archive status indicates that to the best of the EPA's knowledge, Superfund has completed its assessment of a site and has determined that no further steps will be taken to list that site on the National Priorities List. A review of the NFRAP database revealed that there are three such sites for Isle of Wight County. One lies in Zuni which is west of the Search Area, and the other two lie near Franklin, many miles southwest of the Search Area.

There are currently believed to be no DEQ permitted hazardous waste disposal sites in Virginia.

To date DEQ have not responded officially to the request for information, however they have stated that information on leaking Underground storage Tank (LUST) sites is available in the download library on their Internet website. LUST sites have the potential to contaminate the project area due to subsurface contaminant migration.

The DEQ website was accessed and revealed no listed LUST sites within the Search Area or within ½ mile of the Search Area.

(23) PERMITS

List all required permits for the proposed project. Indicate whether any difficulties are anticipated in obtaining the required permits.

Air

a. Clean Air Act construction and operating permit(s) for stationary sources at the site
b. Building permits (also for installation of underground storage tanks)

Water

c. Virginia Pollutant Discharge Elimination System permit during and after construction – for stormwater runoff
d. Groundwater Management Area Withdrawal Permit – for groundwater withdrawal (if over 300,000 gallons/month)
e. Sewage Disposal Permits – for construction, operation, expansion, modification of sewer system
f. Private well permit – required if project involves the construction, alteration, rehabilitation, abandonment or extension of a private well

g. Permit for construction in waters of the commonwealth and wetlands – plans to fill in, build in, on or in any way disturb any waterway or wetland area

Waste

h. A hazardous waste permit - for the treatment, storage and/or disposal of hazardous waste

i. Solid Waste Transfer Station Permit – for the temporary storage and/or collection of solid waste

1) Groundwater Withdrawal Permit from DEQ – Requires special permit. Proposed project is within a groundwater protection area. Processing of the permit will take over one year. Currently, groundwater is plentiful and do not expect permit to be denied.

2) Water Treatment Plant Permit from VDH – No difficulty anticipated.

3) Wastewater Pumping Station Permit from VDH – No difficulty anticipated.

NOTE: Even though the airport sponsor has/shall obtain one or more permits from the appropriate federal, state, and/or local agencies for the proposed project, initiation of such project shall NOT be approved until FAA has issued its environmental determination.

(24) ENVIRONMENTAL JUSTICE

Would the proposed project impact minority and/or low-income populations? Consider human health, social, economic, and environmental issues in your evaluation. Explain.

(25) CUMULATIVE IMPACTS

When considered together with other past, present, and reasonably foreseeable future development projects on or off the airport, federal or non-federal, would the proposed project produce a cumulative effect on any of the environmental impact categories above? You should consider projects that are connected, cumulative and similar (common timing and geography). Provide a list of such projects considered. For purposes of this Evaluation Form, generally use 3 years for past projects and 5 years for future foreseeable projects.

Appendix H

Catalytic Development

Case Study Bibliography

APPENDIX H

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Appendix I

Cash Flow Analysis Details

Table I.1

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Base Case

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Inflation Factor (a)	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020
Bond Term (b)	25										
Bond Interest Rate (c)	6.5%										
Bond Financing Cost (d)	4.0%										
Capital Costs (e)											
Airfield	40,156,000	114,750,000	114,750,000	76,500,000	86,700,000	1,118,000	1,760,000	2,461,000	3,227,000	4,062,000	4,970,000
Terminal Area	33,075,000	-	25,245,000	30,845,000	30,845,000	373,000	592,000	837,000	1,108,000	1,409,000	1,741,000
General Aviation	6,438,000	9,945,000	12,678,000	19,244,000	24,344,000	93,000	145,000	200,000	259,000	322,000	389,000
Support Facilities	-	-	35,300,000	35,300,000	34,981,000	186,000	295,000	414,000	546,000	691,000	849,000
Air Cargo/Aircraft Maint. Facilities	-	-	-	-	10,017,000	93,000	149,000	212,000	283,000	362,000	451,000
Miscellaneous	34,680,000	-	-	-	33,864,000	132,427,064	33,864,000	33,864,000	33,864,000	-	-
Total	114,349,000	124,695,000	187,973,000	161,889,000	220,751,000	134,290,064	36,805,000	37,988,000	39,287,000	6,846,000	8,400,000
FAA Funds											
FAA Eligible Capital Costs (f)	88,718,400	110,733,750	144,225,000	117,524,500	155,981,800	31,902,800	32,724,850	33,624,500	34,610,400	5,210,550	6,384,750
Entitlements (g)	-	-	-	-	-	-	-	2,782,583	2,855,926	2,933,547	3,015,698
Available Entitlements (j)	-	-	-	-	-	-	-	2,782,583	2,855,926	2,933,547	3,015,698
Expended Entitlements (k)	-	-	-	-	-	-	-	2,782,583	2,855,926	2,933,547	3,015,698
Remaining Potential Entitlements (l)	-	-	-	-	-	-	-	-	-	-	-
Discretionary Expenditures (m)	24,877,600	35,882,130	43,332,100	35,437,800	47,210,200	8,382,315	5,633,650	3,750,717	4,663,274	2,277,003	3,369,052
Eligible Costs Unfunded by AIP (n)	63,840,800	74,851,620	100,892,900	82,086,700	108,771,600	23,520,485	27,091,200	27,091,200	27,091,200	-	-
PFC Funds											
PFC Eligible Capital Costs (o)	114,349,000	124,695,000	168,534,000	139,167,000	176,514,000	134,066,614	36,451,000	37,489,950	38,629,800	6,013,550	7,374,950
PFC Eligible Less AIP Funded (p)	89,471,400	88,812,870	125,201,900	103,729,200	129,303,800	125,684,299	30,817,350	30,956,650	31,110,600	803,000	990,200
PFC Collections (q)	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	19,370,323	20,520,730
Encumbered PFC Funds (r)	-	-	-	-	-	-	-	-	-	-	-
PFC Bond Size											
PFC Bond Proceeds											
PFC Debt Service	-	-	-	-	-	-	-	-	-	-	-
Interest Earnings (s)	-	-	-	-	-	-	-	-	-	-	763,901
Reserve											
Debt Service Coverage											
Available PFC Funds (sa)	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	19,370,323	20,520,730
PFC Expenditures (sb)	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	272,790	335,400
Airport Costs Reimbursable by PFCs (u)	-	-	-	-	-	-	-	-	-	-	-
Reimbursements from PFCs (ub)	-	-	-	-	-	-	-	-	-	-	-
Cummulative PFC Reimbursables (ua)	-	-	-	-	-	-	-	-	-	-	-
Remaining PFC Funds (sc)	-	-	-	-	-	-	-	-	-	19,097,533	20,185,330
Remaining PFC Eligible Costs (t)	89,471,400	88,812,870	125,201,900	103,729,200	129,303,800	110,305,830	14,525,551	13,697,278	12,826,191	530,210	654,800
State Funds											
State Eligible Capital Costs (x)	58,230,500	92,250,000	113,482,500	88,965,500	96,160,900	1,243,650	1,961,250	2,747,300	3,608,850	4,551,100	5,578,250

Table I.1

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Base Case

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
State Entitlements (y)	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745
Available State Entitlements (ab)	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745
Expended State Entitlements (ac)	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745
Discretionary Expenditures (ac)	6,870,913	7,022,554	7,627,542	7,785,951	7,947,855	1,243,650	1,361,250	2,111,666	2,935,465	377,783	585,855
Remaining State Entitlements (ad)	-	-	-	-	-	-	-	-	-	-	-
Grant and PFC Summary											
Total Costs (ae)	114,349,000	124,695,000	187,973,000	161,889,000	220,751,000	134,290,064	36,805,000	37,988,000	39,287,000	6,846,000	8,400,000
Ineligible Costs (ae)	-	2,486,250	32,273,000	36,714,500	53,732,800	256,250	407,750	577,500	766,250	976,000	1,208,750
Eligible Costs (ae)	114,349,000	122,208,750	155,700,000	125,174,500	167,018,200	134,033,814	36,397,250	37,410,500	38,520,750	5,870,000	7,191,250
Available Funds(af)	31,748,513	42,904,684	50,959,642	43,223,751	55,158,055	25,004,434	23,886,699	26,539,972	29,412,459	25,672,033	28,247,080
Eligible Expenditures (ag)	31,748,513	42,904,684	50,959,642	43,223,751	55,158,055	25,004,434	23,886,699	26,539,972	29,412,459	6,574,500	8,061,750
Remaining Costs (ah)	82,600,487	81,790,316	137,013,358	118,665,249	165,592,945	109,285,630	12,918,301	11,448,028	9,874,541	271,500	338,250
Other Expenditures (ai)	-	-	-	1,313,200	5,313,200	69,750	111,750	159,000	212,250	271,500	338,250
Airport Estimated Costs (aj)	82,600,487	81,790,316	137,013,358	117,352,049	160,279,745	106,778,690	10,915,801	9,995,448	9,022,381	-	-
	ALL Subsequent Calculations are on Fiscal Year Basis										
Airport Expenditures (am)	82,600,487	81,790,316	137,013,358	117,352,049	160,279,745	106,778,690	10,915,801	9,995,448	9,022,381	-	-
Bond Issues											
Bond Issue - Initial Construction #1											
Bond Size (ao)	459,871,933										
Bond Proceeds (ap)	441,477,056										
Debt Service (aq)						$37,700,982	$37,700,982	$37,700,982	$37,700,982	$37,700,982	$37,700,982
Interest Earnings (ar)		14,954,136	10,314,633	5,248,268	1,623,592	-	-	-	-	-	-
Reserve (as)	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982
Capitalized Interest (at)	14,945,838	29,891,676	29,891,676	29,891,676	29,891,676						
Available Funds (au)	388,830,236	291,292,209	189,924,850	28,268,084	-						
Expenditures from Proceeds (av)	82,600,487	81,790,316	137,013,358	-	-						
Remaining Funds (aw)	306,229,748	209,501,893	52,911,492	28,268,084	-						
Bond Issue - Initial Construction #2											
Bond Size (ao)				507,407,498							
Bond Proceeds (ap)				487,111,198							
Debt Service (aq)							$41,598,018	$41,598,018	$41,598,018	$41,598,018	$41,598,018
Interest Earnings (ar)					15,975,632	5,375,391	400,000	-	-	-	-
Reserve (as)				41,598,018	41,598,018	41,598,018	41,598,018	41,598,018	41,598,018	41,598,018	41,598,018
Capitalized Interest (at)				16,490,744	32,981,487	32,981,487					
Available Funds (au)				429,022,436	294,664,531	106,778,690					
Expenditures from Proceeds (av)				117,352,049	160,279,745	96,778,690					
Remaining Funds (aw)				311,670,387	134,384,786	10,000,000					
Bond Issue											
Bond Size (ao)											
Bond Proceeds (ap)											

Table I.1

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Base Case

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Debt Service (aq)											
Interest Earnings (ar)											
Reserve (as)											
Capitalized Interest (at)											
Available Funds (au)											
Expenditures from Proceeds (av)											
Remaining Funds (aw)											
Total New Debt Service (bb)			-	-	-	79,299,000	79,299,000	79,299,000	79,299,000	79,299,000	79,299,000
Expenses											
Total O&M Expenses						17,513,745	18,553,889	19,655,808	20,823,169	22,059,861	23,370,000
Non-Operating Costs											
Debt Service (ck)						79,299,000	77,744,118	76,219,724	74,725,219	73,260,019	71,823,548
ORF/PHF Operating Expense						2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Total Costs (cn)						99,212,745	98,698,007	98,275,531	97,948,389	97,719,880	97,593,548
Revenues											
Available PFC Funds for Debt Service						$ -	$ -	$ -	$ -	$ 19,097,533	$ 20,185,330
Non-Airline Revenues						27,133,598	28,745,067	30,452,242	32,260,806	34,176,781	36,206,546
Required Airline Revenues						89,202,434	86,672,833	85,215,056	84,631,112	65,025,638	63,508,246
Total Revenues (dx)						116,336,032	115,417,900	115,667,298	116,891,917	118,299,951	119,900,122
Total Costs (dy)			-	-	-	99,212,745	98,698,007	98,275,531	97,948,389	97,719,880	97,593,548
Net Revenue			-	-	-	17,123,287	16,719,893	17,391,767	18,943,529	20,580,071	22,306,574
Capital Outlays	-	-	-	-	-	10,000,000	10,915,801	9,995,448	9,022,381	-	-
Additional Principal Paid						-	-	7,396,318	9,921,147	20,580,071	22,306,574
CIP Reserve Balance (ec)	-	-	-	-	-	7,123,287	12,927,380	12,927,380	12,927,380	12,927,380	12,927,380
Debt Service Coverage Estimate											
Total Revenues (dx)			-	-	-	116,336,032	115,417,900	115,667,298	116,891,917	118,299,951	119,900,122
Total Operating Costs (ed)			-	-	-	17,513,745	18,553,889	19,655,808	20,823,169	22,059,861	23,370,000
Remaining Revenue (ee)			-	-	-	98,822,288	96,864,011	96,011,490	96,068,748	96,240,090	96,530,122
Debt Service (ef)			-	-	-	79,299,000	77,744,118	76,219,724	74,725,219	73,260,019	71,823,548
Coverage Ratio (eg)						1.25	1.25	1.26	1.29	1.31	1.34
Airline Cost per Enplanement						$ 38.20	$ 35.04	$ 32.52	$ 30.48	$ 22.11	$ 20.38
Average Cost per Enplanement: 2025-2034						$ 25.38					

Table I.1

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Base Case

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Inflation Factor (a)	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020
Bond Term (b)										
Bond Interest Rate (c)										
Bond Financing Cost (d)										
Capital Costs (e)										
Airfield	5,958,000	7,812,000	9,833,000	12,034,000	14,426,000	16,635,000	18,945,000	19,419,000	19,904,000	20,402,000
Terminal Area	2,108,000	2,791,000	20,804,000	24,910,000	25,834,000	6,329,000	7,450,000	7,892,000	8,361,000	8,857,000
General Aviation	460,000	595,000	740,000	894,000	1,058,000	1,220,000	1,390,000	1,424,000	1,460,000	1,497,000
Support Facilities	1,023,000	1,348,000	11,374,000	11,766,000	18,901,000	2,963,000	3,431,000	3,576,000	3,726,000	3,884,000
Air Cargo/Aircraft Maint. Facilities	550,000	734,000	939,000	4,184,000	4,441,000	1,644,000	1,872,000	1,919,000	1,967,000	2,016,000
Miscellaneous	-	-	-	-	-	-	-	-	-	-
Total	10,099,000	13,280,000	43,690,000	53,788,000	64,660,000	28,791,000	33,088,000	34,230,000	35,418,000	36,656,000
FAA Funds										
FAA Eligible Capital Costs (f)	7,665,950	10,067,050	21,320,200	26,833,600	29,958,150	21,684,250	24,859,250	25,652,850	26,475,350	27,330,050
Entitlements (g)	3,102,643	3,194,665	3,292,062	3,395,148	3,504,259	3,619,748	3,741,989	3,871,380	4,008,341	4,153,317
Available Entitlements (j)	3,102,643	3,194,665	3,292,062	3,395,148	3,504,259	3,619,748	3,741,989	3,871,380	4,008,341	4,153,317
Expended Entitlements (k)	3,102,643	3,194,665	3,292,062	3,395,148	3,504,259	3,619,748	3,741,989	3,871,380	4,008,341	4,153,317
Remaining Potential Entitlements (l)	-	-	-	-	-	-	-	-	-	-
Discretionary Expenditures (m)	4,563,307	6,872,385	11,126,138	13,889,452	16,904,891	18,064,502	21,117,261	21,781,470	22,467,009	23,176,733
Eligible Costs Unfunded by AIP (n)	-	-	6,902,000	9,549,000	9,549,000	-	-	-	-	-
PFC Funds										
PFC Eligible Capital Costs (o)	8,862,400	11,648,150	28,502,250	36,230,600	39,870,100	25,184,150	28,908,300	29,870,300	30,869,050	31,908,450
PFC Eligible Less AIP Funded (p)	1,196,450	1,581,100	14,084,050	18,946,000	19,460,950	3,499,900	4,049,050	4,217,450	4,393,700	4,578,400
PFC Collections (q)	21,739,459	23,030,570	24,398,359	25,847,382	27,382,462	29,008,711	30,731,544	32,556,696	34,490,243	36,538,625
Encumbered PFC Funds (r)	-	-	-	-	-	-	-	-	-	-
PFC Bond Size										
PFC Bond Proceeds										
PFC Debt Service	-	-	-	-	-	-	-	-	-	-
Interest Earnings (s)	807,413	853,414	899,923	412,572	276,055	316,860	1,115,798	1,177,444	1,248,013	1,322,791
Reserve										
Debt Service Coverage										
Available PFC Funds (sa)	21,739,459	23,030,570	24,398,359	25,847,382	27,382,462	29,008,711	30,731,544	32,556,696	34,490,243	36,538,625
PFC Expenditures (sb)	404,110	532,490	14,084,050	18,946,000	19,460,950	1,113,750	1,295,450	1,356,380	1,420,480	1,487,940
Airport Costs Reimbursable by PFCs (u)	-	-	-	-	-	-	-	-	-	-
Reimbursements from PFCs (ub)	-	-	-	-	-	-	-	-	-	-
Cummulative PFC Reimbursables (ua)	-	-	-	-	-	-	-	-	-	-
Remaining PFC Funds (sc)	21,335,349	22,498,080	10,314,309	6,901,382	7,921,512	27,894,961	29,436,094	31,200,316	33,069,763	35,050,685
Remaining PFC Eligible Costs (t)	792,340	1,048,610	-	-	-	2,386,150	2,753,600	2,861,070	2,973,220	3,090,460
State Funds										
State Eligible Capital Costs (x)	6,699,400	8,800,100	19,725,650	24,769,950	27,506,800	18,975,000	21,759,500	22,460,950	23,188,450	23,944,600

Table I.1

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Base Case

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
State Entitlements (y)	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
Available State Entitlements (ab)	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
Expended State Entitlements (ac)	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
Discretionary Expenditures (ac)	815,812	1,281,782	8,227,081	8,375,119	8,524,432	3,447,657	4,119,508	4,297,711	4,484,701	4,680,953
Remaining State Entitlements (ad)	-	-	-	-	-	-	-	-	-	-
Grant and PFC Summary										
Total Costs (ae)	10,099,000	13,280,000	43,690,000	53,788,000	64,660,000	28,791,000	33,088,000	34,230,000	35,418,000	36,656,000
Ineligible Costs (ae)	1,466,500	1,946,000	21,201,500	25,527,500	32,994,750	4,397,500	5,129,000	5,385,250	5,655,750	5,940,500
Eligible Costs (ae)	8,632,500	11,334,000	22,488,500	28,260,500	31,665,250	24,393,500	27,959,000	28,844,750	29,762,250	30,715,500
Available Funds(af)	31,021,849	35,227,580	47,942,191	52,459,017	57,324,495	55,208,961	60,842,094	63,706,266	66,720,513	69,895,285
Eligible Expenditures (ag)	9,686,500	12,729,500	37,627,882	45,557,635	49,402,983	27,314,000	31,406,000	32,505,950	33,650,750	34,844,600
Remaining Costs (ah)	412,500	550,500	6,062,118	8,230,365	15,257,017	1,477,000	1,682,000	1,724,050	1,767,250	1,811,400
Other Expenditures (ai)	412,500	550,500	704,250	876,750	1,069,500	1,477,000	1,682,000	1,724,050	1,767,250	1,811,400
Airport Estimated Costs (aj)	-	-	196,660	3,255,680	6,266,005	-	-	-	-	-
ALL Subsequent Calculations are on Fiscal Year Basis										
Airport Expenditures (am)	-	-	196,660	3,255,680	6,266,005	-	-	-	-	-
Bond Issues										
Bond Issue - Initial Construction #1										
Bond Size (ao)	-							-		
Bond Proceeds (ap)	-							-		
Debt Service (aq)	$37,700,982	$37,700,982	$37,700,982	$37,700,982	$37,700,982	$37,700,982	$37,700,982	$37,700,982	$37,700,982	$37,700,982
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982
Capitalized Interest (at)										
Available Funds (au)										
Expenditures from Proceeds (av)										
Remaining Funds (aw)										
Bond Issue - Initial Construction #2										
Bond Size (ao)										
Bond Proceeds (ap)										
Debt Service (aq)	$41,598,018	$41,598,018	$41,598,018	$41,598,018	$41,598,018	$41,598,018	$41,598,018	$41,598,018	$41,598,018	$41,598,018
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	41,598,018	41,598,018	41,598,018	41,598,018	41,598,018	41,598,018	41,598,018	41,598,018	41,598,018	41,598,018
Capitalized Interest (at)										
Available Funds (au)										
Expenditures from Proceeds (av)										
Remaining Funds (aw)										
Bond Issue										
Bond Size (ao)										
Bond Proceeds (ap)										

Table I.1

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Base Case

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Debt Service (aq)										
Interest Earnings (ar)										
Reserve (as)										
Capitalized Interest (at)										
Available Funds (au)										
Expenditures from Proceeds (av)										
Remaining Funds (aw)										
Total New Debt Service (bb)	79,299,000	79,299,000	79,299,000	79,299,000	79,299,000	79,299,000	79,299,000	79,299,000	78,736,480	41,598,018
Expenses										
Total O&M Expenses	24,757,948	26,228,327	27,786,032	29,436,249	31,184,473	33,036,525	34,998,569	37,077,140	39,279,158	41,611,954
Non-Operating Costs										
Debt Service (ck)	70,415,243	69,034,552	67,680,933	66,353,856	65,052,800	63,777,255	62,526,721	61,300,706	59,672,412	30,907,940
ORF/PHF Operating Expense	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Total Costs (cn)	97,573,191	97,662,879	97,866,965	98,190,105	98,637,273	99,213,780	99,925,290	100,777,847	101,351,570	74,919,895
Revenues										
Available PFC Funds for Debt Service	$ 21,335,349	$ 22,498,080	$ 10,314,309	$ 6,901,382	$ 7,921,512	$ 27,894,961	$ 29,436,094	$ 31,200,316	$ 33,069,763	$ 35,050,685
Non-Airline Revenues	38,356,859	40,634,879	43,048,192	45,604,831	48,313,310	51,182,646	54,222,392	57,442,669	60,854,199	64,468,341
Required Airline Revenues	62,009,505	60,581,642	72,586,788	75,910,733	74,894,619	55,021,782	53,681,705	52,223,095	50,368,534	23,053,877
Total Revenues (dx)	121,701,713	123,714,601	125,949,289	128,416,946	131,129,441	134,099,389	137,340,191	140,866,080	144,292,496	122,572,903
Total Costs (dy)	97,573,191	97,662,879	97,866,965	98,190,105	98,637,273	99,213,780	99,925,290	100,777,847	101,351,570	74,919,895
Net Revenue	24,128,521	26,051,721	28,082,324	30,226,840	32,492,168	34,885,610	37,414,901	40,088,233	42,940,926	47,653,008
Capital Outlays	-	-	196,660	3,255,680	6,266,005	-	-	-	-	-
Additional Principal Paid	24,128,521	26,051,721	27,885,664	26,971,160	-	-	-	-	-	-
CIP Reserve Balance (ec)	12,927,380	12,927,380	12,927,380	12,927,380	39,153,543	74,039,153	111,454,054	151,542,287	194,483,213	242,136,221
Debt Service Coverage Estimate										
Total Revenues (dx)	121,701,713	123,714,601	125,949,289	128,416,946	131,129,441	134,099,389	137,340,191	140,866,080	144,292,496	122,572,903
Total Operating Costs (ed)	24,757,948	26,228,327	27,786,032	29,436,249	31,184,473	33,036,525	34,998,569	37,077,140	39,279,158	41,611,954
Remaining Revenue (ee)	96,943,764	97,486,273	98,163,257	98,980,696	99,944,968	101,062,865	102,341,622	103,788,939	105,013,338	80,960,948
Debt Service (ef)	70,415,243	69,034,552	67,680,933	66,353,856	65,052,800	63,777,255	62,526,721	61,300,706	59,672,412	30,907,940
Coverage Ratio (eg)	1.38	1.41	1.45	1.49	1.54	1.58	1.64	1.69	1.76	2.62
Airline Cost per Enplanement	$ 18.78	$ 17.32	$ 19.59	$ 19.34	$ 18.01	$ 12.49	$ 11.50	$ 10.56	$ 9.62	$ 4.16
Average Cost per Enplanement: 2025-2034										

Table I.2

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Restricted Airline Cost Analysis

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Inflation Factor (a)	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020
Bond Term (b)	25										
Bond Interest Rate (c)	6.5%										
Bond Financing Cost (d)	4.0%										
Capital Costs (e)											
Airfield	29,180,000	57,375,000	57,375,000	57,375,000	24,225,000	478,000	1,002,000	1,577,000	2,206,000	2,892,000	3,640,000
Terminal Area	24,987,000	-	18,176,000	22,376,000	22,376,000	159,000	337,000	536,000	757,000	1,003,000	1,275,000
General Aviation	4,659,000	5,967,000	8,700,000	14,828,000	13,800,000	40,000	82,000	128,000	177,000	229,000	285,000
Support Facilities	-	-	20,910,000	20,910,000	17,627,000	7,252,000	168,000	265,000	373,000	492,000	622,000
Air Cargo/Aircraft Maint. Facilities	-	-	-	-	7,514,000	40,000	85,000	136,000	193,000	258,000	330,000
Miscellaneous	23,300,000	-	-	-	28,784,000	127,347,064	28,784,000	28,784,000	14,392,000	-	-
Total	82,126,000	63,342,000	105,161,000	115,489,000	114,326,000	135,316,064	30,458,000	31,426,000	18,098,000	4,874,000	6,152,000
FAA Funds											
FAA Eligible Capital Costs (f)	63,219,750	56,112,750	86,069,500	92,765,500	81,689,200	26,515,300	27,184,650	27,921,650	15,777,450	3,709,550	4,676,250
Entitlements (g)	-	-	-	-	-	-	-	2,782,583	2,855,926	2,933,547	3,015,698
Available Entitlements (j)	-	-	-	-	-	-	-	2,782,583	2,855,926	2,933,547	3,015,698
Expended Entitlements (k)	-	-	-	-	-	-	-	2,782,583	2,855,926	2,933,547	3,015,698
Remaining Potential Entitlements (l)	-	-	-	-	-	-	-	-	-	-	-
Discretionary Expenditures (m)	17,884,200	34,421,000	23,900,950	25,392,800	23,630,200	7,957,566	4,157,450	2,111,867	1,407,924	776,003	1,660,552
Eligible Costs Unfunded by AIP (n)	45,335,550	21,691,750	62,168,550	67,372,700	58,059,000	18,557,734	23,027,200	23,027,200	11,513,600	-	-
PFC Funds											
PFC Eligible Capital Costs (o)	82,126,000	63,342,000	101,525,800	108,789,800	93,708,800	128,048,314	30,256,650	31,107,000	17,649,150	4,281,350	5,401,350
PFC Eligible Less AIP Funded (p)	64,241,800	28,921,000	77,624,850	83,397,000	70,078,600	120,090,749	26,099,200	26,212,550	13,385,300	571,800	725,100
PFC Collections (q)	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	19,370,323	20,520,730
Encumbered PFC Funds (r)	-	-	-	-	-	-	-	-	-	-	-
PFC Bond Size											
PFC Bond Proceeds											
PFC Debt Service	-	-	-	-	-	-	-	-	-	-	-
Interest Earnings (s)	-	-	-	-	-	-	-	-	-	264,940	767,045
Reserve											
Debt Service Coverage											
Available PFC Funds (sa)	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	19,370,323	20,520,730
PFC Expenditures (sb)	-	-	-	-	-	15,378,469	16,291,799	17,259,372	11,660,920	194,190	245,650
Airport Costs Reimbursable by PFCs (u)	-	-	-	-	-	-	-	-	-	-	-
Reimbursements from PFCs (ub)	-	-	-	-	-	-	-	-	-	-	-
Cummulative PFC Reimbursables (ua)	-	-	-	-	-	-	-	-	-	-	-
Remaining PFC Funds (sc)	-	-	-	-	-	-	-	-	6,623,489	19,176,133	20,275,080
Remaining PFC Eligible Costs (t)	64,241,800	28,921,000	77,624,850	83,397,000	70,078,600	104,712,280	9,807,401	8,953,178	1,724,380	377,610	479,450
State Funds											
State Eligible Capital Costs (x)	42,657,100	46,350,000	64,048,000	69,212,000	37,916,200	531,900	1,116,350	1,760,100	2,466,550	3,240,100	4,085,500

Table I.2

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Restricted Airline Cost Analysis

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
State Entitlements (y)	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745
Available State Entitlements (ab)	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745
Expended State Entitlements (ac)	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745
Discretionary Expenditures (ac)	6,870,913	7,022,554	7,627,542	7,785,951	7,947,855	531,900	516,350	1,124,466	1,355,095	63,383	226,855
Remaining State Entitlements (ad)	-	-	-	-	-	-	-	-	-	-	-
Grant and PFC Summary											
Total Costs (ae)	82,126,000	63,342,000	105,161,000	115,489,000	114,326,000	135,316,064	30,458,000	31,426,000	18,098,000	4,874,000	6,152,000
Ineligible Costs (ae)	-	-	-	-	-	7,208,000	42,500	68,000	96,500	129,000	165,000
Eligible Costs (ae)	82,126,000	63,342,000	105,161,000	115,489,000	114,326,000	128,108,064	30,415,500	31,358,000	18,001,500	4,745,000	5,987,000
Available Funds(af)	24,755,113	41,443,554	31,528,492	33,178,751	31,578,055	23,867,934	21,565,599	23,913,922	24,576,739	23,856,633	26,179,580
Eligible Expenditures (ag)	24,755,113	41,443,554	31,528,492	33,178,751	31,578,055	23,867,934	21,565,599	23,913,922	17,953,250	4,680,500	5,904,500
Remaining Costs (ah)	57,370,887	21,898,446	73,632,508	82,310,249	82,747,945	111,448,130	8,892,401	7,512,078	144,750	193,500	247,500
Other Expenditures (ai)	-	-	-	1,225,600	4,000,000	30,000	63,750	102,000	144,750	193,500	247,500
Airport Estimated Costs (aj)	57,370,887	21,898,446	73,632,508	81,084,649	78,747,945	108,945,790	6,801,641	5,872,618	-	-	-
	ALL Subsequent Calculations are on Fiscal Year Basis										
Airport Expenditures (am)	57,370,887	21,898,446	73,632,508	81,084,649	78,747,945	108,945,790	6,801,641	5,872,618	-	-	-
Bond Issues											
Bond Issue - Initial Construction #1											
Bond Size (ao)	233,985,232										
Bond Proceeds (ap)	224,625,823										
Debt Service (aq)						$19,182,456	$19,182,456	$19,182,456	$19,182,456	$19,182,456	$19,182,456
Interest Earnings (ar)		7,301,876	5,022,606	2,750,115	824,558	-	-	-	-	-	-
Reserve (as)	19,182,456	19,182,456	19,182,456	19,182,456	19,182,456	19,182,456	19,182,456	19,182,456	19,182,456	19,182,456	19,182,456
Capitalized Interest (at)	7,604,520	15,209,040	15,209,040	15,209,040	15,209,040						
Available Funds (au)	197,838,847	132,560,795	100,475,915	14,384,482	(0)						
Expenditures from Proceeds (av)	57,370,887	21,898,446	73,632,508	-	-						
Remaining Funds (aw)	140,467,959	110,662,349	26,843,407	14,384,482	(0)						
Bond Issue - Initial Construction #2											
Bond Size (ao)				197,708,273							
Bond Proceeds (ap)				189,799,942							
Debt Service (aq)						$16,208,417	$16,208,417	$16,208,417	$16,208,417	$16,208,417	$16,208,417
Interest Earnings (ar)					5,517,626	-	-	-	-	-	-
Reserve (as)				16,208,417	16,208,417	16,208,417	16,208,417	16,208,417	16,208,417	16,208,417	16,208,417
Capitalized Interest (at)				6,425,519	12,851,038						
Available Funds (au)				167,166,006	78,747,945						
Expenditures from Proceeds (av)				81,084,649	78,747,945						
Remaining Funds (aw)				86,081,356	-						

Table I.2

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Restricted Airline Cost Analysis

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Bond Issue											
Bond Size (ao)						144,406,288					-
Bond Proceeds (ap)						138,630,037					-
Debt Service (aq)								$11,838,641	$11,838,641	$11,838,641	$11,838,641
Interest Earnings (ar)							3,035,649	(0)			
Reserve (as)						11,838,641	11,838,641	11,838,641	11,838,641	11,838,641	11,838,641
Capitalized Interest (at)						4,693,204	9,386,409				
Available Funds (au)						122,098,191	6,801,641				
Expenditures from Proceeds (av)						108,945,790	6,801,641				
Remaining Funds (aw)						13,152,401	(0)				
Total New Debt Service (bb)			-	-	-	28,060,078	28,060,078	39,898,719	47,229,514	47,229,514	35,390,873
Expenses											
Total O&M Expenses						14,886,683	15,770,806	16,707,436	17,699,694	18,750,882	19,864,500
Non-Operating Costs											
Debt Service (ck)						28,060,078	27,509,880	38,349,403	44,505,426	43,632,771	32,054,604
ORF/PHF Operating Expense						2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Total Costs (cn)						45,346,761	45,680,686	57,456,840	64,605,120	64,783,653	54,319,104
Revenues											
Available PFC Funds for Debt Service						$ -	$ -	$ -	$ 6,623,489	$ 19,176,133	$ 20,275,080
Non-Airline Revenues						24,420,238	25,870,561	27,407,018	29,034,725	30,759,103	32,585,891
Required Airline Revenues						25,453,309	26,593,907	37,214,996	37,759,347	31,619,134	23,681,262
Total Revenues (dx)						49,873,547	52,464,468	64,622,013	73,417,561	81,554,370	76,542,232
Total Costs (dy)			-	-	-	45,346,761	45,680,686	57,456,840	64,605,120	64,783,653	54,319,104
Net Revenue			-	-	-	4,526,787	6,783,782	7,165,174	8,812,441	16,770,717	22,223,128
Capital Outlays	-	-	-	-	-	-	-	5,872,618	-	-	-
Additional Principal Paid						-	-	-	-	-	-
CIP Reserve Balance (ec)	-	-	-	-	-	4,526,787	11,310,569	12,603,124	21,415,565	38,186,282	60,409,410
Debt Service Coverage Estimate											
Total Revenues (dx)			-	-	-	49,873,547	52,464,468	64,622,013	73,417,561	81,554,370	76,542,232
Total Operating Costs (ed)			-	-	-	14,886,683	15,770,806	16,707,436	17,699,694	18,750,882	19,864,500
Remaining Revenue (ee)			-	-	-	34,986,864	36,693,663	47,914,577	55,717,867	62,803,488	56,677,732
Debt Service (ef)			-	-	-	28,060,078	27,509,880	38,349,403	44,505,426	43,632,771	32,054,604
Coverage Ratio (eg)						1.25	1.33	1.25	1.25	1.44	1.77
Airline Cost per Enplanement						$ 10.90	$ 10.75	$ 14.20	$ 13.60	$ 10.75	$ 7.60

Table I.2

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Restricted Airline Cost Analysis

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Inflation Factor (a)	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020
Bond Term (b)										
Bond Interest Rate (c)										
Bond Financing Cost (d)										
Capital Costs (e)										
Airfield	5,091,000	6,676,000	8,403,000	10,283,000	12,327,000	14,215,000	16,189,000	16,594,000	17,009,000	17,434,000
Terminal Area	1,801,000	2,385,000	20,287,000	24,272,000	25,062,000	5,408,000	6,366,000	6,744,000	7,144,000	7,569,000
General Aviation	393,000	509,000	632,000	764,000	904,000	1,043,000	1,188,000	1,217,000	1,248,000	1,279,000
Support Facilities	874,000	1,152,000	11,126,000	11,461,000	18,533,000	2,532,000	2,932,000	3,055,000	3,184,000	3,319,000
Air Cargo/Aircraft Maint. Facilities	470,000	627,000	803,000	4,014,000	4,233,000	1,405,000	1,600,000	1,640,000	1,681,000	1,723,000
Miscellaneous	-	-	-	-	-	-	-	-	-	-
Total	8,629,000	11,349,000	41,251,000	50,794,000	61,059,000	24,603,000	28,275,000	29,250,000	30,266,000	31,324,000
FAA Funds										
FAA Eligible Capital Costs (f)	6,550,150	8,603,400	19,473,700	24,569,950	27,239,550	18,530,000	21,243,100	21,920,600	22,624,350	23,354,350
Entitlements (g)	3,102,643	3,194,665	3,292,062	3,395,148	3,504,259	3,619,748	3,741,989	3,871,380	4,008,341	4,153,317
Available Entitlements (j)	3,102,643	3,194,665	3,292,062	3,395,148	3,504,259	3,619,748	3,741,989	3,871,380	4,008,341	4,153,317
Expended Entitlements (k)	3,102,643	3,194,665	3,292,062	3,395,148	3,504,259	3,619,748	3,741,989	3,871,380	4,008,341	4,153,317
Remaining Potential Entitlements (l)	-	-	-	-	-	-	-	-	-	-
Discretionary Expenditures (m)	3,447,507	5,408,735	9,279,638	11,625,802	14,186,291	14,910,252	17,501,111	18,049,220	18,616,009	19,201,033
Eligible Costs Unfunded by AIP (n)	-	-	6,902,000	9,549,000	9,549,000	-	-	-	-	-
PFC Funds										
PFC Eligible Capital Costs (o)	7,572,450	9,954,350	26,364,100	33,607,100	36,716,700	21,520,600	24,703,100	25,524,500	26,378,700	27,266,950
PFC Eligible Less AIP Funded (p)	1,022,300	1,350,950	13,792,400	18,586,150	19,026,150	2,990,600	3,460,000	3,603,900	3,754,350	3,912,600
PFC Collections (q)	21,739,459	23,030,570	24,398,359	25,847,382	27,382,462	29,008,711	30,731,544	32,556,696	34,490,243	36,538,625
Encumbered PFC Funds (r)	-	-	-	-	-	-	-	-	-	-
PFC Bond Size										
PFC Bond Proceeds										
PFC Debt Service	-	-	-	-	-	-	-	-	-	-
Interest Earnings (s)	811,003	855,768	903,020	424,238	290,449	334,252	1,122,280	1,184,983	1,255,907	1,331,059
Reserve										
Debt Service Coverage										
Available PFC Funds (sa)	21,739,459	23,030,570	24,398,359	25,847,382	27,382,462	29,008,711	30,731,544	32,556,696	34,490,243	36,538,625
PFC Expenditures (sb)	345,270	455,070	13,792,400	18,586,150	19,026,150	951,700	1,106,980	1,159,030	1,213,780	1,271,530
Airport Costs Reimbursable by PFCs (u)	-	-	-	-	-	-	-	-	-	-
Reimbursements from PFCs (ub)	-	-	-	-	-	-	-	-	-	-
Cummulative PFC Reimbursables (ua)	-	-	-	-	-	-	-	-	-	-
Remaining PFC Funds (sc)	21,394,189	22,575,500	10,605,959	7,261,232	8,356,312	28,057,011	29,624,564	31,397,666	33,276,463	35,267,095
Remaining PFC Eligible Costs (t)	677,030	895,880	-	-	-	2,038,900	2,353,020	2,444,870	2,540,570	2,641,070
State Funds										
State Eligible Capital Costs (x)	5,724,300	7,520,550	18,111,150	22,790,150	25,128,600	16,214,750	18,594,200	19,193,200	19,815,450	20,461,450

Table I.2

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Restricted Airline Cost Analysis

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
State Entitlements (y)	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
Available State Entitlements (ab)	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
Expended State Entitlements (ac)	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
Discretionary Expenditures (ac)	580,452	972,102	8,227,081	8,375,119	8,524,432	2,790,607	3,355,528	3,497,961	3,647,301	3,804,413
Remaining State Entitlements (ad)	-	-	-	-	-	-	-	-	-	-
Grant and PFC Summary										
Total Costs (ae)	8,629,000	11,349,000	41,251,000	50,794,000	61,059,000	24,603,000	28,275,000	29,250,000	30,266,000	31,324,000
Ineligible Costs (ae)	235,000	313,500	10,361,900	10,027,400	16,805,800	702,500	800,000	820,000	840,500	861,500
Eligible Costs (ae)	8,394,000	11,035,500	30,889,100	40,766,600	44,253,200	23,900,500	27,475,000	28,430,000	29,425,500	30,462,500
Available Funds(af)	29,670,689	33,454,250	46,095,691	50,195,367	54,605,895	51,397,661	56,461,964	59,174,266	62,032,113	65,043,045
Eligible Expenditures (ag)	8,276,500	10,878,750	35,489,732	42,934,135	46,249,583	23,340,650	26,837,400	27,776,600	28,755,650	29,775,950
Remaining Costs (ah)	352,500	470,250	5,761,268	7,859,865	14,809,417	1,262,350	1,437,600	1,473,400	1,510,350	1,548,050
Other Expenditures (ai)	352,500	470,250	602,250	749,250	913,500	1,262,350	1,437,600	1,473,400	1,510,350	1,548,050
Airport Estimated Costs (aj)	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
ALL Subsequent Calculations are on Fiscal Year Basis										
Airport Expenditures (am)	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
Bond Issues										
Bond Issue - Initial Construction #1										
Bond Size (ao)	-							-		
Bond Proceeds (ap)	-							-		
Debt Service (aq)	$19,182,456	$19,182,456	$19,182,456	$19,182,456	$19,182,456	$19,182,456	$19,182,456	$19,182,456	$19,182,456	$19,182,456
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	19,182,456	19,182,456	19,182,456	19,182,456	19,182,456	19,182,456	19,182,456	19,182,456	19,182,456	19,182,456
Capitalized Interest (at)										
Available Funds (au)										
Expenditures from Proceeds (av)										
Remaining Funds (aw)										
Bond Issue - Initial Construction #2										
Bond Size (ao)										
Bond Proceeds (ap)										
Debt Service (aq)	$16,208,417	$16,208,417	$16,208,417	$16,208,417	$16,208,417	$16,208,417	$16,208,417	$16,208,417	$16,208,417	$16,208,417
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	16,208,417	16,208,417	16,208,417	16,208,417	16,208,417	16,208,417	16,208,417	16,208,417	16,208,417	16,208,417
Capitalized Interest (at)										
Available Funds (au)										
Expenditures from Proceeds (av)										
Remaining Funds (aw)										

Table I.2

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Restricted Airline Cost Analysis

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bond Issue										
Bond Size (ao)										
Bond Proceeds (ap)	-									
Debt Service (aq)	$11,838,641	$11,838,641	$11,838,641	$11,838,641	$11,838,641	$11,838,641	$11,838,641	$11,838,641	$11,838,641	$11,838,641
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	11,838,641	11,838,641	11,838,641	11,838,641	11,838,641	11,838,641	11,838,641	11,838,641	11,838,641	11,838,641
Capitalized Interest (at)										
Available Funds (au)										
Expenditures from Proceeds (av)										
Remaining Funds (aw)										
Total New Debt Service (bb)	36,054,892	36,105,121	36,159,148	36,217,262	36,279,773	36,347,011	36,419,336	36,497,131	36,580,812	36,670,822
Expenses										
Total O&M Expenses	21,044,256	22,294,078	23,618,127	25,020,812	26,506,802	28,081,046	29,748,784	31,515,569	33,387,285	35,370,161
Non-Operating Costs										
Debt Service (ck)	32,015,713	31,431,680	30,861,485	30,304,985	29,762,050	29,232,558	28,716,398	28,213,470	27,723,684	27,246,961
ORF/PHF Operating Expense	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Total Costs (cn)	55,459,969	56,125,758	56,879,612	57,725,797	58,668,852	59,713,604	60,865,182	62,129,039	63,510,968	65,017,122
Revenues										
Available PFC Funds for Debt Service	$ 21,394,189	$ 22,575,500	$ 10,605,959	$ 7,261,232	$ 8,356,312	$ 28,057,011	$ 29,624,564	$ 31,397,666	$ 33,276,463	$ 35,267,095
Non-Airline Revenues	34,521,173	36,571,391	38,743,372	41,044,348	43,481,979	46,064,381	48,800,153	51,698,402	54,768,779	58,021,507
Required Airline Revenues	23,351,521	22,497,555	34,859,372	38,664,260	38,100,371	19,005,243	18,121,208	17,113,361	16,085,589	15,036,044
Total Revenues (dx)	79,266,883	81,644,446	84,208,703	86,969,840	89,938,662	93,126,636	96,545,925	100,209,429	104,130,832	108,324,645
Total Costs (dy)	55,459,969	56,125,758	56,879,612	57,725,797	58,668,852	59,713,604	60,865,182	62,129,039	63,510,968	65,017,122
Net Revenue	23,806,914	25,518,688	27,329,091	29,244,043	31,269,810	33,413,033	35,680,743	38,080,390	40,619,864	43,307,523
Capital Outlays	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
Additional Principal Paid	18,306,914	19,918,688	27,161,031	-	-	33,413,033	-			
CIP Reserve Balance (ec)	65,909,410	71,509,410	71,509,410	97,532,793	123,262,998	123,262,998	158,943,741	197,024,131	237,643,994	280,951,517
Debt Service Coverage Estimate										
Total Revenues (dx)	79,266,883	81,644,446	84,208,703	86,969,840	89,938,662	93,126,636	96,545,925	100,209,429	104,130,832	108,324,645
Total Operating Costs (ed)	21,044,256	22,294,078	23,618,127	25,020,812	26,506,802	28,081,046	29,748,784	31,515,569	33,387,285	35,370,161
Remaining Revenue (ee)	58,222,627	59,350,368	60,590,576	61,949,028	63,431,860	65,045,590	66,797,141	68,693,859	70,743,547	72,954,484
Debt Service (ef)	32,015,713	31,431,680	30,861,485	30,304,985	29,762,050	29,232,558	28,716,398	28,213,470	27,723,684	27,246,961
Coverage Ratio (eg)	1.82	1.89	1.96	2.04	2.13	2.23	2.33	2.43	2.55	2.68
Airline Cost per Enplanement	$ 7.07	$ 6.43	$ 9.41	$ 9.85	$ 9.16	$ 4.31	$ 3.88	$ 3.46	$ 3.07	$ 2.71

Table I.3

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: High Forecast Analysis

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Inflation Factor (a)	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020
Bond Term (b)	25										
Bond Interest Rate (c)	6.5%										
Bond Financing Cost (d)	4.0%										
Capital Costs (e)											
Airfield	40,156,000	114,750,000	114,750,000	76,500,000	86,700,000	1,118,000	1,760,000	2,461,000	3,227,000	4,062,000	4,970,000
Terminal Area	33,075,000	-	25,245,000	30,845,000	30,845,000	373,000	592,000	837,000	1,108,000	1,409,000	1,741,000
General Aviation	6,438,000	9,945,000	12,678,000	19,244,000	24,344,000	93,000	145,000	200,000	259,000	322,000	389,000
Support Facilities	-	-	35,300,000	35,300,000	34,981,000	186,000	295,000	414,000	546,000	691,000	849,000
Air Cargo/Aircraft Maint. Facilities	-	-	-	-	10,017,000	93,000	149,000	212,000	283,000	362,000	451,000
Miscellaneous	34,680,000	-	-	-	33,864,000	132,427,064	33,864,000	33,864,000	33,864,000	-	-
Total	114,349,000	124,695,000	187,973,000	161,889,000	220,751,000	134,290,064	36,805,000	37,988,000	39,287,000	6,846,000	8,400,000
FAA Funds											
FAA Eligible Capital Costs (f)	88,718,400	110,733,750	144,225,000	117,524,500	155,981,800	31,902,800	32,724,850	33,624,500	34,610,400	5,210,550	6,384,750
Entitlements (g)	-	-	-	-	-	-	-	3,106,245	3,270,722	3,452,745	3,654,207
Available Entitlements (j)	-	-	-	-	-	-	-	3,106,245	3,270,722	3,452,745	3,654,207
Expended Entitlements (k)	-	-	-	-	-	-	-	3,106,245	3,270,722	3,452,745	3,654,207
Remaining Potential Entitlements (l)	-	-	-	-	-	-	-	-	-	-	-
Discretionary Expenditures (m)	24,877,600	35,882,130	43,332,100	35,437,800	47,210,200	8,382,315	5,633,650	3,427,055	4,248,478	1,757,805	2,730,543
Eligible Costs Unfunded by AIP (n)	63,840,800	74,851,620	100,892,900	82,086,700	108,771,600	23,520,485	27,091,200	27,091,200	27,091,200	-	-
PFC Funds											
PFC Eligible Capital Costs (o)	114,349,000	124,695,000	168,534,000	139,167,000	176,514,000	134,066,614	36,451,000	37,489,950	38,629,800	6,013,550	7,374,950
PFC Eligible Less AIP Funded (p)	89,471,400	88,812,870	125,201,900	103,729,200	129,303,800	125,684,299	30,817,350	30,956,650	31,110,600	803,000	990,200
PFC Collections (q)	-	-	-	-	-	19,312,209	21,412,711	23,741,676	26,323,951	29,187,090	32,361,638
Encumbered PFC Funds (r)	-	-	-	-	-	-	-	-	-	-	-
PFC Bond Size											
PFC Bond Proceeds											
PFC Debt Service	-	-	-	-	-	-	-	-	-	-	-
Interest Earnings (s)	-	-	-	-	-	-	-	-	-	-	1,156,572
Reserve											
Debt Service Coverage											
Available PFC Funds (sa)	-	-	-	-	-	19,312,209	21,412,711	23,741,676	26,323,951	29,187,090	32,361,638
PFC Expenditures (sb)	-	-	-	-	-	19,312,209	21,412,711	23,741,676	26,323,951	272,790	335,400
Airport Costs Reimbursable by PFCs (u)	-	-	-	-	-	-	-	-	-	-	-
Reimbursements from PFCs (ub)	-	-	-	-	-	-	-	-	-	-	-
Cummulative PFC Reimbursables (ua)	-	-	-	-	-	-	-	-	-	-	-
Remaining PFC Funds (sc)	-	-	-	-	-	-	-	-	-	28,914,300	32,026,238
Remaining PFC Eligible Costs (t)	89,471,400	88,812,870	125,201,900	103,729,200	129,303,800	106,372,091	9,404,639	7,214,974	4,786,649	530,210	654,800
State Funds											
State Eligible Capital Costs (x)	58,230,500	92,250,000	113,482,500	88,965,500	96,160,900	1,243,650	1,961,250	2,747,300	3,608,850	4,551,100	5,578,250

Table I.3

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: High Forecast Analysis

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
State Entitlements (y)	-	-	-	-	-	-	600,000	665,259	737,617	817,844	906,797
Available State Entitlements (ab)	-	-	-	-	-	-	600,000	665,259	737,617	817,844	906,797
Expended State Entitlements (ac)	-	-	-	-	-	-	600,000	665,259	737,617	817,844	906,797
Discretionary Expenditures (ac)	6,870,913	7,022,554	7,627,542	7,785,951	7,947,855	1,243,650	1,361,250	2,082,041	2,871,233	273,316	434,803
Remaining State Entitlements (ad)	-	-	-	-	-	-	-	-	-	-	-
Grant and PFC Summary											
Total Costs (ae)	114,349,000	124,695,000	187,973,000	161,889,000	220,751,000	134,290,064	36,805,000	37,988,000	39,287,000	6,846,000	8,400,000
Ineligible Costs (ae)	-	-	-	-	24,526,000	46,500	74,500	106,000	141,500	181,000	225,500
Eligible Costs (ae)	114,349,000	124,695,000	187,973,000	161,889,000	196,225,000	134,243,564	36,730,500	37,882,000	39,145,500	6,665,000	8,174,500
Available Funds(af)	31,748,513	42,904,684	50,959,642	43,223,751	55,158,055	28,938,174	29,007,611	33,022,276	37,452,001	35,488,800	40,087,988
Eligible Expenditures (ag)	31,748,513	42,904,684	50,959,642	43,223,751	55,158,055	28,938,174	29,007,611	33,022,276	37,452,001	6,574,500	8,061,750
Remaining Costs (ah)	82,600,487	81,790,316	137,013,358	118,665,249	165,592,945	105,351,891	7,797,389	4,965,724	1,834,999	271,500	338,250
Other Expenditures (ai)	-	-	-	1,313,200	5,313,200	69,750	111,750	159,000	212,250	271,500	338,250
Airport Estimated Costs (aj)	82,600,487	81,790,316	137,013,358	117,352,049	160,279,745	102,844,951	5,794,889	3,513,144	982,839	-	-
	ALL Subsequent Calculations are on Fiscal Year Basis										
Airport Expenditures (am)	82,600,487	81,790,316	137,013,358	117,352,049	160,279,745	102,844,951	5,794,889	3,513,144	982,839	-	-
Bond Issues											
Bond Issue - Initial Construction #1											
Bond Size (ao)	459,871,933										
Bond Proceeds (ap)	441,477,056										
Debt Service (aq)						$37,700,982	$37,700,982	$37,700,982	$37,700,982	$37,700,982	$37,700,982
Interest Earnings (ar)		14,954,136	10,314,633	5,248,268	1,623,592	-	-	-	-	-	-
Reserve (as)	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982
Capitalized Interest (at)	14,945,838	29,891,676	29,891,676	29,891,676	29,891,676						
Available Funds (au)	388,830,236	291,292,209	189,924,850	28,268,084	-						
Expenditures from Proceeds (av)	82,600,487	81,790,316	137,013,358	-	-						
Remaining Funds (aw)	306,229,748	209,501,893	52,911,492	28,268,084	-						
Bond Issue - Initial Construction #2											
Bond Size (ao)				502,391,854							
Bond Proceeds (ap)				482,296,180							
Debt Service (aq)							$41,186,828	$41,186,828	$41,186,828	$41,186,828	$41,186,828
Interest Earnings (ar)					15,794,515	5,211,555	-	-	-	-	-
Reserve (as)				41,186,828	41,186,828	41,186,828	41,186,828	41,186,828	41,186,828	41,186,828	41,186,828
Capitalized Interest (at)				16,327,735	32,655,470	32,655,470					
Available Funds (au)				424,781,616	290,568,611	102,844,951					
Expenditures from Proceeds (av)				117,352,049	160,279,745	102,844,951					
Remaining Funds (aw)				307,429,567	130,288,866	-					

Table I.3

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: High Forecast Analysis

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Bond Issue											
Bond Size (ao)											-
Bond Proceeds (ap)											-
Debt Service (aq)											
Interest Earnings (ar)											
Reserve (as)											-
Capitalized Interest (at)											
Available Funds (au)											-
Expenditures from Proceeds (av)											-
Remaining Funds (aw)											-
Total New Debt Service (bb)			-	-	-	70,356,453	70,356,453	70,356,453	78,887,810	78,887,810	78,887,810
Expenses											
Total O&M Expenses						21,993,678	24,385,832	27,038,169	29,978,990	33,239,670	36,855,000
Non-Operating Costs											
Debt Service (ck)						70,356,453	68,976,914	67,624,426	74,337,746	72,880,143	71,451,120
ORF/PHF Expense (cl)						2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Total Costs (cn)						94,750,131	95,762,746	97,062,595	106,716,736	108,519,813	110,706,120
Revenues											
Proceeds from Sale of Land						$ -	$ -	$ -	$ -	$ -	$ -
Available PFC Funds for Debt Service						$ -	$ -	$ -	$ -	$ 28,914,300	$ 32,026,238
Non-Airline Revenues						34,074,245	37,780,348	41,889,547	46,445,685	51,497,374	57,098,513
Required Airline Revenues						75,554,749	72,535,939	69,524,618	76,176,929	62,678,603	60,757,687
Total Revenues (dx)						109,628,994	110,316,287	111,414,165	122,622,615	143,090,277	149,882,438
Total Costs (dy)			-	-	-	94,750,131	95,762,746	97,062,595	106,716,736	108,519,813	110,706,120
Net Revenue			-	-	-	14,878,863	14,553,541	14,351,570	15,905,879	34,570,464	39,176,318
Capital Outlays	-	-	-	-	-	-	5,794,889	3,513,144	982,839	-	-
Additional Principal Paid									14,923,041	34,570,464	39,176,318
CIP Reserve Balance (ec)	-	-	-	-	-	14,878,863	23,637,516	34,475,941	34,475,941	34,475,941	34,475,941
Debt Service Coverage Estimate											
Total Revenues (dx)			-	-	-	109,628,994	110,316,287	111,414,165	122,622,615	143,090,277	149,882,438
Total Operating Costs (ed)			-	-	-	21,993,678	24,385,832	27,038,169	29,978,990	33,239,670	36,855,000
Remaining Revenue (ee)			-	-	-	87,635,316	85,930,456	84,375,995	92,643,625	109,850,607	113,027,438
Debt Service (ef)			-	-	-	70,356,453	68,976,914	67,624,426	74,337,746	72,880,143	71,451,120
Coverage Ratio (eg)						1.25	1.25	1.25	1.25	1.51	1.58
Airline Cost per Enplanement						$ 25.76	$ 22.31	$ 19.29	$ 19.06	$ 14.14	$ 12.36

Table I.3

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: High Forecast Analysis

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Inflation Factor (a)	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020
Bond Term (b)										
Bond Interest Rate (c)										
Bond Financing Cost (d)										
Capital Costs (e)										
Airfield	5,958,000	7,812,000	9,833,000	12,034,000	14,426,000	16,635,000	18,945,000	19,419,000	19,904,000	20,402,000
Terminal Area	2,108,000	2,791,000	20,804,000	24,910,000	25,834,000	6,329,000	7,450,000	7,892,000	8,361,000	8,857,000
General Aviation	460,000	595,000	740,000	894,000	1,058,000	1,220,000	1,390,000	1,424,000	1,460,000	1,497,000
Support Facilities	1,023,000	1,348,000	11,374,000	11,766,000	18,901,000	2,963,000	3,431,000	3,576,000	3,726,000	3,884,000
Air Cargo/Aircraft Maint. Facilities	550,000	734,000	939,000	4,184,000	4,441,000	1,644,000	1,872,000	1,919,000	1,967,000	2,016,000
Miscellaneous	-	-	-	-	-	-	-	-	-	-
Total	10,099,000	13,280,000	43,690,000	53,788,000	64,660,000	28,791,000	33,088,000	34,230,000	35,418,000	36,656,000
FAA Funds										
FAA Eligible Capital Costs (f)	7,665,950	10,067,050	21,320,200	26,833,600	29,958,150	21,684,250	24,859,250	25,652,850	26,475,350	27,330,050
Entitlements (g)	3,877,210	4,124,082	4,397,402	4,700,031	5,035,142	5,406,248	5,817,247	6,272,459	6,776,674	7,335,201
Available Entitlements (j)	3,877,210	4,124,082	4,397,402	4,700,031	5,035,142	5,406,248	5,817,247	6,272,459	6,776,674	7,335,201
Expended Entitlements (k)	3,877,210	4,124,082	4,397,402	4,700,031	5,035,142	5,406,248	5,817,247	6,272,459	6,776,674	7,335,201
Remaining Potential Entitlements (l)	-	-	-	-	-	-	-	-	-	-
Discretionary Expenditures (m)	3,788,740	5,942,968	10,020,798	12,584,569	15,374,008	16,278,002	19,042,003	19,380,391	19,698,676	19,994,849
Eligible Costs Unfunded by AIP (n)	-	-	6,902,000	9,549,000	9,549,000	-	-	-	-	-
PFC Funds										
PFC Eligible Capital Costs (o)	8,862,400	11,648,150	28,502,250	36,230,600	39,870,100	25,184,150	28,908,300	29,870,300	30,869,050	31,908,450
PFC Eligible Less AIP Funded (p)	1,196,450	1,581,100	14,084,050	18,946,000	19,460,950	3,499,900	4,049,050	4,217,450	4,393,700	4,578,400
PFC Collections (q)	35,881,469	39,784,135	44,111,277	48,909,063	54,228,682	60,126,893	66,666,626	73,917,656	81,957,347	90,871,481
Encumbered PFC Funds (r)	-	-	-	-	-	-	-	-	-	-
PFC Bond Size										
PFC Bond Proceeds										
PFC Debt Service	-	-	-	-	-	-	-	-	-	-
Interest Earnings (s)	1,281,050	1,419,094	1,570,066	1,201,089	1,198,523	1,390,709	2,360,526	2,614,847	2,902,451	3,221,475
Reserve										
Debt Service Coverage										
Available PFC Funds (sa)	35,881,469	39,784,135	44,111,277	48,909,063	54,228,682	60,126,893	66,666,626	73,917,656	81,957,347	90,871,481
PFC Expenditures (sb)	404,110	532,490	14,084,050	18,946,000	19,460,950	1,113,750	1,295,450	1,356,380	1,420,480	1,487,940
Airport Costs Reimbursable by PFCs (u)	-	-	-	-	-	-	-	-	-	-
Reimbursements from PFCs (ub)	-	-	-	-	-	-	-	-	-	-
Cummulative PFC Reimbursables (ua)	-	-	-	-	-	-	-	-	-	-
Remaining PFC Funds (sc)	35,477,359	39,251,645	30,027,227	29,963,063	34,767,732	59,013,143	65,371,176	72,561,276	80,536,867	89,383,541
Remaining PFC Eligible Costs (t)	792,340	1,048,610	-	-	-	2,386,150	2,753,600	2,861,070	2,973,220	3,090,460
State Funds										
State Eligible Capital Costs (x)	6,699,400	8,800,100	19,725,650	24,769,950	27,506,800	18,975,000	21,759,500	22,460,950	23,188,450	23,944,600

Table I.3

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: High Forecast Analysis

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
State Entitlements (y)	1,005,425	1,114,781	1,236,031	1,370,468	1,519,528	1,684,800	1,868,048	2,071,227	2,296,505	2,546,286
Available State Entitlements (ab)	1,005,425	1,114,781	1,236,031	1,370,468	1,519,528	1,684,800	1,868,048	2,071,227	2,296,505	2,546,286
Expended State Entitlements (ac)	1,005,425	1,114,781	1,236,031	1,370,468	1,519,528	1,684,800	1,868,048	2,071,227	2,296,505	2,546,286
Discretionary Expenditures (ac)	611,015	1,015,179	7,889,601	7,956,567	8,013,355	2,831,200	3,383,252	3,425,493	3,458,415	3,480,324
Remaining State Entitlements (ad)	-	-	-	-	-	-	-	-	-	-
Grant and PFC Summary										
Total Costs (ae)	10,099,000	13,280,000	43,690,000	53,788,000	64,660,000	28,791,000	33,088,000	34,230,000	35,418,000	36,656,000
Ineligible Costs (ae)	275,000	367,000	10,479,500	10,088,400	16,879,400	822,000	936,000	959,500	983,500	1,008,000
Eligible Costs (ae)	9,824,000	12,913,000	33,210,500	43,699,600	47,780,600	27,969,000	32,152,000	33,270,500	34,434,500	35,648,000
Available Funds(af)	45,163,859	51,981,145	67,655,109	75,520,698	84,170,715	86,327,143	96,777,176	105,067,226	114,187,617	124,228,141
Eligible Expenditures (ag)	9,686,500	12,729,500	37,627,882	45,557,635	49,402,983	27,314,000	31,406,000	32,505,950	33,650,750	34,844,600
Remaining Costs (ah)	412,500	550,500	6,062,118	8,230,365	15,257,017	1,477,000	1,682,000	1,724,050	1,767,250	1,811,400
Other Expenditures (ai)	412,500	550,500	704,250	876,750	1,069,500	1,477,000	1,682,000	1,724,050	1,767,250	1,811,400
Airport Estimated Costs (aj)	-	-	196,660	3,255,680	3,303,520	-	-	-	-	-
ALL Subsequent Calculations are on Fiscal Year Basis										
Airport Expenditures (am)	-	-	196,660	3,255,680	3,303,520	-	-	-	-	-
Bond Issues										
Bond Issue - Initial Construction #1										
Bond Size (ao)	-							-		
Bond Proceeds (ap)	-							-		
Debt Service (aq)	$37,700,982	$37,700,982	$37,700,982	$37,700,982	$37,700,982	$37,700,982	$37,700,982	$37,700,982	$37,700,982	$37,700,982
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982
Capitalized Interest (at)										
Available Funds (au)										
Expenditures from Proceeds (av)										
Remaining Funds (aw)										
Bond Issue - Initial Construction #2										
Bond Size (ao)										
Bond Proceeds (ap)										
Debt Service (aq)	$41,186,828	$41,186,828	$41,186,828	$41,186,828	$41,186,828	$41,186,828	$41,186,828	$41,186,828	$41,186,828	$41,186,828
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	41,186,828	41,186,828	41,186,828	41,186,828	41,186,828	41,186,828	41,186,828	41,186,828	41,186,828	41,186,828
Capitalized Interest (at)										
Available Funds (au)										
Expenditures from Proceeds (av)										
Remaining Funds (aw)										

Table I.3

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: High Forecast Analysis

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bond Issue										
Bond Size (ao)										
Bond Proceeds (ap)	-									
Debt Service (aq)		$0	$0	$0	$0	$0	$0	$0	$0	$0
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	-	-	-	-	-	-	-	-	-	-
Capitalized Interest (at)	-									
Available Funds (au)	-	-	-	-	-	-	-	-	-	-
Expenditures from Proceeds (av)	-	-	-	-	-	-	-	-	-	-
Remaining Funds (aw)	-	-	-	-	-	-	-	-	-	-
Total New Debt Service (bb)	80,575,135	80,702,769	80,840,057	80,987,729	81,146,573	81,317,431	81,501,214	81,698,898	81,911,536	80,791,539
Expenses										
Total O&M Expenses	40,863,553	45,308,099	50,236,057	55,700,008	61,758,248	68,475,416	75,923,180	84,181,003	93,336,994	103,488,840
Non-Operating Costs										
Debt Service (ck)	71,548,414	70,256,617	68,996,210	67,766,909	66,568,453	65,400,604	64,263,151	63,155,906	62,078,707	60,029,304
ORF/PHF Expense (cl)	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Total Costs (cn)	114,811,967	117,964,715	121,632,267	125,866,917	130,726,701	136,276,020	142,586,331	149,736,909	157,815,701	165,918,144
Revenues										
Proceeds from Sale of Land	$ -	$ -								
Available PFC Funds for Debt Service	$ 35,477,359	$ 39,251,645	$ 30,027,227	$ 29,963,063	$ 34,767,732	$ 59,013,143	$ 65,371,176	$ 72,561,276	$ 80,536,867	$ 89,383,541
Non-Airline Revenues	63,308,862	70,194,683	77,829,444	86,294,603	95,680,480	106,087,217	117,625,848	130,419,484	144,604,626	160,332,623
Required Airline Revenues	60,203,767	58,329,602	69,821,960	72,558,420	70,870,966	50,232,714	48,021,754	45,574,088	42,997,816	39,336,120
Total Revenues (dx)	158,989,987	167,775,930	177,678,630	188,816,086	201,319,178	215,333,075	231,018,778	248,554,848	268,139,310	289,052,283
Total Costs (dy)	114,811,967	117,964,715	121,632,267	125,866,917	130,726,701	136,276,020	142,586,331	149,736,909	157,815,701	165,918,144
Net Revenue	44,178,020	49,811,215	56,046,363	62,949,169	70,592,478	79,057,055	88,432,447	98,817,939	110,323,609	123,134,140
Capital Outlays	-	-	196,660	3,255,680	3,303,520	-	-	-	-	-
Additional Principal Paid	44,178,020	-	-	-	-	-	-			
CIP Reserve Balance (ec)	34,475,941	84,287,156	140,136,859	199,830,348	267,119,306	346,176,360	434,608,807	533,426,746	643,750,355	766,884,495
Debt Service Coverage Estimate										
Total Revenues (dx)	158,989,987	167,775,930	177,678,630	188,816,086	201,319,178	215,333,075	231,018,778	248,554,848	268,139,310	289,052,283
Total Operating Costs (ed)	40,863,553	45,308,099	50,236,057	55,700,008	61,758,248	68,475,416	75,923,180	84,181,003	93,336,994	103,488,840
Remaining Revenue (ee)	118,126,434	122,467,831	127,442,573	133,116,078	139,560,930	146,857,659	155,095,598	164,373,844	174,802,316	185,563,443
Debt Service (ef)	71,548,414	70,256,617	68,996,210	67,766,909	66,568,453	65,400,604	64,263,151	63,155,906	62,078,707	60,029,304
Coverage Ratio (eg)	1.65	1.74	1.85	1.96	2.10	2.25	2.41	2.60	2.82	3.09
Airline Cost per Enplanement	$ 11.05	$ 9.66	$ 10.42	$ 9.77	$ 8.61	$ 5.50	$ 4.74	$ 4.06	$ 3.46	$ 2.85

Table I.4

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Enhanced Private Funding

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Inflation Factor (a)	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020
Bond Term (b)	25										
Bond Interest Rate (c)	6.5%										
Bond Financing Cost (d)	4.0%										
Capital Costs (e)											
Airfield	38,148,000	109,013,000	109,013,000	72,675,000	82,365,000	478,000	1,002,000	1,577,000	2,206,000	2,892,000	3,640,000
Terminal Area	31,421,000	-	23,983,000	29,303,000	29,303,000	159,000	337,000	536,000	757,000	1,003,000	1,275,000
General Aviation	6,116,000	9,448,000	12,045,000	18,283,000	23,128,000	40,000	82,000	128,000	177,000	229,000	285,000
Support Facilities	-	-	33,535,000	33,535,000	33,231,000	80,000	168,000	265,000	373,000	492,000	622,000
Air Cargo/Aircraft Maint. Facilities	-	-	-	-	9,516,000	40,000	85,000	136,000	193,000	258,000	330,000
Miscellaneous	32,946,000	-	-	-	32,171,000	130,734,064	32,171,000	32,171,000	32,171,000	-	-
Total	108,631,000	118,461,000	178,576,000	153,796,000	209,714,000	131,531,064	33,845,000	34,813,000	35,877,000	4,874,000	6,152,000
FAA Funds											
FAA Eligible Capital Costs (f)	84,282,100	105,197,700	137,015,450	111,649,750	148,183,600	29,563,600	30,232,950	30,969,950	31,778,550	3,709,550	4,676,250
Entitlements (g)	-	-	-	-	-	-	-	2,782,583	2,855,926	2,933,547	3,015,698
Available Entitlements (j)	-	-	-	-	-	-	-	2,782,583	2,855,926	2,933,547	3,015,698
Expended Entitlements (k)	-	-	-	-	-	-	-	2,782,583	2,855,926	2,933,547	3,015,698
Remaining Potential Entitlements (l)	-	-	-	-	-	-	-	-	-	-	-
Discretionary Expenditures (m)	23,633,600	34,086,950	41,165,850	33,666,200	44,849,800	7,219,000	4,496,150	2,450,567	3,185,824	776,003	1,660,552
Eligible Costs Unfunded by AIP (n)	60,648,500	71,110,750	95,849,600	77,983,550	103,333,800	22,344,600	25,736,800	25,736,800	25,736,800	-	-
PFC Funds											
PFC Eligible Capital Costs (o)	108,631,000	118,461,000	160,109,400	132,210,400	167,689,400	131,435,314	33,643,650	34,494,000	35,428,150	4,281,350	5,401,350
PFC Eligible Less AIP Funded (p)	84,997,400	84,374,050	118,943,550	98,544,200	122,839,600	124,216,314	29,147,500	29,260,850	29,386,400	571,800	725,100
PFC Collections (q)	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	19,370,323	20,520,730
Encumbered PFC Funds (r)	-	-	-	-	-	-	-	-	-	-	-
PFC Bond Size											
PFC Bond Proceeds											
PFC Debt Service	-	-	-	-	-	-	-	-	-	-	-
Interest Earnings (s)	-	-	-	-	-	-	-	-	-	-	767,045
Reserve											
Debt Service Coverage											
Available PFC Funds (sa)	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	19,370,323	20,520,730
PFC Expenditures (sb)	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	194,190	245,650
Airport Costs Reimbursable by PFCs (u)	-	-	-	-	-	-	-	-	-	-	-
Reimbursements from PFCs (ub)	-	-	-	-	-	-	-	-	-	-	-
Cummulative PFC Reimbursables (ua)	-	-	-	-	-	-	-	-	-	-	-
Remaining PFC Funds (sc)	-	-	-	-	-	-	-	-	-	19,176,133	20,275,080
Remaining PFC Eligible Costs (t)	84,997,400	84,374,050	118,943,550	98,544,200	122,839,600	108,837,845	12,855,701	12,001,478	11,101,991	377,610	479,450
State Funds											
State Eligible Capital Costs (x)	55,318,700	87,660,400	107,853,900	84,562,500	91,404,300	531,900	1,116,350	1,760,100	2,466,550	3,240,100	4,085,500

Table I.4

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Enhanced Private Funding

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
State Entitlements (y)	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745
Available State Entitlements (ab)	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745
Expended State Entitlements (ac)	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745
Discretionary Expenditures (ac)	6,870,913	7,022,554	7,627,542	7,785,951	7,947,855	531,900	516,350	1,124,466	1,793,165	63,383	226,855
Remaining State Entitlements (ad)	-	-	-	-	-	-	-	-	-	-	-
Grant and PFC Summary											
Total Costs (ae)	108,631,000	118,461,000	178,576,000	153,796,000	209,714,000	131,531,064	33,845,000	34,813,000	35,877,000	4,874,000	6,152,000
Ineligible Costs (ae)	-	-	-	-	23,299,000	20,000	42,500	68,000	96,500	129,000	165,000
Eligible Costs (ae)	108,631,000	118,461,000	178,576,000	153,796,000	186,415,000	131,511,064	33,802,500	34,745,000	35,780,500	4,745,000	5,987,000
Available Funds(af)	30,504,513	41,109,504	48,793,392	41,452,151	52,797,655	23,129,369	21,904,299	24,252,622	26,792,709	23,856,633	26,179,580
Eligible Expenditures (ag)	30,504,513	41,109,504	48,793,392	41,452,151	52,797,655	23,129,369	21,904,299	24,252,622	26,792,709	4,680,500	5,904,500
Remaining Costs (ah)	78,126,487	77,351,496	129,782,608	112,343,849	156,916,345	108,401,695	11,940,701	10,560,378	9,084,291	193,500	247,500
Other Expenditures (ai)	17,503,900	-	30,122,400	31,370,000	47,721,200	30,000	63,750	102,000	144,750	193,500	247,500
Airport Estimated Costs (aj)	60,622,587	77,351,496	99,660,208	80,973,849	109,195,145	105,560,655	9,511,241	8,582,218	7,599,711	-	-
	ALL Subsequent Calculations are on Fiscal Year Basis										
Airport Expenditures (am)	60,622,587	77,351,496	99,660,208	80,973,849	109,195,145	105,560,655	9,511,241	8,582,218	7,599,711	-	-
Bond Issues											
Bond Issue - Initial Construction #1											
Bond Size (ao)	362,787,768										
Bond Proceeds (ap)	348,276,257										
Debt Service (aq)						$29,741,879	$29,741,879	$29,741,879	$29,741,879	$29,741,879	$29,741,879
Interest Earnings (ar)		11,887,949	8,063,953	3,979,508	1,283,925	-	-	-	-	-	-
Reserve (as)	29,741,879	29,741,879	29,741,879	29,741,879	29,741,879	29,741,879	29,741,879	29,741,879	29,741,879	29,741,879	29,741,879
Capitalized Interest (at)	11,790,602	23,581,205	23,581,205	23,581,205	23,581,205						
Available Funds (au)	306,743,776	234,427,933	141,559,184	22,297,280	0						
Expenditures from Proceeds (av)	60,622,587	77,351,496	99,660,208	-	-						
Remaining Funds (aw)	246,121,189	157,076,437	41,898,976	22,297,280	0						
Bond Issue - Initial Construction #2											
Bond Size (ao)				350,091,437							
Bond Proceeds (ap)				336,087,779							
Debt Service (aq)							$28,701,014	$28,701,014	$28,701,014	$28,701,014	$28,701,014
Interest Earnings (ar)					11,596,475	4,935,254	0	-	-	-	-
Reserve (as)				-	-	-	-	-	-	-	-
Capitalized Interest (at)				11,377,972	22,755,943	22,755,943					
Available Funds (au)				324,709,808	232,576,489	105,560,655					
Expenditures from Proceeds (av)				80,973,849	109,195,145	105,560,655					
Remaining Funds (aw)				243,735,958	123,381,345	0					

Table I.4

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Enhanced Private Funding

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Bond Issue											
Bond Size (ao)											-
Bond Proceeds (ap)											-
Debt Service (aq)											
Interest Earnings (ar)											
Reserve (as)											-
Capitalized Interest (at)											
Available Funds (au)											-
Expenditures from Proceeds (av)											-
Remaining Funds (aw)											-
Total New Debt Service (bb)			-	-	-	52,497,822	52,497,822	52,497,822	58,442,893	58,442,893	58,442,893
Expenses											
Total O&M Expenses						11,383,934	12,060,028	12,776,275	13,535,060	14,338,910	15,190,500
Non-Operating Costs											
Debt Service (ck)						52,497,822	51,468,453	50,459,268	55,072,043	53,992,199	52,933,529
ORF/PHF Expense (cl)						2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Total Costs (cn)						66,281,756	65,928,481	65,635,542	71,007,104	70,731,109	70,524,029
Revenues											
Proceeds from Sale of Land						$ -	$ -	$ -	$ -	$ -	$ -
Available PFC Funds for Debt Service						$ -	$ -	$ -	$ -	$ 19,176,133	$ 20,275,080
Non-Airline Revenues						18,993,519	20,121,547	21,316,569	22,582,564	23,923,746	25,344,582
Required Airline Revenues						58,185,462	56,493,694	54,648,956	59,804,583	41,478,791	39,983,454
Total Revenues (dx)						77,178,981	76,615,241	75,965,525	82,387,147	84,578,670	85,603,115
Total Costs (dy)			-	-	-	66,281,756	65,928,481	65,635,542	71,007,104	70,731,109	70,524,029
Net Revenue			-	-	-	10,897,225	10,686,761	10,329,983	11,380,043	13,847,561	15,079,086
Capital Outlays	-	-	-	-	-	-	9,511,241	8,582,218	7,599,711	-	-
Additional Principal Paid						-	1,175,519		3,780,332	16,000,000	15,079,086
CIP Reserve Balance (ec)	-	-	-	-	-	10,897,225	10,897,225	12,644,989	12,644,989	10,492,550	10,492,550
Debt Service Coverage Estimate											
Total Revenues (dx)			-	-	-	77,178,981	76,615,241	75,965,525	82,387,147	84,578,670	85,603,115
Total Operating Costs (ed)			-	-	-	11,383,934	12,060,028	12,776,275	13,535,060	14,338,910	15,190,500
Remaining Revenue (ee)			-	-	-	65,795,047	64,555,213	63,189,250	68,852,087	70,239,761	70,412,615
Debt Service (ef)			-	-	-	52,497,822	51,468,453	50,459,268	55,072,043	53,992,199	52,933,529
Coverage Ratio (eg)						1.25	1.25	1.25	1.25	1.30	1.33
Airline Cost per Enplanement						$ 24.92	$ 22.84	$ 20.85	$ 21.54	$ 14.10	$ 12.83

Table I.4

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Enhanced Private Funding

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Inflation Factor (a)	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020
Bond Term (b)										
Bond Interest Rate (c)										
Bond Financing Cost (d)										
Capital Costs (e)										
Airfield	5,091,000	6,676,000	8,403,000	10,283,000	12,327,000	14,215,000	16,189,000	16,594,000	17,009,000	17,434,000
Terminal Area	1,801,000	2,385,000	19,424,000	23,246,000	24,036,000	5,408,000	6,366,000	6,744,000	7,144,000	7,569,000
General Aviation	393,000	509,000	632,000	764,000	904,000	1,043,000	1,188,000	1,217,000	1,248,000	1,279,000
Support Facilities	874,000	1,152,000	10,642,000	10,977,000	17,714,000	2,532,000	2,932,000	3,055,000	3,184,000	3,319,000
Air Cargo/Aircraft Maint. Facilities	470,000	627,000	803,000	3,862,000	4,081,000	1,405,000	1,600,000	1,640,000	1,681,000	1,723,000
Miscellaneous	-	-	-	-	-	-	-	-	-	-
Total	8,629,000	11,349,000	39,904,000	49,132,000	59,062,000	24,603,000	28,275,000	29,250,000	30,266,000	31,324,000
FAA Funds										
FAA Eligible Capital Costs (f)	6,550,150	8,603,400	19,042,200	24,005,650	26,675,250	18,530,000	21,243,100	21,920,600	22,624,350	23,354,350
Entitlements (g)	3,102,643	3,194,665	3,292,062	3,395,148	3,504,259	3,619,748	3,741,989	3,871,380	4,008,341	4,153,317
Available Entitlements (j)	3,102,643	3,194,665	3,292,062	3,395,148	3,504,259	3,619,748	3,741,989	3,871,380	4,008,341	4,153,317
Expended Entitlements (k)	3,102,643	3,194,665	3,292,062	3,395,148	3,504,259	3,619,748	3,741,989	3,871,380	4,008,341	4,153,317
Remaining Potential Entitlements (l)	-	-	-	-	-	-	-	-	-	-
Discretionary Expenditures (m)	3,447,507	5,408,735	9,193,338	11,539,502	14,099,991	14,910,252	17,501,111	18,049,220	18,616,009	19,201,033
Eligible Costs Unfunded by AIP (n)	-	-	6,556,800	9,071,000	9,071,000	-	-	-	-	-
PFC Funds										
PFC Eligible Capital Costs (o)	7,572,450	9,954,350	25,673,700	32,696,700	35,806,300	21,520,600	24,703,100	25,524,500	26,378,700	27,266,950
PFC Eligible Less AIP Funded (p)	1,022,300	1,350,950	13,188,300	17,762,050	18,202,050	2,990,600	3,460,000	3,603,900	3,754,350	3,912,600
PFC Collections (q)	21,739,459	23,030,570	24,398,359	25,847,382	27,382,462	29,008,711	30,731,544	32,556,696	34,490,243	36,538,625
Encumbered PFC Funds (r)	-	-	-	-	-	-	-	-	-	-
PFC Bond Size										
PFC Bond Proceeds										
PFC Debt Service	-	-	-	-	-	-	-	-	-	-
Interest Earnings (s)	811,003	855,768	903,020	448,402	542,119	419,476	1,121,863	1,184,507	1,255,420	1,330,559
Reserve										
Debt Service Coverage										
Available PFC Funds (sa)	21,739,459	23,030,570	24,398,359	25,847,382	27,382,462	29,008,711	30,731,544	32,556,696	34,490,243	36,538,625
PFC Expenditures (sb)	345,270	455,070	13,188,300	12,294,399	16,895,559	962,130	1,118,860	1,171,200	1,226,260	1,284,320
Airport Costs Reimbursable by PFCs (u)	-	-	-	-	-	-	-	-	-	-
Reimbursements from PFCs (ub)	-	-	-	-	-	-	-	-	-	-
Cummulative PFC Reimbursables (ua)	-	-	-	-	-	-	-	-	-	-
Remaining PFC Funds (sc)	21,394,189	22,575,500	11,210,059	13,552,983	10,486,903	28,046,581	29,612,684	31,385,496	33,263,983	35,254,305
Remaining PFC Eligible Costs (t)	677,030	895,880	-	5,467,651	1,306,491	2,028,470	2,341,140	2,432,700	2,528,090	2,628,280
State Funds										
State Eligible Capital Costs (x)	5,724,300	7,520,550	17,679,650	22,231,550	24,570,000	16,214,750	18,594,200	19,193,200	19,815,450	20,461,450

Table I.4

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Enhanced Private Funding

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
State Entitlements (y)	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
Available State Entitlements (ab)	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
Expended State Entitlements (ac)	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
Discretionary Expenditures (ac)	580,452	972,102	8,227,081	8,375,119	8,524,432	2,780,177	3,343,648	3,485,791	3,634,821	3,791,623
Remaining State Entitlements (ad)	-	-	-	-	-	-	-	-	-	-
Grant and PFC Summary										
Total Costs (ae)	8,629,000	11,349,000	39,904,000	49,132,000	59,062,000	24,603,000	28,275,000	29,250,000	30,266,000	31,324,000
Ineligible Costs (ae)	235,000	313,500	9,877,900	9,543,400	15,986,800	702,500	800,000	820,000	840,500	861,500
Eligible Costs (ae)	8,394,000	11,035,500	30,026,100	39,588,600	43,075,200	23,900,500	27,475,000	28,430,000	29,425,500	30,462,500
Available Funds(af)	29,670,689	33,454,250	46,009,391	50,109,067	54,519,595	51,387,231	56,450,084	59,162,096	62,019,633	65,030,255
Eligible Expenditures (ag)	8,276,500	10,878,750	34,799,332	36,556,084	44,032,692	23,340,650	26,837,400	27,776,600	28,755,650	29,775,950
Remaining Costs (ah)	352,500	470,250	5,104,668	12,575,916	15,029,308	1,262,350	1,437,600	1,473,400	1,510,350	1,548,050
Other Expenditures (ai)	352,500	470,250	3,638,811	11,302,256	13,714,768	1,262,350	1,437,600	1,473,400	1,510,350	1,548,050
Airport Estimated Costs (aj)	-	-	168,060	1,273,660	1,314,540	-	-	-	-	-
ALL Subsequent Calculations are on Fiscal Year Basis										
Airport Expenditures (am)	-	-	168,060	1,273,660	1,314,540	-	-	-	-	-
Bond Issues										
Bond Issue - Initial Construction #1										
Bond Size (ao)	-							-		
Bond Proceeds (ap)	-							-		
Debt Service (aq)	$29,741,879	$29,741,879	$29,741,879	$29,741,879	$29,741,879	$29,741,879	$29,741,879	$29,741,879	$29,741,879	$29,741,879
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	29,741,879	29,741,879	29,741,879	29,741,879	29,741,879	29,741,879	29,741,879	29,741,879	29,741,879	29,741,879
Capitalized Interest (at)										
Available Funds (au)										
Expenditures from Proceeds (av)										
Remaining Funds (aw)										
Bond Issue - Initial Construction #2										
Bond Size (ao)										
Bond Proceeds (ap)										
Debt Service (aq)	$28,701,014	$28,701,014	$28,701,014	$28,701,014	$28,701,014	$28,701,014	$28,701,014	$28,701,014	$28,701,014	$28,701,014
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	-	-	-	-	-	-	-	-	-	-
Capitalized Interest (at)										
Available Funds (au)										
Expenditures from Proceeds (av)										
Remaining Funds (aw)										

Table I.4

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Enhanced Private Funding

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bond Issue										
Bond Size (ao)										
Bond Proceeds (ap)	-									
Debt Service (aq)		$0	$0	$0	$0	$0	$0	$0	$0	$0
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	-	-	-	-	-	-	-	-	-	-
Capitalized Interest (at)	-									
Available Funds (au)	-	-	-	-	-	-	-	-	-	-
Expenditures from Proceeds (av)	-	-	-	-	-	-	-	-	-	-
Remaining Funds (aw)	-	-	-	-	-	-	-	-	-	-
Total New Debt Service (bb)	59,618,704	59,707,645	59,803,315	59,906,220	60,016,910	60,135,973	60,264,041	60,401,798	42,947,158	30,967,481
Expenses										
Total O&M Expenses	16,092,666	17,048,413	18,060,921	19,133,562	20,269,908	21,473,741	22,749,070	24,100,141	25,531,453	27,047,770
Non-Operating Costs										
Debt Service (ck)	52,939,703	51,979,098	51,041,553	50,126,845	49,234,770	48,365,140	47,517,785	46,692,554	32,548,579	23,009,294
ORF/PHF Expense (cl)	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Total Costs (cn)	71,432,370	71,427,511	71,502,474	71,660,407	71,904,678	72,238,881	72,666,856	73,192,696	60,480,032	52,457,065
Revenues										
Proceeds from Sale of Land	$ -	$ -								
Available PFC Funds for Debt Service	$ 21,394,189	$ 22,575,500	$ 11,210,059	$ 13,552,983	$ 10,486,903	$ 28,046,581	$ 29,612,684	$ 31,385,496	$ 33,263,983	$ 35,254,305
Non-Airline Revenues	26,849,801	28,444,415	30,133,734	31,923,382	33,819,317	35,827,852	37,955,674	40,209,868	42,597,939	45,127,838
Required Airline Revenues	39,501,649	38,088,794	49,284,042	46,834,428	49,859,629	32,327,356	30,859,589	29,258,873	15,122,326	5,250,348
Total Revenues (dx)	87,745,639	89,108,709	90,627,835	92,310,793	94,165,849	96,201,790	98,427,947	100,854,237	90,984,249	85,632,491
Total Costs (dy)	71,432,370	71,427,511	71,502,474	71,660,407	71,904,678	72,238,881	72,666,856	73,192,696	60,480,032	52,457,065
Net Revenue	16,313,270	17,681,198	19,125,361	20,650,385	22,261,172	23,962,908	25,761,092	27,661,541	30,504,217	33,175,426
Capital Outlays	-	-	168,060	1,273,660	1,314,540	-	-	-	-	-
Additional Principal Paid	16,313,270	17,681,198	18,957,301	19,376,725	20,946,632	23,962,908				
CIP Reserve Balance (ec)	10,492,550	10,492,550	10,492,550	10,492,550	10,492,550	10,492,550	36,253,642	63,915,183	94,419,401	127,594,827
Debt Service Coverage Estimate										
Total Revenues (dx)	87,745,639	89,108,709	90,627,835	92,310,793	94,165,849	96,201,790	98,427,947	100,854,237	90,984,249	85,632,491
Total Operating Costs (ed)	16,092,666	17,048,413	18,060,921	19,133,562	20,269,908	21,473,741	22,749,070	24,100,141	25,531,453	27,047,770
Remaining Revenue (ee)	71,652,973	72,060,296	72,566,914	73,177,231	73,895,942	74,728,049	75,678,877	76,754,096	65,452,796	58,584,721
Debt Service (ef)	52,939,703	51,979,098	51,041,553	50,126,845	49,234,770	48,365,140	47,517,785	46,692,554	32,548,579	23,009,294
Coverage Ratio (eg)	1.35	1.39	1.42	1.46	1.50	1.55	1.59	1.64	2.01	2.55
Airline Cost per Enplanement	$ 11.97	$ 10.89	$ 13.30	$ 11.93	$ 11.99	$ 7.34	$ 6.61	$ 5.92	$ 2.89	$ 0.95

Table I.5

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: No FAA Funding of Initial Construction Projects

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Inflation Factor (a)	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020
Bond Term (b)	25										
Bond Interest Rate (c)	6.5%										
Bond Financing Cost (d)	4.0%										
Capital Costs (e)											
Airfield	40,156,000	114,750,000	114,750,000	76,500,000	86,700,000	478,000	1,002,000	1,577,000	2,206,000	2,892,000	3,640,000
Terminal Area	33,075,000	-	25,245,000	30,845,000	30,845,000	159,000	337,000	536,000	757,000	1,003,000	1,275,000
General Aviation	6,438,000	9,945,000	12,678,000	19,244,000	24,344,000	40,000	82,000	128,000	177,000	229,000	285,000
Support Facilities	-	-	35,300,000	35,300,000	34,981,000	80,000	168,000	265,000	373,000	492,000	622,000
Air Cargo/Aircraft Maint. Facilities	-	-	-	-	10,017,000	40,000	85,000	136,000	193,000	258,000	330,000
Miscellaneous	34,680,000	-	-	-	33,864,000	132,427,064	33,864,000	33,864,000	33,864,000	-	-
Total	114,349,000	124,695,000	187,973,000	161,889,000	220,751,000	133,224,064	35,538,000	36,506,000	37,570,000	4,874,000	6,152,000
FAA Funds											
FAA Eligible Capital Costs (f)	88,718,400	110,733,750	144,225,000	117,524,500	155,981,800	31,087,300	31,756,650	32,493,650	33,302,250	3,709,550	4,676,250
Entitlements (g)	-	-	-	-	-	-	-	2,782,583	2,855,926	2,933,547	3,015,698
Available Entitlements (j)	-	-	-	-	-	-	-	2,782,583	3,622,459	3,731,356	3,037,504
Expended Entitlements (k)	-	-	-	-	-	-	-	2,016,050	2,824,650	3,709,550	3,037,504
Remaining Potential Entitlements (l)	-	-	-	-	-	-	-	766,533	797,809	21,806	-
Discretionary Expenditures (m)	-	-	-	-	-	-	-	-	-	-	1,638,746
Eligible Costs Unfunded by AIP (n)	88,718,400	110,733,750	144,225,000	117,524,500	155,981,800	31,087,300	31,756,650	30,477,600	30,477,600	-	-
PFC Funds											
PFC Eligible Capital Costs (o)	114,349,000	124,695,000	168,534,000	139,167,000	176,514,000	133,128,314	35,336,650	36,187,000	37,121,150	4,281,350	5,401,350
PFC Eligible Less AIP Funded (p)	114,349,000	124,695,000	168,534,000	139,167,000	176,514,000	133,128,314	35,336,650	34,170,950	34,296,500	571,800	725,100
PFC Collections (q)	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	19,370,323	20,520,730
Encumbered PFC Funds (r)	-	-	-	-	-	-	-	-	-	-	-
PFC Bond Size											
PFC Bond Proceeds											
PFC Debt Service	-	-	-	-	-	-	-	-	-	-	-
Interest Earnings (s)	-	-	-	-	-	-	-	-	-	-	767,045
Reserve											
Debt Service Coverage											
Available PFC Funds (sa)	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	19,370,323	20,520,730
PFC Expenditures (sb)	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	194,190	245,650
Airport Costs Reimbursable by PFCs (u)	-	-	-	-	-	-	-	-	-	-	-
Reimbursements from PFCs (ub)	-	-	-	-	-	-	-	-	-	-	-
Cummulative PFC Reimbursables (ua)	-	-	-	-	-	-	-	-	-	-	-
Remaining PFC Funds (sc)	-	-	-	-	-	-	-	-	-	19,176,133	20,275,080
Remaining PFC Eligible Costs (t)	114,349,000	124,695,000	168,534,000	139,167,000	176,514,000	117,749,845	19,044,851	16,911,578	16,012,091	377,610	479,450
State Funds											
State Eligible Capital Costs (x)	58,230,500	92,250,000	113,482,500	88,965,500	96,160,900	531,900	1,116,350	1,760,100	2,466,550	3,240,100	4,085,500

Table I.5

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: No FAA Funding of Initial Construction Projects

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
State Entitlements (y)	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745
Available State Entitlements (ab)	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745
Expended State Entitlements (ac)	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745
Discretionary Expenditures (ac)	6,870,913	7,022,554	7,627,542	7,785,951	7,947,855	531,900	516,350	1,124,466	1,793,165	63,383	226,855
Remaining State Entitlements (ad)	-	-	-	-	-	-	-	-	-	-	-
Grant and PFC Summary											
Total Costs (ae)	114,349,000	124,695,000	187,973,000	161,889,000	220,751,000	133,224,064	35,538,000	36,506,000	37,570,000	4,874,000	6,152,000
Ineligible Costs (ae)	-	-	-	-	24,526,000	20,000	42,500	68,000	96,500	129,000	165,000
Eligible Costs (ae)	114,349,000	124,695,000	187,973,000	161,889,000	196,225,000	133,204,064	35,495,500	36,438,000	37,473,500	4,745,000	5,987,000
Available Funds(af)	6,870,913	7,022,554	7,627,542	7,785,951	7,947,855	15,910,369	17,408,149	21,802,055	24,373,417	23,878,439	26,179,580
Eligible Expenditures (ag)	6,870,913	7,022,554	7,627,542	7,785,951	7,947,855	15,910,369	17,408,149	21,035,522	23,575,609	4,680,500	5,904,500
Remaining Costs (ah)	107,478,087	117,672,446	180,345,458	154,103,049	212,803,145	117,313,695	18,129,851	15,470,478	13,994,391	193,500	247,500
Other Expenditures (ai)	-	-	-	1,313,200	5,313,200	30,000	63,750	102,000	144,750	193,500	247,500
Airport Estimated Costs (aj)	107,478,087	117,672,446	180,345,458	152,789,849	207,489,945	113,899,295	14,683,951	13,323,018	12,340,511	-	-
	ALL Subsequent Calculations are on Fiscal Year Basis										
Airport Expenditures (am)	107,478,087	117,672,446	180,345,458	152,789,849	207,489,945	113,899,295	14,683,951	13,323,018	12,340,511	-	-
Bond Issues											
Bond Issue - Initial Construction #1											
Bond Size (ao)	618,702,827										
Bond Proceeds (ap)	593,954,714										
Debt Service (aq)						$50,722,174	$50,722,174	$50,722,174	$50,722,174	$50,722,174	$50,722,174
Interest Earnings (ar)		20,192,026	13,871,942	6,984,236	2,185,823	-	-	-	-	-	-
Reserve (as)	50,722,174	50,722,174	50,722,174	50,722,174	50,722,174	50,722,174	50,722,174	50,722,174	50,722,174	50,722,174	50,722,174
Capitalized Interest (at)	20,107,842	40,215,684	40,215,684	40,215,684	40,215,684						
Available Funds (au)	523,124,698	395,622,953	251,606,766	38,029,860	(0)						
Expenditures from Proceeds (av)	107,478,087	117,672,446	180,345,458	-	-						
Remaining Funds (aw)	415,646,610	277,950,507	71,261,308	38,029,860	(0)						
Bond Issue - Initial Construction #2											
Bond Size (ao)				444,921,305							
Bond Proceeds (ap)				427,124,453							
Debt Service (aq)						$36,475,308	$36,475,308	$36,475,308	$36,475,308	$36,475,308	$36,475,308
Interest Earnings (ar)					13,010,476	(0)	-	-	-	-	-
Reserve (as)				36,475,308	36,475,308	36,475,308	36,475,308	36,475,308	36,475,308	36,475,308	36,475,308
Capitalized Interest (at)				14,459,942	28,919,885						
Available Funds (au)				376,189,203	207,489,945						
Expenditures from Proceeds (av)				152,789,849	207,489,945						
Remaining Funds (aw)				223,399,353	(0)						

Table I.5

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: No FAA Funding of Initial Construction Projects

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Bond Issue											
Bond Size (ao)						178,127,944					-
Bond Proceeds (ap)						171,002,827					-
Debt Service (aq)								$14,603,193	$14,603,193	$14,603,193	$14,603,193
Interest Earnings (ar)							4,154,280				
Reserve (as)						14,603,193	14,603,193	14,603,193	14,603,193	14,603,193	14,603,193
Capitalized Interest (at)						5,789,158	11,578,316				
Available Funds (au)						150,610,476	14,683,951				
Expenditures from Proceeds (av)						113,899,295	14,683,951				
Remaining Funds (aw)						36,711,180	(0)				
Total New Debt Service (bb)			-	-	-	79,642,059	79,642,059	94,245,252	101,800,674	101,800,674	101,800,674
Expenses											
Total O&M Expenses						17,513,745	18,553,889	19,655,808	20,823,169	22,059,861	23,370,000
Non-Operating Costs											
Debt Service (ck)						79,642,059	78,080,450	90,585,594	95,929,049	94,048,087	92,204,007
ORF/PHF Expense (cl)						2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Total Costs (cn)						99,555,804	99,034,339	112,641,401	119,152,219	118,507,948	117,974,007
Revenues											
Proceeds from Sale of Land						$ -	$ -	$ -	$ -	$ -	$ -
Available PFC Funds for Debt Service						$ -	$ -	$ -	$ -	$ 19,176,133	$ 20,275,080
Non-Airline Revenues						27,133,598	28,745,067	30,452,242	32,260,806	34,176,781	36,206,546
Required Airline Revenues						86,924,051	86,188,144	98,683,059	104,509,702	84,435,852	82,525,177
Total Revenues (dx)						114,057,650	114,933,211	129,135,301	136,770,508	137,788,765	139,006,802
Total Costs (dy)			-	-	-	99,555,804	99,034,339	112,641,401	119,152,219	118,507,948	117,974,007
Net Revenue			-	-	-	14,501,846	15,898,873	16,493,900	17,618,289	19,280,817	21,032,795
Capital Outlays	-	-	-	-	-	-	-	13,323,018	12,340,511	-	-
Additional Principal Paid						-	-			19,280,817	21,032,795
CIP Reserve Balance (ec)	-	-	-	-	-	14,501,846	30,400,719	33,571,600	38,849,378	38,849,378	38,849,378
Debt Service Coverage Estimate											
Total Revenues (dx)			-	-	-	114,057,650	114,933,211	129,135,301	136,770,508	137,788,765	139,006,802
Total Operating Costs (ed)			-	-	-	17,513,745	18,553,889	19,655,808	20,823,169	22,059,861	23,370,000
Remaining Revenue (ee)			-	-	-	96,543,905	96,379,323	109,479,494	115,947,339	115,728,904	115,636,802
Debt Service (ef)			-	-	-	79,642,059	78,080,450	90,585,594	95,929,049	94,048,087	92,204,007
Coverage Ratio (eg)						1.21	1.23	1.21	1.21	1.23	1.25
Airline Cost per Enplanement						$ 37.22	$ 34.84	$ 37.65	$ 37.64	$ 28.71	$ 26.48

Table I.5

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: No FAA Funding of Initial Construction Projects

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Inflation Factor (a)	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020
Bond Term (b)										
Bond Interest Rate (c)										
Bond Financing Cost (d)										
Capital Costs (e)										
Airfield	5,091,000	6,676,000	8,403,000	10,283,000	12,327,000	14,215,000	16,189,000	16,594,000	17,009,000	17,434,000
Terminal Area	1,801,000	2,385,000	20,287,000	24,272,000	25,062,000	5,408,000	6,366,000	6,744,000	7,144,000	7,569,000
General Aviation	393,000	509,000	632,000	764,000	904,000	1,043,000	1,188,000	1,217,000	1,248,000	1,279,000
Support Facilities	874,000	1,152,000	11,126,000	11,461,000	18,533,000	2,532,000	2,932,000	3,055,000	3,184,000	3,319,000
Air Cargo/Aircraft Maint. Facilities	470,000	627,000	803,000	4,014,000	4,233,000	1,405,000	1,600,000	1,640,000	1,681,000	1,723,000
Miscellaneous	-	-	-	-	-	-	-	-	-	-
Total	8,629,000	11,349,000	41,251,000	50,794,000	61,059,000	24,603,000	28,275,000	29,250,000	30,266,000	31,324,000
FAA Funds										
FAA Eligible Capital Costs (f)	6,550,150	8,603,400	19,473,700	24,569,950	27,239,550	18,530,000	21,243,100	21,920,600	22,624,350	23,354,350
Entitlements (g)	3,102,643	3,194,665	3,292,062	3,395,148	3,504,259	3,619,748	3,741,989	3,871,380	4,008,341	4,153,317
Available Entitlements (j)	3,102,643	3,194,665	3,292,062	3,395,148	3,504,259	3,619,748	3,741,989	3,871,380	4,008,341	4,153,317
Expended Entitlements (k)	3,102,643	3,194,665	3,292,062	3,395,148	3,504,259	3,619,748	3,741,989	3,871,380	4,008,341	4,153,317
Remaining Potential Entitlements (l)	-	-	-	-	-	-	-	-	-	-
Discretionary Expenditures (m)	3,447,507	5,408,735	9,279,638	11,625,802	14,186,291	14,910,252	17,501,111	18,049,220	18,616,009	19,201,033
Eligible Costs Unfunded by AIP (n)	-	-	6,902,000	9,549,000	9,549,000	-	-	-	-	-
PFC Funds										
PFC Eligible Capital Costs (o)	7,572,450	9,954,350	26,364,100	33,607,100	36,716,700	21,520,600	24,703,100	25,524,500	26,378,700	27,266,950
PFC Eligible Less AIP Funded (p)	1,022,300	1,350,950	13,792,400	18,586,150	19,026,150	2,990,600	3,460,000	3,603,900	3,754,350	3,912,600
PFC Collections (q)	21,739,459	23,030,570	24,398,359	25,847,382	27,382,462	29,008,711	30,731,544	32,556,696	34,490,243	36,538,625
Encumbered PFC Funds (r)	-	-	-	-	-	-	-	-	-	-
PFC Bond Size										
PFC Bond Proceeds										
PFC Debt Service	-	-	-	-	-	-	-	-	-	-
Interest Earnings (s)	811,003	855,768	903,020	424,238	290,449	334,252	1,121,863	1,184,507	1,255,420	1,330,559
Reserve										
Debt Service Coverage										
Available PFC Funds (sa)	21,739,459	23,030,570	24,398,359	25,847,382	27,382,462	29,008,711	30,731,544	32,556,696	34,490,243	36,538,625
PFC Expenditures (sb)	345,270	455,070	13,792,400	18,586,150	19,026,150	962,130	1,118,860	1,171,200	1,226,260	1,284,320
Airport Costs Reimbursable by PFCs (u)	-	-	-	-	-	-	-	-	-	-
Reimbursements from PFCs (ub)	-	-	-	-	-	-	-	-	-	-
Cummulative PFC Reimbursables (ua)	-	-	-	-	-	-	-	-	-	-
Remaining PFC Funds (sc)	21,394,189	22,575,500	10,605,959	7,261,232	8,356,312	28,046,581	29,612,684	31,385,496	33,263,983	35,254,305
Remaining PFC Eligible Costs (t)	677,030	895,880	-	-	-	2,028,470	2,341,140	2,432,700	2,528,090	2,628,280
State Funds										
State Eligible Capital Costs (x)	5,724,300	7,520,550	18,111,150	22,790,150	25,128,600	16,214,750	18,594,200	19,193,200	19,815,450	20,461,450

Table I.5

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: No FAA Funding of Initial Construction Projects

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
State Entitlements (y)	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
Available State Entitlements (ab)	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
Expended State Entitlements (ac)	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
Discretionary Expenditures (ac)	580,452	972,102	8,227,081	8,375,119	8,524,432	2,780,177	3,343,648	3,485,791	3,634,821	3,791,623
Remaining State Entitlements (ad)	-	-	-	-	-	-	-	-	-	-
Grant and PFC Summary										
Total Costs (ae)	8,629,000	11,349,000	41,251,000	50,794,000	61,059,000	24,603,000	28,275,000	29,250,000	30,266,000	31,324,000
Ineligible Costs (ae)	235,000	313,500	10,361,900	10,027,400	16,805,800	702,500	800,000	820,000	840,500	861,500
Eligible Costs (ae)	8,394,000	11,035,500	30,889,100	40,766,600	44,253,200	23,900,500	27,475,000	28,430,000	29,425,500	30,462,500
Available Funds(af)	29,670,689	33,454,250	46,095,691	50,195,367	54,605,895	51,387,231	56,450,084	59,162,096	62,019,633	65,030,255
Eligible Expenditures (ag)	8,276,500	10,878,750	35,489,732	42,934,135	46,249,583	23,340,650	26,837,400	27,776,600	28,755,650	29,775,950
Remaining Costs (ah)	352,500	470,250	5,761,268	7,859,865	14,809,417	1,262,350	1,437,600	1,473,400	1,510,350	1,548,050
Other Expenditures (ai)	352,500	470,250	602,250	749,250	913,500	1,262,350	1,437,600	1,473,400	1,510,350	1,548,050
Airport Estimated Costs (aj)	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
ALL Subsequent Calculations are on Fiscal Year Basis										
Airport Expenditures (am)	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
Bond Issues										
Bond Issue - Initial Construction #1										
Bond Size (ao)	-							-		
Bond Proceeds (ap)	-							-		
Debt Service (aq)	$50,722,174	$50,722,174	$50,722,174	$50,722,174	$50,722,174	$50,722,174	$50,722,174	$50,722,174	$50,722,174	$50,722,174
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	50,722,174	50,722,174	50,722,174	50,722,174	50,722,174	50,722,174	50,722,174	50,722,174	50,722,174	50,722,174
Capitalized Interest (at)										
Available Funds (au)										
Expenditures from Proceeds (av)										
Remaining Funds (aw)										
Bond Issue - Initial Construction #2										
Bond Size (ao)										
Bond Proceeds (ap)										
Debt Service (aq)	$36,475,308	$36,475,308	$36,475,308	$36,475,308	$36,475,308	$36,475,308	$36,475,308	$36,475,308	$36,475,308	$36,475,308
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	36,475,308	36,475,308	36,475,308	36,475,308	36,475,308	36,475,308	36,475,308	36,475,308	36,475,308	36,475,308
Capitalized Interest (at)										
Available Funds (au)										
Expenditures from Proceeds (av)										
Remaining Funds (aw)										

Table I.5

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: No FAA Funding of Initial Construction Projects

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bond Issue										
Bond Size (ao)										
Bond Proceeds (ap)	-									
Debt Service (aq)	$14,603,193	$14,603,193	$14,603,193	$14,603,193	$14,603,193	$14,603,193	$14,603,193	$14,603,193	$14,603,193	$14,603,193
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	14,603,193	14,603,193	14,603,193	14,603,193	14,603,193	14,603,193	14,603,193	14,603,193	14,603,193	14,603,193
Capitalized Interest (at)										
Available Funds (au)										
Expenditures from Proceeds (av)										
Remaining Funds (aw)										
Total New Debt Service (bb)	103,294,979	103,408,012	103,529,595	103,660,375	103,801,048	103,952,361	104,115,120	104,290,191	104,478,504	104,681,062
Expenses										
Total O&M Expenses	24,757,948	26,228,327	27,786,032	29,436,249	31,184,473	33,036,525	34,998,569	37,077,140	39,279,158	41,611,954
Non-Operating Costs										
Debt Service (ck)	91,722,986	90,022,898	88,361,513	86,738,365	85,153,013	83,605,042	82,094,062	80,619,710	79,181,649	77,779,571
ORF/PHF Expense (cl)	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Total Costs (cn)	118,880,934	118,651,225	118,547,545	118,574,614	118,737,486	119,041,567	119,492,631	120,096,850	120,860,807	121,791,525
Revenues										
Proceeds from Sale of Land	$ -	$ -								
Available PFC Funds for Debt Service	$ 21,394,189	$ 22,575,500	$ 10,605,959	$ 7,261,232	$ 8,356,312	$ 28,046,581	$ 29,612,684	$ 31,385,496	$ 33,263,983	$ 35,254,305
Non-Airline Revenues	38,356,859	40,634,879	43,048,192	45,604,831	48,313,310	51,182,646	54,222,392	57,442,669	60,854,199	64,468,341
Required Airline Revenues	81,926,674	80,180,796	91,683,182	94,661,360	93,303,769	73,458,713	71,849,498	70,149,481	68,464,223	66,792,411
Total Revenues (dx)	141,677,721	143,391,175	145,337,332	147,527,423	149,973,391	152,687,940	155,684,574	158,977,645	162,582,406	166,515,057
Total Costs (dy)	118,880,934	118,651,225	118,547,545	118,574,614	118,737,486	119,041,567	119,492,631	120,096,850	120,860,807	121,791,525
Net Revenue	22,796,787	24,739,950	26,789,787	28,952,808	31,235,905	33,646,373	36,191,942	38,880,795	41,721,599	44,723,531
Capital Outlays	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
Additional Principal Paid	22,796,787	24,739,950	26,621,727	25,732,148	25,696,300	33,646,373				
CIP Reserve Balance (ec)	38,849,378	38,849,378	38,849,378	38,849,378	38,849,378	38,849,378	75,041,321	113,922,116	155,643,715	200,367,246
Debt Service Coverage Estimate										
Total Revenues (dx)	141,677,721	143,391,175	145,337,332	147,527,423	149,973,391	152,687,940	155,684,574	158,977,645	162,582,406	166,515,057
Total Operating Costs (ed)	24,757,948	26,228,327	27,786,032	29,436,249	31,184,473	33,036,525	34,998,569	37,077,140	39,279,158	41,611,954
Remaining Revenue (ee)	116,919,773	117,162,848	117,551,300	118,091,174	118,788,918	119,651,415	120,686,004	121,900,505	123,303,248	124,903,102
Debt Service (ef)	91,722,986	90,022,898	88,361,513	86,738,365	85,153,013	83,605,042	82,094,062	80,619,710	79,181,649	77,779,571
Coverage Ratio (eg)	1.27	1.30	1.33	1.36	1.40	1.43	1.47	1.51	1.56	1.61
Airline Cost per Enplanement	$ 24.82	$ 22.93	$ 24.75	$ 24.12	$ 22.44	$ 16.68	$ 15.40	$ 14.19	$ 13.07	$ 12.04

Table A.6

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Close ORF Analysis

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Inflation Factor (a)	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020
Bond Term (b)	25										
Bond Interest Rate (c)	6.5%										
Bond Financing Cost (d)	4.0%										
Capital Costs (e)											
Airfield	40,156,000	114,750,000	114,750,000	76,500,000	86,700,000	478,000	1,002,000	1,577,000	2,206,000	2,892,000	3,640,000
Terminal Area	33,075,000	-	25,245,000	30,845,000	30,845,000	159,000	337,000	536,000	757,000	1,003,000	1,275,000
General Aviation	6,438,000	9,945,000	12,678,000	19,244,000	24,344,000	40,000	82,000	128,000	177,000	229,000	285,000
Support Facilities	-	-	35,300,000	35,300,000	34,981,000	80,000	168,000	265,000	373,000	492,000	622,000
Air Cargo/Aircraft Maint. Facilities	-	-	-	-	10,017,000	40,000	85,000	136,000	193,000	258,000	330,000
Miscellaneous	34,680,000	-	-	-	33,864,000	132,427,064	33,864,000	33,864,000	33,864,000	-	-
Total	114,349,000	124,695,000	187,973,000	161,889,000	220,751,000	133,224,064	35,538,000	36,506,000	37,570,000	4,874,000	6,152,000
FAA Funds											
FAA Eligible Capital Costs (f)	88,718,400	110,733,750	144,225,000	117,524,500	155,981,800	31,087,300	31,756,650	32,493,650	33,302,250	3,709,550	4,676,250
Entitlements (g)	-	-	-	-	-	-	-	2,807,583	2,881,926	2,960,587	3,043,819
Available Entitlements (j)	-	-	-	-	-	-	-	2,807,583	2,881,926	2,960,587	3,043,819
Expended Entitlements (k)	-	-	-	-	-	-	-	2,807,583	2,881,926	2,960,587	3,043,819
Remaining Potential Entitlements (l)	-	-	-	-	-	-	-	-	-	-	-
Discretionary Expenditures (m)	24,877,600	35,216,600	43,332,100	35,437,800	47,210,200	7,566,815	4,665,450	2,594,867	3,329,124	748,963	1,632,431
Eligible Costs Unfunded by AIP (n)	63,840,800	75,517,150	100,892,900	82,086,700	108,771,600	23,520,485	27,091,200	27,091,200	27,091,200	-	-
PFC Funds											
PFC Eligible Capital Costs (o)	114,349,000	124,695,000	168,534,000	139,167,000	176,514,000	133,128,314	35,336,650	36,187,000	37,121,150	4,281,350	5,401,350
PFC Eligible Less AIP Funded (p)	89,471,400	89,478,400	125,201,900	103,729,200	129,303,800	125,561,499	30,671,200	30,784,550	30,910,100	571,800	725,100
PFC Collections (q)	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	19,370,323	20,520,730
Encumbered PFC Funds (r)	-	-	-	-	-	-	-	-	-	-	-
PFC Bond Size											
PFC Bond Proceeds											
PFC Debt Service	-	-	-	-	-	-	-	-	-	-	-
Interest Earnings (s)	-	-	-	-	-	-	-	-	-	-	767,045
Reserve											
Debt Service Coverage											
Available PFC Funds (sa)	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	19,370,323	20,520,730
PFC Expenditures (sb)	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	194,190	245,650
Airport Costs Reimbursable by PFCs (u)	-	-	-	-	-	-	-	-	-	-	-
Reimbursements from PFCs (ub)	-	-	-	-	-	-	-	-	-	-	-
Cummulative PFC Reimbursables (ua)	-	-	-	-	-	-	-	-	-	-	-
Remaining PFC Funds (sc)	-	-	-	-	-	-	-	-	-	19,176,133	20,275,080
Remaining PFC Eligible Costs (t)	89,471,400	89,478,400	125,201,900	103,729,200	129,303,800	110,183,030	14,379,401	13,525,178	12,625,691	377,610	479,450
State Funds											
State Eligible Capital Costs (x)	58,230,500	92,250,000	113,482,500	88,965,500	96,160,900	531,900	1,116,350	1,760,100	2,466,550	3,240,100	4,085,500

Table A.6

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Close ORF Analysis

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
State Entitlements (y)	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745
Available State Entitlements (ab)	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745
Expended State Entitlements (ac)	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745
Discretionary Expenditures (ac)	6,870,913	7,022,554	7,627,542	7,785,951	7,947,855	531,900	516,350	1,124,466	1,793,165	63,383	226,855
Remaining State Entitlements (ad)	-	-	-	-	-	-	-	-	-	-	-
Grant and PFC Summary											
Total Costs (ae)	114,349,000	124,695,000	187,973,000	161,889,000	220,751,000	133,224,064	35,538,000	36,506,000	37,570,000	4,874,000	6,152,000
Ineligible Costs (ae)	-	-	-	-	24,526,000	20,000	42,500	68,000	96,500	129,000	165,000
Eligible Costs (ae)	114,349,000	124,695,000	187,973,000	161,889,000	196,225,000	133,204,064	35,495,500	36,438,000	37,473,500	4,745,000	5,987,000
Available Funds(af)	31,748,513	42,239,154	50,959,642	43,223,751	55,158,055	23,477,184	22,073,599	24,421,922	26,962,009	23,856,633	26,179,580
Eligible Expenditures (ag)	31,748,513	42,239,154	50,959,642	43,223,751	55,158,055	23,477,184	22,073,599	24,421,922	26,962,009	4,680,500	5,904,500
Remaining Costs (ah)	82,600,487	82,455,846	137,013,358	118,665,249	165,592,945	109,746,880	13,464,401	12,084,078	10,607,991	193,500	247,500
Other Expenditures (ai)	-	-	-	1,313,200	5,313,200	30,000	63,750	102,000	144,750	193,500	247,500
Airport Estimated Costs (aj)	82,600,487	82,455,846	137,013,358	117,352,049	160,279,745	106,736,540	10,865,641	9,936,618	8,954,111	-	-
	ALL Subsequent Calculations are on Fiscal Year Basis										
Airport Expenditures (am)	82,600,487	82,455,846	137,013,358	117,352,049	160,279,745	106,736,540	10,865,641	9,936,618	8,954,111	-	-
Bond Issues											
Bond Issue - Initial Construction #1											
Bond Size (ao)	460,893,925										
Bond Proceeds (ap)	442,458,168										
Debt Service (aq)						$37,784,767	$37,784,767	$37,784,767	$37,784,767	$37,784,767	$37,784,767
Interest Earnings (ar)		14,991,041	10,335,296	5,254,115	1,627,312	-	-	-	-	-	-
Reserve (as)	37,784,767	37,784,767	37,784,767	37,784,767	37,784,767	37,784,767	37,784,767	37,784,767	37,784,767	37,784,767	37,784,767
Capitalized Interest (at)	14,979,053	29,958,105	29,958,105	29,958,105	29,958,105						
Available Funds (au)	389,694,349	292,126,797	190,048,142	28,330,794	(0)						
Expenditures from Proceeds (av)	82,600,487	82,455,846	137,013,358	-	-						
Remaining Funds (aw)	307,093,861	209,670,951	53,034,784	28,330,794	(0)						
Bond Issue - Initial Construction #2											
Bond Size (ao)				507,353,755							
Bond Proceeds (ap)				487,059,605							
Debt Service (aq)							$41,593,612	$41,593,612	$41,593,612	$41,593,612	$41,593,612
Interest Earnings (ar)					15,973,691	5,373,636	-	-	-	-	-
Reserve (as)				41,593,612	41,593,612	41,593,612	41,593,612	41,593,612	41,593,612	41,593,612	41,593,612
Capitalized Interest (at)				16,488,997	32,977,994	32,977,994					
Available Funds (au)				428,976,996	294,620,643	106,736,540					
Expenditures from Proceeds (av)				117,352,049	160,279,745	106,736,540					
Remaining Funds (aw)				311,624,946	134,340,899	-					

Table A.6

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Close ORF Analysis

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Bond Issue											
Bond Size (ao)											-
Bond Proceeds (ap)											-
Debt Service (aq)											
Interest Earnings (ar)											
Reserve (as)											-
Capitalized Interest (at)											
Available Funds (au)											-
Expenditures from Proceeds (av)											-
Remaining Funds (aw)											-
Total New Debt Service (bb)			-	-	-	70,762,761	70,762,761	70,762,761	79,378,379	79,378,379	79,378,379
Expenses											
Total O&M Expenses						18,389,432	19,481,583	20,638,598	21,864,328	23,162,854	24,538,500
Non-Operating Costs											
Debt Service (ck)						70,762,761	69,375,256	68,014,956	74,800,019	73,333,352	71,895,443
ORF/PHF Expense (cl)						1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Total Costs (cn)						90,352,193	90,056,839	89,853,554	97,864,347	97,696,206	97,633,943
Revenues											
Proceeds from Sale of Land						-	-	-	-	-	-
Available PFC Funds for Debt Service						$ -	$ -	$ -	$ -	$ 19,176,133	$ 20,275,080
Non-Airline Revenues						29,032,950	30,757,222	32,583,899	34,519,062	36,569,155	38,741,004
Required Airline Revenues						77,499,709	75,327,024	72,823,087	80,501,237	65,015,788	63,485,899
Total Revenues (dx)						106,532,660	106,084,246	105,406,986	115,020,299	120,761,076	122,501,982
Total Costs (dy)			-	-	-	90,352,193	90,056,839	89,853,554	97,864,347	97,696,206	97,633,943
Net Revenue			-	-	-	16,180,467	16,027,408	15,553,431	17,155,952	23,064,869	24,868,039
Capital Outlays	-	-	-	-	-	-	10,865,641	9,936,618	8,954,111	-	-
Additional Principal Paid						-	-	-	-	23,064,869	24,868,039
CIP Reserve Balance (ec)	-	-	-	-	-	16,180,467	21,342,233	26,959,046	35,160,887	35,160,887	35,160,887
Debt Service Coverage Estimate											
Total Revenues (dx)			-	-	-	106,532,660	106,084,246	105,406,986	115,020,299	120,761,076	122,501,982
Total Operating Costs (ed)			-	-	-	18,389,432	19,481,583	20,638,598	21,864,328	23,162,854	24,538,500
Remaining Revenue (ee)			-	-	-	88,143,228	86,602,663	84,768,388	93,155,971	97,598,222	97,963,482
Debt Service (ef)			-	-	-	70,762,761	69,375,256	68,014,956	74,800,019	73,333,352	71,895,443
Coverage Ratio (eg)						1.25	1.25	1.25	1.25	1.33	1.36
Airline Cost per Enplanement						$ 33.19	$ 30.45	$ 27.79	$ 28.99	$ 22.10	$ 20.37

Table A.6

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Close ORF Analysis

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Inflation Factor (a)	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020
Bond Term (b)										
Bond Interest Rate (c)										
Bond Financing Cost (d)										
Capital Costs (e)										
Airfield	5,091,000	6,676,000	8,403,000	10,283,000	12,327,000	14,215,000	16,189,000	16,594,000	17,009,000	17,434,000
Terminal Area	1,801,000	2,385,000	20,287,000	24,272,000	25,062,000	5,408,000	6,366,000	6,744,000	7,144,000	7,569,000
General Aviation	393,000	509,000	632,000	764,000	904,000	1,043,000	1,188,000	1,217,000	1,248,000	1,279,000
Support Facilities	874,000	1,152,000	11,126,000	11,461,000	18,533,000	2,532,000	2,932,000	3,055,000	3,184,000	3,319,000
Air Cargo/Aircraft Maint. Facilities	470,000	627,000	803,000	4,014,000	4,233,000	1,405,000	1,600,000	1,640,000	1,681,000	1,723,000
Miscellaneous	-	-	-	-	-	-	-	-	-	-
Total	8,629,000	11,349,000	41,251,000	50,794,000	61,059,000	24,603,000	28,275,000	29,250,000	30,266,000	31,324,000
FAA Funds										
FAA Eligible Capital Costs (f)	6,550,150	8,603,400	19,473,700	24,569,950	27,239,550	18,530,000	21,243,100	21,920,600	22,624,350	23,354,350
Entitlements (g)	3,131,890	3,225,082	3,323,695	3,428,047	3,538,473	3,655,331	3,778,995	3,909,867	4,048,367	4,194,944
Available Entitlements (j)	3,131,890	3,225,082	3,323,695	3,428,047	3,538,473	3,655,331	3,778,995	3,909,867	4,048,367	4,194,944
Expended Entitlements (k)	3,131,890	3,225,082	3,323,695	3,428,047	3,538,473	3,655,331	3,778,995	3,909,867	4,048,367	4,194,944
Remaining Potential Entitlements (l)	-	-	-	-	-	-	-	-	-	-
Discretionary Expenditures (m)	3,418,260	5,378,318	9,248,005	11,592,903	14,152,077	14,874,669	17,464,105	18,010,733	18,575,983	19,159,406
Eligible Costs Unfunded by AIP (n)	-	-	6,902,000	9,549,000	9,549,000	-	-	-	-	-
PFC Funds										
PFC Eligible Capital Costs (o)	7,572,450	9,954,350	26,364,100	33,607,100	36,716,700	21,520,600	24,703,100	25,524,500	26,378,700	27,266,950
PFC Eligible Less AIP Funded (p)	1,022,300	1,350,950	13,792,400	18,586,150	19,026,150	2,990,600	3,460,000	3,603,900	3,754,350	3,912,600
PFC Collections (q)	21,739,459	23,030,570	24,398,359	25,847,382	27,382,462	29,008,711	30,731,544	32,556,696	34,490,243	36,538,625
Encumbered PFC Funds (r)	-	-	-	-	-	-	-	-	-	-
PFC Bond Size										
PFC Bond Proceeds										
PFC Debt Service	-	-	-	-	-	-	-	-	-	-
Interest Earnings (s)	811,003	855,768	903,020	424,238	290,449	334,252	1,121,863	1,184,507	1,255,420	1,330,559
Reserve										
Debt Service Coverage										
Available PFC Funds (sa)	21,739,459	23,030,570	24,398,359	25,847,382	27,382,462	29,008,711	30,731,544	32,556,696	34,490,243	36,538,625
PFC Expenditures (sb)	345,270	455,070	13,792,400	18,586,150	19,026,150	962,130	1,118,860	1,171,200	1,226,260	1,284,320
Airport Costs Reimbursable by PFCs (u)	-	-	-	-	-	-	-	-	-	-
Reimbursements from PFCs (ub)	-	-	-	-	-	-	-	-	-	-
Cummulative PFC Reimbursables (ua)	-	-	-	-	-	-	-	-	-	-
Remaining PFC Funds (sc)	21,394,189	22,575,500	10,605,959	7,261,232	8,356,312	28,046,581	29,612,684	31,385,496	33,263,983	35,254,305
Remaining PFC Eligible Costs (t)	677,030	895,880	-	-	-	2,028,470	2,341,140	2,432,700	2,528,090	2,628,280
State Funds										
State Eligible Capital Costs (x)	5,724,300	7,520,550	18,111,150	22,790,150	25,128,600	16,214,750	18,594,200	19,193,200	19,815,450	20,461,450

Table A.6

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Close ORF Analysis

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
State Entitlements (y)	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
Available State Entitlements (ab)	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
Expended State Entitlements (ac)	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
Discretionary Expenditures (ac)	580,452	972,102	8,227,081	8,375,119	8,524,432	2,780,177	3,343,648	3,485,791	3,634,821	3,791,623
Remaining State Entitlements (ad)	-	-	-	-	-	-	-	-	-	-
Grant and PFC Summary										
Total Costs (ae)	8,629,000	11,349,000	41,251,000	50,794,000	61,059,000	24,603,000	28,275,000	29,250,000	30,266,000	31,324,000
Ineligible Costs (ae)	235,000	313,500	10,361,900	10,027,400	16,805,800	702,500	800,000	820,000	840,500	861,500
Eligible Costs (ae)	8,394,000	11,035,500	30,889,100	40,766,600	44,253,200	23,900,500	27,475,000	28,430,000	29,425,500	30,462,500
Available Funds(af)	29,670,689	33,454,250	46,095,691	50,195,367	54,605,895	51,387,231	56,450,084	59,162,096	62,019,633	65,030,255
Eligible Expenditures (ag)	8,276,500	10,878,750	35,489,732	42,934,135	46,249,583	23,340,650	26,837,400	27,776,600	28,755,650	29,775,950
Remaining Costs (ah)	352,500	470,250	5,761,268	7,859,865	14,809,417	1,262,350	1,437,600	1,473,400	1,510,350	1,548,050
Other Expenditures (ai)	352,500	470,250	602,250	749,250	913,500	1,262,350	1,437,600	1,473,400	1,510,350	1,548,050
Airport Estimated Costs (aj)	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
ALL Subsequent Calculations are on Fiscal Year Basis										
Airport Expenditures (am)	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
Bond Issues										
Bond Issue - Initial Construction #1										
Bond Size (ao)	-							-		
Bond Proceeds (ap)	-							-		
Debt Service (aq)	$37,784,767	$37,784,767	$37,784,767	$37,784,767	$37,784,767	$37,784,767	$37,784,767	$37,784,767	$37,784,767	$37,784,767
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	37,784,767	37,784,767	37,784,767	37,784,767	37,784,767	37,784,767	37,784,767	37,784,767	37,784,767	37,784,767
Capitalized Interest (at)										
Available Funds (au)										
Expenditures from Proceeds (av)										
Remaining Funds (aw)										
Bond Issue - Initial Construction #2										
Bond Size (ao)										
Bond Proceeds (ap)										
Debt Service (aq)	$41,593,612	$41,593,612	$41,593,612	$41,593,612	$41,593,612	$41,593,612	$41,593,612	$41,593,612	$41,593,612	$41,593,612
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	41,593,612	41,593,612	41,593,612	41,593,612	41,593,612	41,593,612	41,593,612	41,593,612	41,593,612	41,593,612
Capitalized Interest (at)										
Available Funds (au)										
Expenditures from Proceeds (av)										
Remaining Funds (aw)										

Table A.6

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Close ORF Analysis

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bond Issue										
Bond Size (ao)										
Bond Proceeds (ap)	-									
Debt Service (aq)		$0	$0	$0	$0	$0	$0	$0	$0	$0
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	-	-	-	-	-	-	-	-	-	-
Capitalized Interest (at)	-									
Available Funds (au)	-	-	-	-	-	-	-	-	-	-
Expenditures from Proceeds (av)	-	-	-	-	-	-	-	-	-	-
Remaining Funds (aw)	-	-	-	-	-	-	-	-	-	-
Total New Debt Service (bb)	81,082,368	81,211,263	81,349,906	81,499,038	81,659,450	81,831,996	82,017,594	82,217,231	82,431,968	55,789,135
Expenses										
Total O&M Expenses	25,995,846	27,539,744	29,175,334	30,908,062	32,743,697	34,688,351	36,748,498	38,930,998	41,243,116	43,692,552
Non-Operating Costs										
Debt Service (ck)	71,998,823	70,699,291	69,431,362	68,194,749	66,989,191	65,814,450	64,670,313	63,556,593	62,473,130	41,452,149
ORF/PHF Expense (cl)	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Total Costs (cn)	99,194,669	99,439,035	99,806,696	100,302,811	100,932,888	101,702,800	102,618,811	103,687,591	104,916,246	86,344,701
Revenues										
Proceeds from Sale of Land	-	-	-	-						
Available PFC Funds for Debt Service	$ 21,394,189	$ 22,575,500	$ 10,605,959	$ 7,261,232	$ 8,356,312	$ 28,046,581	$ 29,612,684	$ 31,385,496	$ 33,263,983	$ 35,254,305
Non-Airline Revenues	41,041,839	43,479,321	46,061,565	48,797,169	51,695,242	54,765,431	58,017,959	61,463,656	65,113,993	68,981,124
Required Airline Revenues	63,435,271	62,064,915	73,936,165	77,276,720	76,275,185	56,780,032	55,514,733	54,152,809	52,799,987	32,735,453
Total Revenues (dx)	125,871,299	128,119,735	130,603,689	133,335,121	136,326,739	139,592,045	143,145,376	147,001,961	151,177,963	136,970,883
Total Costs (dy)	99,194,669	99,439,035	99,806,696	100,302,811	100,932,888	101,702,800	102,618,811	103,687,591	104,916,246	86,344,701
Net Revenue	26,676,630	28,680,700	30,796,994	33,032,310	35,393,852	37,889,244	40,526,566	43,314,370	46,261,717	50,626,181
Capital Outlays	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
Additional Principal Paid	26,676,630	28,680,700	30,628,934	29,811,650	-	-	-			
CIP Reserve Balance (ec)	35,160,887	35,160,887	35,160,887	35,160,887	65,015,133	102,904,378	143,430,943	186,745,313	233,007,030	283,633,211
Debt Service Coverage Estimate										
Total Revenues (dx)	125,871,299	128,119,735	130,603,689	133,335,121	136,326,739	139,592,045	143,145,376	147,001,961	151,177,963	136,970,883
Total Operating Costs (ed)	25,995,846	27,539,744	29,175,334	30,908,062	32,743,697	34,688,351	36,748,498	38,930,998	41,243,116	43,692,552
Remaining Revenue (ee)	99,875,453	100,579,992	101,428,356	102,427,059	103,583,042	104,903,694	106,396,878	108,070,963	109,934,847	93,278,331
Debt Service (ef)	71,998,823	70,699,291	69,431,362	68,194,749	66,989,191	65,814,450	64,670,313	63,556,593	62,473,130	41,452,149
Coverage Ratio (eg)	1.39	1.42	1.46	1.50	1.55	1.59	1.65	1.70	1.76	2.25
Airline Cost per Enplanement	$ 19.22	$ 17.75	$ 19.96	$ 19.69	$ 18.34	$ 12.89	$ 11.90	$ 10.95	$ 10.08	$ 5.90

Table I.7

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Close ORF and PHF Analysis

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Inflation Factor (a)	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020
Bond Term (b)	25										
Bond Interest Rate (c)	6.5%										
Bond Financing Cost (d)	4.0%										
Capital Costs (e)											
Airfield	40,156,000	114,750,000	114,750,000	76,500,000	86,700,000	478,000	1,002,000	1,577,000	2,206,000	2,892,000	3,640,000
Terminal Area	33,075,000	-	25,245,000	30,845,000	30,845,000	159,000	337,000	536,000	757,000	1,003,000	1,275,000
General Aviation	6,438,000	9,945,000	12,678,000	19,244,000	24,344,000	40,000	82,000	128,000	177,000	229,000	285,000
Support Facilities	-	-	35,300,000	35,300,000	34,981,000	80,000	168,000	265,000	373,000	492,000	622,000
Air Cargo/Aircraft Maint. Facilities	-	-	-	-	10,017,000	40,000	85,000	136,000	193,000	258,000	330,000
Miscellaneous	34,680,000	-	-	-	33,864,000	132,427,064	33,864,000	33,864,000	33,864,000	-	-
Total	114,349,000	124,695,000	187,973,000	161,889,000	220,751,000	133,224,064	35,538,000	36,506,000	37,570,000	4,874,000	6,152,000
FAA Funds											
FAA Eligible Capital Costs (f)	88,718,400	110,733,750	144,225,000	117,524,500	155,981,800	31,087,300	31,756,650	32,493,650	33,302,250	3,709,550	4,676,250
Entitlements (g)	-	-	-	-	-	-	-	2,832,583	2,907,926	2,987,627	3,071,941
Available Entitlements (j)	-	-	-	-	-	-	-	2,832,583	2,907,926	2,987,627	3,071,941
Expended Entitlements (k)	-	-	-	-	-	-	-	2,832,583	2,907,926	2,987,627	3,071,941
Remaining Potential Entitlements (l)	-	-	-	-	-	-	-	-	-	-	-
Discretionary Expenditures (m)	24,877,600	35,882,130	43,332,100	35,437,800	47,210,200	7,566,815	4,665,450	2,569,867	3,303,124	721,923	1,604,309
Eligible Costs Unfunded by AIP (n)	63,840,800	74,851,620	100,892,900	82,086,700	108,771,600	23,520,485	27,091,200	27,091,200	27,091,200	-	-
PFC Funds											
PFC Eligible Capital Costs (o)	114,349,000	124,695,000	168,534,000	139,167,000	176,514,000	133,128,314	35,336,650	36,187,000	37,121,150	4,281,350	5,401,350
PFC Eligible Less AIP Funded (p)	89,471,400	88,812,870	125,201,900	103,729,200	129,303,800	125,561,499	30,671,200	30,784,550	30,910,100	571,800	725,100
PFC Collections (q)	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	19,370,323	20,520,730
Encumbered PFC Funds (r)	-	-	-	-	-	-	-	-	-	-	-
PFC Bond Size											
PFC Bond Proceeds											
PFC Debt Service	-	-	-	-	-	-	-	-	-	-	-
Interest Earnings (s)	-	-	-	-	-	-	-	-	-	-	767,045
Reserve											
Debt Service Coverage											
Available PFC Funds (sa)	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	19,370,323	21,287,775
PFC Expenditures (sb)	-	-	-	-	-	15,378,469	16,291,799	17,259,372	18,284,409	194,190	245,650
Airport Costs Reimbursable by PFCs (u)	-	-	-	-	-	-	-	-	-	-	-
Reimbursements from PFCs (ub)	-	-	-	-	-	-	-	-	-	-	-
Cummulative PFC Reimbursables (ua)	-	-	-	-	-	-	-	-	-	-	-
Remaining PFC Funds (sc)	-	-	-	-	-	-	-	-	-	19,176,133	21,042,125
Remaining PFC Eligible Costs (t)	89,471,400	88,812,870	125,201,900	103,729,200	129,303,800	110,183,030	14,379,401	13,525,178	12,625,691	377,610	479,450
State Funds											
State Eligible Capital Costs (x)	58,230,500	92,250,000	113,482,500	88,965,500	96,160,900	531,900	1,116,350	1,760,100	2,466,550	3,240,100	4,085,500

Table I.7

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Close ORF and PHF Analysis

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
State Entitlements (y)	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745
Available State Entitlements (ab)	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745
Expended State Entitlements (ac)	-	-	-	-	-	-	600,000	635,634	673,385	713,377	755,745
Discretionary Expenditures (ac)	6,870,913	7,022,554	7,627,542	7,785,951	7,947,855	531,900	516,350	1,124,466	1,793,165	63,383	226,855
Remaining State Entitlements (ad)	-	-	-	-	-	-	-	-	-	-	-
Grant and PFC Summary											
Total Costs (ae)	114,349,000	124,695,000	187,973,000	161,889,000	220,751,000	133,224,064	35,538,000	36,506,000	37,570,000	4,874,000	6,152,000
Ineligible Costs (ae)	-	-	-	-	24,526,000	20,000	42,500	68,000	96,500	129,000	165,000
Eligible Costs (ae)	114,349,000	124,695,000	187,973,000	161,889,000	196,225,000	133,204,064	35,495,500	36,438,000	37,473,500	4,745,000	5,987,000
Available Funds(af)	31,748,513	42,904,684	50,959,642	43,223,751	55,158,055	23,477,184	22,073,599	24,421,922	26,962,009	23,856,633	26,946,625
Eligible Expenditures (ag)	31,748,513	42,904,684	50,959,642	43,223,751	55,158,055	23,477,184	22,073,599	24,421,922	26,962,009	4,680,500	5,904,500
Remaining Costs (ah)	82,600,487	81,790,316	137,013,358	118,665,249	165,592,945	109,746,880	13,464,401	12,084,078	10,607,991	193,500	247,500
Other Expenditures (ai)	-	-	-	1,313,200	5,313,200	30,000	63,750	102,000	144,750	193,500	247,500
Airport Estimated Costs (aj)	82,600,487	81,790,316	137,013,358	117,352,049	160,279,745	106,736,540	10,865,641	9,936,618	8,954,111	-	-
	ALL Subsequent Calculations are on Fiscal Year Basis										
Airport Expenditures (am)	82,600,487	81,790,316	137,013,358	117,352,049	160,279,745	106,736,540	10,865,641	9,936,618	8,954,111	-	-
Bond Issues											
Bond Issue - Initial Construction #1											
Bond Size (ao)	459,871,933										
Bond Proceeds (ap)	441,477,056										
Debt Service (aq)						$37,700,982	$42,761,396	$42,761,396	$42,761,396	$42,761,396	$42,761,396
Interest Earnings (ar)		14,954,136	10,314,633	5,248,268	1,623,592	-	-	-	-	-	-
Reserve (as)	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982
Capitalized Interest (at)	14,945,838	29,891,676	29,891,676	29,891,676	29,891,676						
Available Funds (au)	388,830,236	291,292,209	189,924,850	28,268,084	-						
Expenditures from Proceeds (av)	82,600,487	81,790,316	137,013,358	-	-						
Remaining Funds (aw)	306,229,748	209,501,893	52,911,492	28,268,084	-						
Bond Issue - Initial Construction #2											
Bond Size (ao)				507,353,755							
Bond Proceeds (ap)				487,059,605							
Debt Service (aq)							$41,593,612	$41,593,612	$41,593,612	$41,593,612	$41,593,612
Interest Earnings (ar)					15,973,691	5,373,636	(0)	-	-	-	-
Reserve (as)				41,593,612	41,593,612	41,593,612	41,593,612	41,593,612	41,593,612	41,593,612	41,593,612
Capitalized Interest (at)				16,488,997	32,977,994	32,977,994					
Available Funds (au)				428,976,996	294,620,643	106,736,540					
Expenditures from Proceeds (av)				117,352,049	160,279,745	106,736,540					
Remaining Funds (aw)				311,624,946	134,340,899	(0)					

Table I.7

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis: Close ORF and PHF Analysis

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Bond Issue											
Bond Size (ao)											-
Bond Proceeds (ap)											-
Debt Service (aq)											
Interest Earnings (ar)											
Reserve (as)											-
Capitalized Interest (at)											
Available Funds (au)											-
Expenditures from Proceeds (av)											-
Remaining Funds (aw)											-
Total New Debt Service (bb)			-	-	-	70,678,976	70,678,976	70,678,976	79,294,594	79,294,594	79,294,594
Expenses											
Total O&M Expenses						18,739,707	19,852,661	21,031,714	22,280,791	23,604,051	25,005,900
Non-Operating Costs											
Debt Service (ck)						70,678,976	69,293,114	67,934,425	74,721,067	73,255,948	71,819,557
ORF/PHF Expense (cl)						2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Total Costs (cn)						91,418,683	91,145,775	90,966,140	99,001,859	98,860,000	98,825,457
Revenues											
Proceeds from Sale of Land						-	-	-	-	-	-
Available PFC Funds for Debt Service						$ -	$ -	$ -	$ -	$ 19,176,133	$ 21,042,125
Non-Airline Revenues						30,389,630	32,194,475	34,106,511	36,132,103	38,277,994	40,551,331
Required Airline Revenues						76,907,646	74,329,760	72,020,190	79,592,254	64,800,241	62,496,238
Total Revenues (dx)						107,297,277	106,524,235	106,126,701	115,724,357	122,254,368	124,089,694
Total Costs (dy)			-	-	-	91,418,683	91,145,775	90,966,140	99,001,859	98,860,000	98,825,457
Net Revenue			-	-	-	15,878,594	15,378,460	15,160,562	16,722,498	23,394,368	25,264,237
Capital Outlays	-	-	-	-	-	-	10,865,641	9,936,618	8,954,111	-	-
Additional Principal Paid						-	-	-	-	35,000,000	25,000,000
CIP Reserve Balance (ec)	-	-	-	-	-	15,878,594	20,391,413	25,615,356	33,383,743	21,778,111	22,042,348
Debt Service Coverage Estimate											
Total Revenues (dx)			-	-	-	107,297,277	106,524,235	106,126,701	115,724,357	122,254,368	124,089,694
Total Operating Costs (ed)			-	-	-	18,739,707	19,852,661	21,031,714	22,280,791	23,604,051	25,005,900
Remaining Revenue (ee)			-	-	-	88,557,570	86,671,574	85,094,987	93,443,566	98,650,317	99,083,794
Debt Service (ef)			-	-	-	70,678,976	69,293,114	67,934,425	74,721,067	73,255,948	71,819,557
Coverage Ratio (eg)						1.25	1.25	1.25	1.25	1.35	1.38
Airline Cost per Enplanement						$ 32.93	$ 30.05	$ 27.48	$ 28.67	$ 22.03	$ 20.06

Table I.7

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Inflation Factor (a)	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020
Bond Term (b)										
Bond Interest Rate (c)										
Bond Financing Cost (d)										
Capital Costs (e)										
Airfield	5,091,000	6,676,000	8,403,000	10,283,000	12,327,000	14,215,000	16,189,000	16,594,000	17,009,000	17,434,000
Terminal Area	1,801,000	2,385,000	20,287,000	24,272,000	25,062,000	5,408,000	6,366,000	6,744,000	7,144,000	7,569,000
General Aviation	393,000	509,000	632,000	764,000	904,000	1,043,000	1,188,000	1,217,000	1,248,000	1,279,000
Support Facilities	874,000	1,152,000	11,126,000	11,461,000	18,533,000	2,532,000	2,932,000	3,055,000	3,184,000	3,319,000
Air Cargo/Aircraft Maint. Facilities	470,000	627,000	803,000	4,014,000	4,233,000	1,405,000	1,600,000	1,640,000	1,681,000	1,723,000
Miscellaneous	-	-	-	-	-	-	-	-	-	-
Total	8,629,000	11,349,000	41,251,000	50,794,000	61,059,000	24,603,000	28,275,000	29,250,000	30,266,000	31,324,000
FAA Funds										
FAA Eligible Capital Costs (f)	6,550,150	8,603,400	19,473,700	24,569,950	27,239,550	18,530,000	21,243,100	21,920,600	22,624,350	23,354,350
Entitlements (g)	3,161,136	3,255,498	3,355,328	3,460,945	3,572,687	3,690,913	3,816,002	3,948,353	4,088,393	4,236,570
Available Entitlements (j)	3,161,136	3,255,498	3,355,328	3,460,945	3,572,687	3,690,913	3,816,002	3,948,353	4,088,393	4,236,570
Expended Entitlements (k)	3,161,136	3,255,498	3,355,328	3,460,945	3,572,687	3,690,913	3,816,002	3,948,353	4,088,393	4,236,570
Remaining Potential Entitlements (l)	-	-	-	-	-	-	-	-	-	-
Discretionary Expenditures (m)	3,389,014	5,347,902	9,216,372	11,560,005	14,117,863	14,839,087	17,427,098	17,972,247	18,535,957	19,117,780
Eligible Costs Unfunded by AIP (n)	-	-	6,902,000	9,549,000	9,549,000	-	-	-	-	-
PFC Funds										
PFC Eligible Capital Costs (o)	7,572,450	9,954,350	26,364,100	33,607,100	36,716,700	21,520,600	24,703,100	25,524,500	26,378,700	27,266,950
PFC Eligible Less AIP Funded (p)	1,022,300	1,350,950	13,792,400	18,586,150	19,026,150	2,990,600	3,460,000	3,603,900	3,754,350	3,912,600
PFC Collections (q)	21,739,459	23,030,570	24,398,359	25,847,382	27,382,462	29,008,711	30,731,544	32,556,696	34,490,243	36,538,625
Encumbered PFC Funds (r)	-	-	-	-	-	-	-	-	-	-
PFC Bond Size										
PFC Bond Proceeds				-						
PFC Debt Service	-	-	-		$0	$0	$0	$0	$0	$0
Interest Earnings (s)	841,685	889,435	938,597	461,782	308,921	346,609	1,135,728	1,229,936	1,304,617	1,382,744
Reserve				-						
Debt Service Coverage										
Available PFC Funds (sa)	22,581,144	23,920,004	25,336,956	26,309,164	27,691,383	29,355,321	31,867,271	33,786,632	35,794,861	37,921,369
PFC Expenditures (sb)	345,270	455,070	13,792,400	18,586,150	19,026,150	962,130	1,118,860	1,171,200	1,226,260	1,284,320
Airport Costs Reimbursable by PFCs (u)	-	-	-	-	-	-	-	-	-	-
Reimbursements from PFCs (ub)	-	-	-	-	-	-	-	-	-	-
Cummulative PFC Reimbursables (ua)	-	-	-	-	-	-	-	-	-	-
Remaining PFC Funds (sc)	22,235,874	23,464,934	11,544,556	7,723,014	8,665,233	28,393,191	30,748,411	32,615,432	34,568,601	36,637,049
Remaining PFC Eligible Costs (t)	677,030	895,880	-	-	-	2,028,470	2,341,140	2,432,700	2,528,090	2,628,280
State Funds										
State Eligible Capital Costs (x)	5,724,300	7,520,550	18,111,150	22,790,150	25,128,600	16,214,750	18,594,200	19,193,200	19,815,450	20,461,450

Table I.7

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
State Entitlements (y)	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
Available State Entitlements (ab)	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
Expended State Entitlements (ac)	800,628	848,178	898,551	951,916	1,008,451	1,068,343	1,131,792	1,199,009	1,270,219	1,345,657
Discretionary Expenditures (ac)	580,452	972,102	8,227,081	8,375,119	8,524,432	2,780,177	3,343,648	3,485,791	3,634,821	3,791,623
Remaining State Entitlements (ad)	-	-	-	-	-	-	-	-	-	-
Grant and PFC Summary										
Total Costs (ae)	8,629,000	11,349,000	41,251,000	50,794,000	61,059,000	24,603,000	28,275,000	29,250,000	30,266,000	31,324,000
Ineligible Costs (ae)	235,000	313,500	10,361,900	10,027,400	16,805,800	702,500	800,000	820,000	840,500	861,500
Eligible Costs (ae)	8,394,000	11,035,500	30,889,100	40,766,600	44,253,200	23,900,500	27,475,000	28,430,000	29,425,500	30,462,500
Available Funds(af)	30,512,374	34,343,684	47,034,288	50,657,149	54,914,816	51,733,841	57,585,811	60,392,032	63,324,251	66,412,999
Eligible Expenditures (ag)	8,276,500	10,878,750	35,489,732	42,934,135	46,249,583	23,340,650	26,837,400	27,776,600	28,755,650	29,775,950
Remaining Costs (ah)	352,500	470,250	5,761,268	7,859,865	14,809,417	1,262,350	1,437,600	1,473,400	1,510,350	1,548,050
Other Expenditures (ai)	352,500	470,250	602,250	749,250	913,500	1,262,350	1,437,600	1,473,400	1,510,350	1,548,050
Airport Estimated Costs (aj)	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
ALL Subsequent Calculations are on Fiscal Year Basis										
Airport Expenditures (am)	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
Bond Issues										
Bond Issue - Initial Construction #1										
Bond Size (ao)	-							-		
Bond Proceeds (ap)	-							-		
Debt Service (aq)	$42,761,396	$42,761,396	$42,761,396	$42,761,396	$42,761,396	$42,761,396	$42,761,396	$42,761,396	$42,761,396	$42,761,396
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982	37,700,982
Capitalized Interest (at)										
Available Funds (au)										
Expenditures from Proceeds (av)										
Remaining Funds (aw)										
Bond Issue - Initial Construction #2										
Bond Size (ao)										
Bond Proceeds (ap)										
Debt Service (aq)	$41,593,612	$41,593,612	$41,593,612	$41,593,612	$41,593,612	$41,593,612	$41,593,612	$41,593,612	$41,593,612	$41,593,612
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	41,593,612	41,593,612	41,593,612	41,593,612	41,593,612	41,593,612	41,593,612	41,593,612	41,593,612	41,593,612
Capitalized Interest (at)										
Available Funds (au)										
Expenditures from Proceeds (av)										
Remaining Funds (aw)										

Table I.7

EASTERN VIRGINIA AIRPORT SYSTEM STUDY

Pro Forma Cash Flow Analysis

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Bond Issue										
Bond Size (ao)										
Bond Proceeds (ap)	-									
Debt Service (aq)		$0	$0	$0	$0	$0	$0	$0	$0	$0
Interest Earnings (ar)	-	-	-	-	-	-	-	-	-	-
Reserve (as)	-	-	-	-	-	-	-	-	-	-
Capitalized Interest (at)	-									
Available Funds (au)	-	-	-	-	-	-	-	-	-	-
Expenditures from Proceeds (av)	-	-	-	-	-	-	-	-	-	-
Remaining Funds (aw)	-	-	-	-	-	-	-	-	-	-
Total New Debt Service (bb)	80,998,584	81,127,478	81,266,122	81,415,253	81,575,665	81,748,211	81,933,809	82,133,446	82,348,184	49,638,776
Expenses										
Total O&M Expenses	26,491,005	28,064,310	29,731,054	31,496,787	33,367,386	35,349,081	37,448,469	39,672,540	42,028,699	44,524,791
Non-Operating Costs										
Debt Service (ck)	71,924,425	70,626,352	69,359,853	68,124,642	66,920,458	65,747,065	64,604,249	63,491,825	62,409,632	36,882,342
ORF/PHF Expense (cl)	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Total Costs (cn)	100,415,429	100,690,662	101,090,907	101,621,429	102,287,845	103,096,146	104,052,719	105,164,366	106,438,331	83,407,133
Revenues										
Proceeds from Sale of Land	-	-	-	-						
Available PFC Funds for Debt Service	$ 22,235,874	$ 23,464,934	$ 11,544,556	$ 7,723,014	$ 8,665,233	$ 28,393,191	$ 30,748,411	$ 32,615,432	$ 34,568,601	$ 36,637,049
Non-Airline Revenues	42,959,682	45,511,065	48,213,975	51,077,411	54,110,907	57,324,563	60,729,079	64,335,789	68,156,703	72,204,541
Required Airline Revenues	62,363,369	60,937,101	72,750,433	76,558,422	75,699,707	56,156,124	54,090,228	52,621,838	51,181,253	26,798,808
Total Revenues (dx)	127,558,925	129,913,100	132,508,964	135,358,847	138,475,847	141,873,878	145,567,719	149,573,059	153,906,557	135,640,398
Total Costs (dy)	100,415,429	100,690,662	101,090,907	101,621,429	102,287,845	103,096,146	104,052,719	105,164,366	106,438,331	83,407,133
Net Revenue	27,143,496	29,222,438	31,418,057	33,737,418	36,188,002	38,777,732	41,515,000	44,408,694	47,468,225	52,233,265
Capital Outlays	-	-	168,060	3,220,660	5,539,605	-	-	-	-	-
Additional Principal Paid	25,000,000	25,000,000	29,000,000	25,000,000			-	-	-	-
CIP Reserve Balance (ec)	24,185,844	28,408,282	30,658,279	36,175,037	66,823,434	105,601,166	147,116,166	191,524,860	238,993,085	291,226,350
Debt Service Coverage Estimate										
Total Revenues (dx)	127,558,925	129,913,100	132,508,964	135,358,847	138,475,847	141,873,878	145,567,719	149,573,059	153,906,557	135,640,398
Total Operating Costs (ed)	26,491,005	28,064,310	29,731,054	31,496,787	33,367,386	35,349,081	37,448,469	39,672,540	42,028,699	44,524,791
Remaining Revenue (ee)	101,067,921	101,848,790	102,777,910	103,862,060	105,108,460	106,524,797	108,119,250	109,900,519	111,877,857	91,115,607
Debt Service (ef)	71,924,425	70,626,352	69,359,853	68,124,642	66,920,458	65,747,065	64,604,249	63,491,825	62,409,632	36,882,342
Coverage Ratio (eg)	1.41	1.44	1.48	1.52	1.57	1.62	1.67	1.73	1.79	2.47
Airline Cost per Enplanement	$ 18.89	$ 17.42	$ 19.64	$ 19.51	$ 18.21	$ 12.75	$ 11.59	$ 10.64	$ 9.77	$ 4.83

Study Participants

Phase I

Steering Committee

Federal Aviation Administration

Virginia Department of Aviation

Virginia Department of Transportation

Hampton Roads, Richmond Regional, and Crater Planning District Commissions

Capital Regional Airport Commission

Norfolk Airport Authority

Peninsula Airport Commission

Virginia Gateway 21

Washington Airports Task Force

Phase II

Policy Advisory Committee (PAC)

Virginia Secretary of Transportation (Chairman)

Various community leaders

Technical Advisory Committee (TAC)

Virginia Department of Aviation

Richmond, Norfolk, and Newport News-Williamsburg International Airports

Virginia Department of Environmental Quality

Virginia Department of Transportation

Virginia Department of Rail and Public Transportation

U.S. Department of Transportation

Federal Aviation Administration

Hampton Roads, Richmond Regional, and Crater Planning District Commissions